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The Interaction Between Design and Occupier Behaviour in the Safety of New Dwellings

by

Hilary J. McDermott

Doctoral thesis

Submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy of Loughborough University

September 2007

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'Knowledge is of no value unless you put it into practice'

Anton Chekhov (1860 – 1904)
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ABSTRACT

This thesis is concerned with occupier behaviour within new homes and how behaviour can interact with design features to lead to an increased risk of injury or ill-health. Unintentional home injuries are a significant problem within the UK and reducing the incidence and severity of such injuries is a public health priority. Preventative measures targeting risk factors for unintentional injury in the home have tended to focus on either primary efforts to reduce hazards within the environment or behaviour change strategies. It is important however, to also recognise the potential contribution of the interactions that arise between dwelling design and occupier behaviour and how these may influence safety and well-being.

This research comprised four studies, adopting a multi-methodological approach. The first three studies used triangulated investigations to examine occupier experiences of inhabiting a new home. The final study offered an exploration of the attitudes of professionals responsible for the design of new dwellings in relation to occupier safety and the factors which shape current dwelling design.

In the initial stage of the research 40 in-depth, semi-structured interviews and home inspections were conducted with new build occupiers. A range of unsafe interactions were reported in relation to building features including self-closing fire doors, loft access and service pipes and cabling. A number of features were also identified which occupiers felt presented a risk to their health and safety. These features included fire egress windows, sloped access thresholds and descending newel posts, for example.

To assess how home interactions develop over time a diary-based study was undertaken, allowing a temporal assessment of occupier behaviour. In total, 9 usable diaries were completed by participants over durations varying from 9 days to 211 days. Similar unsafe interactions were reported during the course of this diary study and a range of features were reported as presenting a risk of unintentional injury or ill-health. These features included
high hot water temperatures, sloped internal ceilings and loft access. A
temporal analysis of interactions identified that occupiers are initially
proactive in seeking solutions to problems within their homes but these
attempts are not always successful.

The information gathered during these first two studies was used to design a
questionnaire which was distributed to 794 new homes in the Midlands area.
The aim of this questionnaire was to establish the prevalence of the
reported interactions amongst a wider population. Quantitative data from
this study suggested that many of the unsafe interactions reported during
the previous studies are commonplace in new homes.

The final study examined the attitudes of professionals responsible for the
design of new dwellings in relation to occupier safety and sought to identify
the factors which shape current dwelling design. Semi-structured interviews
were undertaken with 14 architects and designers. This study revealed that
some of those responsible for dwelling design have an unsympathetic
attitude towards occupier safety and well-being and rely almost entirely on
building regulations to ensure a level of health and safety within the home.
The design professional participants described a number of factors which
influence current dwelling design, sometimes these being at variance with
each other, for example developer needs can sometimes conflict with Local
Authority planning requirements.

The research has established that many of the interactions that arise within
the domestic setting are influenced by environmental, behavioural and
social factors. The thesis argues that prevention strategies adopting an
ecological systems approach to injury prevention present an opportunity to
address the complex set of factors affecting safety in the home.
ACKNOWLEDGEMENTS

I would like to express my gratitude to Roger Haslam and Alistair Gibb for their continued support and guidance during the course of this work. Many thanks also to George Havenith for his wise counsel as my Director of Research.

This research journey was initially inspired by my previous tutor, Stephen Beck, whose encouragement, teaching and direction at the start of my studies provided me with the necessary building blocks and confidence I needed to pursue such a goal. Without his support this journey would not have taken place and I am deeply grateful for his influence in shaping the path I followed. Thank you, Steve.

Special thanks go to those individuals who shared but a moment along the way by participating in these studies; those who invited me into their homes to record their experiences and those who contributed in other ways by sharing their views and reflections.

Many people have walked a part of this journey beside me; too many to mention individually, but some too special not to name. Sally, Beverley, Cheryl, Karen, Peter, Murray, Nigel, Jonathan and Martin; you have all made a difference in helping me find hope in the darkest of days. Many thanks also to all the staff and students resident within the Bungalow, friends and colleagues in the Department of Human Sciences and the PhD 'Massif' with whom I have shared so much over the past few years.

I dedicate this thesis to my daughter Ellie, who has only known a mother who is journeying. May she have the confidence always to tread any path she desires.

To my husband Colin, I hope you understand my tenacity to embark upon and complete this journey. Thank you for your patience, sacrifice and support during this time. There is good news now . . . it's over, I have reached my Grey Havens.
"I know. It's all wrong. By rights we shouldn't even be here. But we are. It's like in the great stories, Mr. Frodo. The ones that really mattered. Full of darkness and danger, they were. And sometimes you didn't want to know the end. Because how could the end be happy? How could the world go back to the way it was when so much bad had happened? But in the end, it's only a passing thing, this shadow. Even darkness must pass. A new day will come. And when the sun shines it will shine out the clearer. Those were the stories that stayed with you. That meant something, even if you were too small to understand why. But I think, Mr. Frodo, I do understand. I know now. Folk in those stories had lots of chances of turning back, only they didn't. They kept going. Because they were holding on to something."

J.R.R. Tolkien (1892 – 1973)
The Lord of the Rings
Aspects of the work presented in this thesis have been published in the following peer-reviewed journals and conference proceedings.

Journal Papers


Conference Papers


Chapter 1

INTRODUCTION

1.1 The problem

Unintentional home injuries are a major public health concern within the UK and abroad. Each year in the UK alone, almost 4,000 deaths occur and approximately 2.7 million injuries requiring hospital treatment are sustained as a result of an accident within the home environment (Department of Trade & Industry [DTI], 2001). In addition to the recorded statistics, it is estimated that millions of minor injuries are incurred due to a domestic accident which are subsequently unreported and treated elsewhere, other than at a hospital accident and emergency department (DTI, 1999).

The influence of the residential environment on health and well-being has been increasingly recognised (Fuller-Thomson, Hulchanski & Hwang, 2000) and within this framework the relevance of the built form of the home as a potential source of hazards has been identified (Ormandy, 2007). There is strong evidence that the physical characteristics within each home can present hazards which result in unintentional injuries or ill-health (Fuller-Thomson et al., 2000). Occupier behaviour has also been identified as a contributory factor in domestic accidents (Bonnefoy et al., 2004) and a number of studies have demonstrated how occupier behaviour can affect the home environment leading to an increased risk of unintentional injury (Roys, 2001; Haslam et al., 2006).

Reducing the incidence and severity of unintentional home injuries is a public health priority in the UK (Department of Health, 2003a). Over the past four decades, various approaches and frameworks have been developed and implemented within the area of injury prevention. Prevention strategies developed for unintentional home injuries have been dominated by the medical model of health (Engel, 1977), which understands a person and their injury risk in terms of individual behaviour. Consequently,
prevention initiatives have focused on either engineering approaches or behavioural approaches. 'Primary' measures consist of engineering controls which aim to improve the environment in order to reduce the number of hazards present and thereby reduce the risk of unintentional injury. 'Secondary' measures focus on the individual factors, such as the beliefs, attitudes and conduct of the individual and aim to encourage safe practices. Despite the implementation of these strategies in tackling a wide range of unintentional home injuries, the number of injuries sustained within the home remains a public health concern.

Primary intervention methods, focusing solely on environmental modification, have been criticised for ignoring the fact that many environmental modifications require change in behaviour on behalf of the occupant (Carlson-Gielen & Sleet, 2003). In addition to this, primary and secondary measures fail to address psychological, environmental and social factors as individual and collective determinants of injury (Allegrante, Marks & Hanson, 2006).

Recently, the importance of psychological and social factors in the aetiology of injury has been recognised (Carlson-Gielen & Sleet, 2003; Allegrante et al., 2006) and community-based approaches to injury prevention have been developed which address injuries in the context of the whole ecological system. These approaches have been successful in some areas where they have addressed a wide range of injury problems (Spinks, Turner, Nixon & McClure, 2005).

An ecological approach to the prevention of home injuries has intuitive appeal whereby the environmental and social determinants of home based behaviours can be understood and addressed. Although the importance of an interaction between behaviour and dwelling design has been recognised in the literature, very little is known about the interactions that arise within the home environment and how occupier behaviour is influenced by environmental and social factors. This thesis details the research undertaken to develop understanding about the different ways in which
people use their new homes. The work aimed to identify how individuals interact with their new home environment and how other varying influences impact upon current dwelling design and occupier behaviour with regard to safety.

1.2 Scope of the thesis

In response to increased demand for housing, there is a commitment from the government to extend the provision of full market and affordable housing within the UK. New build completions are set to increase by 60% by the year 2016 (Department for Communities and Local Government, [DCLG], 2007a). In addition to this increase in volume there are also plans to extend the rate at which developments are built. A large proportion of the planned new housing will be built by private speculative developers, the majority of whom utilise standard house designs. Lorentzen (1996) argued that new houses could be seen as a consumer product, albeit a very expensive one, yet there has been very little research into consumer needs and requirements in relation to housing (Sommerville & McCosh, 2006). This lack of understanding regarding consumer requirements and the planned expansion of standard house types may lead to some design errors being repeated on a large scale.

A number of environmental measures aimed at reducing unintentional injury within dwellings have been incorporated in building regulations. New-build housing within the UK is required to comply with these regulations, one aim of which is to ensure the health and safety of occupants and visitors. However, there is evidence that some of these measures may not afford the level of protection required (Meacham, 1999; Pickett, 2003; Carlson-Gielen & Sleet, 2003). Some aspects of dwelling design have also been shown to contribute to an increased risk of unintentional injury (Rennie & Ford, 1995; Bonnefoy et al., 2004), and the long life-span of dwellings means that any errors which are present in current design will remain as environmental hazards over a long period of time.
This thesis is concerned with the interactions that arise within new homes. With the current drive to provide additional housing within the UK, a thorough understanding of how people interact with the features and systems within their new homes would provide valuable knowledge for both those responsible for promoting home safety and for those responsible for promoting the design quality of new dwellings.

1.3 Research aims
This research aimed to extend existing knowledge with respect to occupant behaviour within new homes and to gain an understanding of how occupier behaviour can interact with modern day dwelling design to affect health and safety. The specific objectives of the research were to:

- investigate the ways in which occupiers interact and engage with new homes to affect their health and safety
- examine how these interactions are influenced over time
- ascertain the prevalence of common reported interactions amongst a wider population within the UK
- collect information regarding the influences which shape current dwelling design
- examine the attitudes of professionals responsible for the design of new dwellings regarding their role in improving home safety

1.4 Research approach
The disciplines of Psychology and Ergonomics have been plagued by debate between the opposing research paradigms; the quantitative paradigm based on positivism and the qualitative paradigm based on interpretivism and constructivism. The key differences within these paradigms are concerned with ontological and epistemological positions. The underlying assumptions of each paradigm however, extend beyond their philosophical and methodological differences and have given rise to different methods of enquiry, different sources of funding and even
differences in the scientific language used to describe them (Sale, Lohfeld & Brazil, 2002).

Whilst the positivist paradigm is viewed by many as the dominant frame of reference in the physical and social sciences (Sale et al., 2002), quantitative methods cannot measure some of the phenomena studied by social scientists and the prevalence of qualitative research within many disciplines has grown significantly over the last few decades.

Miles and Huberman (1994) suggest it is good practice for researchers to define their philosophical position, a position which guides the choice of methods employed and the subsequent analysis and interpretation of findings (Hignett, 2005). The philosophical position of this thesis is that of transcendental realism, (Bhaskar, 1989), whereby social phenomena exist not only in the mind but also in the objective world and that some lawful and reasonable stable relationships can be found among them (Miles & Huberman, 1994, p 4). This is an ontological view which is shared by other authors (e.g. Hignett, 2005) in which the dichotomy of qualitative and quantitative methodologies can co-exist (Hignett, 2005).

This pragmatic approach is not without its critics, some researchers believe that it is inappropriate to combine qualitative and quantitative methodologies because of the inherent differences in the philosophical assumptions upon which they are based (Lincoln and Guba, 1985). Sale et al., (2002) suggest that although qualitative and quantitative methods represent different paradigms, multiple methods can be utilised within a research agenda for complimentary purposes, whereby each method studies a different aspect of the same phenomena.

The approach used within this thesis involved the use of mixed methodology, whereby qualitative methods and quantitative methods were combined to achieve the universal research aim. Qualitative methods were utilised to understand the human experience whereas quantitative measures provided a way of measuring this experience. This distinction between
'lived experience' and 'measure' reconciles the phenomenon of study to its respective method and paradigm (Sale et al., 2002).

1.5 Development of research

This research adopted a multi-methodological approach to obtain detailed and rich information on the experiences of individuals occupying a brand new home. A variety of qualitative and quantitative methods were employed to achieve the aims of each particular phase of research. The combination of methods in the study of the same phenomenon is referred to as triangulation. Denzin (1970) has argued that researchers should use as many methodological perspectives as possible when investigating social problems. He distinguishes between four forms of triangulation; data, investigator, theoretical and methodological triangulation. Two forms of methodological triangulation are described, 'within-method' triangulation and 'between-method' triangulation. The latter is the process adopted within this thesis whereby different methods of study were used to measure the same unit. The underlying rationale behind 'between-method' triangulation is that through combining different methods, the weakness of one method would be addressed through the strength of another (Magnusson, Finnerty & Pope, 2005).

Lincoln and Guba (1985) suggest that triangulation of data is crucially important in naturalistic studies to increase the probability that the findings are credible. Fielding and Fielding (1986) however argue that it is naïve to assume that the use of several different methods ensures the validity of the findings, theories are generally the product of quite different traditions and whilst combining them can give a breadth or depth to the analysis it cannot provide a more objective one (Fielding & Fielding, 1986). Richardson (2000) provides an alternative analogy for the combination of research methods claiming that 'we do not triangulate, we crystallize' recognising that there are more than 'three sides' from which to approach the world (Richardson, 2000).
The use of a mixed methods approach to the work in this thesis allowed a thorough examination of the different ways in which occupier behaviour within the home is driven by environmental and social influences. The weaknesses of any one approach were considered through the application of multiple methods within the same broad subject arena.

A summary of the research process reported in this thesis is shown in Figure 1.1.
Figure 1.1 An overview of the research process

**Preparation**
- Literature Review

**Phase One**
- **Data Collection**: 40 interviews conducted with 54 participants occupying a new home
- **Data Analysis**: Data reduction, data display, verification and conclusion drawing.

**Phase Two**
- **Data Collection**: 10 audio diaries completed by individual participants occupying a new home
- **Data Analysis**: Data reduction, data display, verification and conclusion drawing.

**Phase Three**
- **Data Collection**: Questionnaire survey of 794 new home owners
- **Data Analysis**: Analysis of quantitative and qualitative data. Verification and conclusion drawing.

**Phase Four**
- **Data Collection**: 14 individual interviews with architects and designers
- **Data Analysis**: Data reduction, data display, verification and conclusion drawing.

**Analysis & Conclusions**
- Review and recode all data
- Identification of themes and relationships
- Thesis development

**Thesis**
Update literature review
Write up
1.6 Ethical issues
This research was subject to and in compliance with the requirements of the Loughborough University Ethical Advisory Committee in relation to research with human participants. The University ethical clearance checklist was completed for all phases of the research. A full submission was made to the University Ethical Advisory Committee with respect to the home interview and diary studies. Permission to proceed was obtained prior to the commencement of the research. Informed consent was obtained from all participants and they were made aware that all information provided during the interviews would remain confidential and that the information would only be reported in anonymised form.

1.7 Thesis structure
This thesis is presented over 7 chapters. Following this introduction the further chapters are structured as follows:

Chapter 2 reviews the published literature relevant to the aims and objectives of this thesis. This review details the topics that inform our current understanding of health and safety within the home and includes a critical appraisal of injury prevention measures introduced to date. This review also introduces the concept of the application of behaviour change theories in injury prevention.

Chapter 3 details the use of home interviews to identify the ways in which occupiers use and interact with their homes and presents the findings and discussion arising from this work.

Chapter 4 presents the use of audio diaries to assess the temporal patterns of engagement within the home. The findings from this study are presented and discussed.
Chapter 5 reports on the use of questionnaires which were used to obtain quantitative information on the prevalence of reported interactions and behaviours from those occupying a brand new home.

Chapter 6 describes the use of interviews to ascertain the views of professionals involved in modern dwelling design. The findings from this study are presented and discussed.

Chapter 7 presents a synthesis of the results from the previous four chapters and details how the findings from this programme of work can contribute to and inform our understanding of home injury prevention. This chapter also details the conclusions drawn as a result of this programme of study. Suggestions for future research are presented together with a critical discussion on the contribution made to knowledge by this body of work.
Chapter 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of the published literature in relation to unintentional home injuries within the UK and elsewhere worldwide. The nature and extent of the problem is described together with an overview of the types of injuries sustained and the areas within the home where there is an increased risk of injury or ill-health. The chapter also explores the risk factors for home injuries and introduces the established links between housing, health and well-being.

The review also explores the approaches and frameworks which have been used in the prevention of unintentional injuries in the home and the effectiveness of these is discussed. This review also includes a consideration of the application of behaviour change theories and models to areas of injury prevention. Attention to environmental, behavioural and social factors in the prevention of unintentional injury or ill-health is central to this thesis and the manner in which these variables play a role in the interaction between behaviour and environmental design will be substantiated.

2.2 Unintentional home injuries – the nature and scale of the problem

This section describes the nature and scale of the problem concerning unintentional home injuries in the UK and abroad. Data sources for unintentional home injuries are outlined and the validity of the data is discussed. Details concerning the type of injuries that arise and the articles frequently involved are presented. The section concludes with details of the estimated cost of unintentional home injuries to society.
2.2.1 Source data

Until recently, the Consumer Affairs Directorate within the Department of Trade and Industry (DTI) had responsibility for the monitoring of unintentional domestic deaths and injuries within the UK. Data had been collated for over 20 years, held in two databases: The Home Accidents Surveillance System (HASS) and The Home Accidents Deaths Database (HADD).

HASS contains details of non-fatal accidents occurring within the home where the casualty visited an Accident and Emergency Department of a hospital for treatment. The data held within this database are taken from a representative sample of 18 hospitals spread across the UK (Department of Trade & Industry [DTI], 1999). The total number of home accidents within the UK in any one year is estimated on the basis of the data obtained from this sample. Figures quoted from this database are therefore only estimates and are generally biased towards more serious injuries, not taking into account minor accidents that have been treated elsewhere other than at a hospital based accident and emergency department. The statistical uncertainty of the national estimates is quantified using confidence limits at 95%.

HADD is based on data from the Office for National Statistics (ONS), which collates coroner’s returns on all fatal accidents within England and Wales and includes details of all accidental deaths that arise as a result of an incident within the home. The data held within this database covers only England and Wales. The population of England and Wales is 88% of that of the whole UK, and estimates of death within the UK are subsequently calculated by multiplying the HADD figures by 1.14 (DTI, 2003).

The validity of data within an emergency-based surveillance system is reliant on the accuracy of reporting and recording at the time of the incident (Farchi et al., 2006). The potential for inadequacies or errors in both the collation of information and the reporting of information within HADD and HASS must therefore be taken into consideration. For example, injured
patients may be unable to provide accurate information following an accident and therefore medical summaries may not contain sufficiently detailed information about the cause of an injury for it to be correctly recorded. Despite this, emergency department based surveillance systems have helped fill a major gap in our understanding of non-fatal injuries (Stone, Morrison & Smith, 1999).

In 2003 it was announced that the DTI would no longer fund the collection and publication of the HASS data for the UK (DTI, 2003). The last complete year for which data is available on accidental home injuries within the UK is 2002. Figures for accidental deaths within England and Wales continue to be published annually by the ONS.

Data on home accidents within Europe are collected within the different member states and were previously reported via the European Home and Leisure Accident Surveillance System (EHLASS) (Bardehle, Fuhr, Monárrez-Espino, Heyer & Rössler, 2002). The methods of data collection within the member states contributing to this database were not consistent, with some countries using survey methods and others collecting data using hospital based surveillance systems. Due to the heterogeneity in both methodology and in the injury definitions used by each country, comparison between different member states is difficult. This system has now been incorporated into a European Injury Database (Euro IDB). The EU injury database was set up in 2002 by DG SANCO, the Directorate General for Public Health and Consumer Protection of the European Commission. With a dedicated coding manual, this database aims to alleviate some of the problems identified with EHLASS. However, not all European member states contribute to this database; the UK for example, is not currently a contributing member. Differences in current reporting levels between the contributing countries also reduces the reliability of the data. The system can be useful however, in highlighting the magnitude of the problem within the entire European Union.
2.2.2 The scale of the problem

Unintentional home injuries are a leading cause of injury-related hospitalisation. Each year within the UK approximately 2.7 million home based injuries occur which result in the casualty seeking treatment at a hospital based Accident and Emergency Department (DTI, 2003). It is estimated that a similar number of domestic injuries occur each year where the casualty seeks medical attention elsewhere, for example from their General Practitioner (DTI, 1999), and that millions of minor injuries are sustained where no medical treatment is sought, but which are subsequently treated through the administration of first aid (DTI, 1999). In addition to these home-based injuries, around 4,000 deaths occur each year within the UK as a result of a home injury (DTI, 1999).

Each year, the Office for National Statistics (ONS) publishes data on non-natural deaths in England and Wales. The latest available data from the ONS shows that a total of 3,681 deaths were recorded in 2001 due to an accident within the home or communal establishment (Office for National Statistics [ONS], 2005). Population figures, based on the 2001 Census of Population (ONS, 2002), have been used to calculate the death rate for home accidents in England and Wales within 2001 as 7.07 per 100,000 population.¹

Research by the Department of Trade and Industry has identified that the total number of accidental domestic deaths occurring within the UK each year is consistently falling whilst the number of non-fatal injuries sustained each year is consistently increasing (DTI, 1999). Explanations of this continuing downward trend of fatalities include the use of home safety campaigns aimed at improving home safety and the continuing advances in medical care that ensure more individuals are able to survive very serious injuries (DTI, 1999).

¹Population for England and Wales in 2001 was 52,041,916

\[
52,041,916 + 100,000 = 520,41916
\]

\[
3681 + 520,41916 = 7.07
\]
Although data on home accidents are no longer collected in a systematic way, projections made by the DTI in 1999 suggested that over the following ten years the number of deaths arising due to an accident could fall by a further 30%, whilst the number of non-fatal injuries could increase by as much as 20% by the year 2010 (DTI, 1999).

Accidental home-based injuries are also a significant public health and safety concern elsewhere worldwide. Each year in the European Union (EU) approximately 20 million home and leisure accidents occur resulting in some 2 million hospital admissions and over 80,000 deaths. More than half of these incidents occur in or around the home, (Bonnefoy et al., 2004).

Within the United States, unintentional injuries are a leading cause of death for Americans of all ages (National Centre for Injury Prevention and Control, 2001). From 1992 to 1999 an average of 18,048 unintentional home injury deaths occurred each year, these fatalities representing 6.83 deaths per 100,000 population (Runyan et al., 2005a). In addition to these, in 1998 there were more than 12 million non-fatal accidental home injuries that required some form of medical attention (Runyan et al., 2005b).

2.2.3 The nature of the problem
In 2002, 3,639 deaths occurred as a result of an unintentional injury sustained within the home in England and Wales. Of these, 1,912 were males and 1,727 were females (ONS, 2005). The most frequent cause of accidental death during this year was falls, with over 2,000 individuals involved in some form of fatal fall. The remaining significant causes of death included accidental threats to breathing (331 deaths), exposure to smoke, fire and flames (324 deaths) and accidental poisoning (661 deaths) (ONS, 2005).

The most recent HASS report providing data on non-fatal home accidents shows that in 2002 an estimated 2,701,331 injuries were sustained within the UK (95% CI, 2,698,107 – 2,704,549) (DTI, 2003). Of these, 46.2% involved the casualty falling in some way and 22.5% resulted in the casualty
colliding or being crushed by an article. The complete list of accident mechanisms resulting in non-fatal injuries for this year (2002) is shown in Table 2.1.

**Table 2.1. Accident mechanisms of UK home accidents 2002.**
*(Based on data from DTI, 2003)*

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>% total accidents</th>
<th>National Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls</td>
<td>46.2</td>
<td>1 247 960</td>
</tr>
<tr>
<td>Struck/Collision</td>
<td>22.5</td>
<td>609 342</td>
</tr>
<tr>
<td>Cut/Tear/Puncture</td>
<td>10.7</td>
<td>288 579</td>
</tr>
<tr>
<td>Foreign Body/Suffocation</td>
<td>5.3</td>
<td>143 624</td>
</tr>
<tr>
<td>Chemical/Thermal effects</td>
<td>3.6</td>
<td>97 088</td>
</tr>
<tr>
<td>Bite/Sting</td>
<td>2.7</td>
<td>72 673</td>
</tr>
<tr>
<td>Poisoning</td>
<td>1.2</td>
<td>33 272</td>
</tr>
<tr>
<td>Electric/Radiation</td>
<td>0.2</td>
<td>5 125</td>
</tr>
<tr>
<td>Over Exertion</td>
<td>3.3</td>
<td>90 118</td>
</tr>
<tr>
<td>Other</td>
<td>4.2</td>
<td>113 550</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>100</strong></td>
<td><strong>2 701 331</strong></td>
</tr>
</tbody>
</table>

It is clear that falls in the home are a major cause of unintentional injury. Over 40% of non-fatal accidents and over 50% of deaths result from some type of fall (DTI, 1999). Based on earlier trends, the predictions made by the DTI in 1999 estimate that the total number of non-fatal falls will increase by 17.3% by the year 2010, despite a projected increase in the population of only 2.7%, and the number of accidental deaths as a result of a fall are expected to decrease by 36% (DTI, 1999).

### 2.2.4 Fire related incidents

Fire related deaths and injuries are also a cause for concern. Data on some burn and scald victims are contained within the HASS database, *(See Chemical/Thermal effects in Table 2.1)* but data on casualties from uncontrolled house fires are available from Home Office fire statistics. The Home Office statistics contain all cases where a casualty is advised to seek
medical treatment at a hospital as the result of a house fire. For clarity, the figures reported here are taken from Home Office statistics.

Every year, almost 400 people are killed and over 10,000 injured in house fires within the UK. Current, but provisional, data from the Department for Communities and Local Government (DCLG) suggests that in the year ending 31st March 2006 a total of 57,100 dwelling fires were attended by Fire and Rescue Services in the UK (Department for Communities and Local Government [DCLG], 2007b). Of these 38,100 are recorded as unintentional dwelling fires. Deaths and injuries from dwelling fires fell during the year ending 31st March 2006, with the number of deaths falling to 334 from 373 in the previous year and injuries falling by 1% to 11,400 (DCLG, 2007b).

Home Office fire statistics show that 89% of fires result from behavioural factors, whilst only 11% arise due to a product fault (DTI, 1999). The misuse of equipment and appliances was the largest cause of non-fatal casualties in accidental dwelling fires during 2005 (DCLG, 2007c). The effects of fire can cause serious disruption to domestic life through the loss of personal belongings and damage to the home. The average cost of a domestic fire in the UK is estimated at £24,900, of which approximately £14,600 is accounted for by the economic cost of injuries and fatalities and £7,300 is due to property damage (Office of the Deputy Prime Minister [ODPM], 2006a).

Within the United States, approximately 79% of all fire deaths occur in the home and in 1999, approximately 383,000 residential fires led to almost 3,000 deaths and over 16,000 injuries (National Centre for Injury Prevention and Control, 2001).
2.2.5 Location of incidents

Certain areas within the home present more hazards than other areas, for example 1 in 10 of all injuries sustained in the home occur in the kitchen (DTI, 1999), and a high percentage arise within the lounge/study/living or play room (DTI, 2003). However, a significant proportion of the remaining injuries are sustained in a variety of other locations within the home. The national estimate of numbers of injuries occurring in each location within the home during 2002 are shown in Table 2.2.

Table 2.2. Location of home based injuries, 2002
(Based on data from DTI, 2003)

<table>
<thead>
<tr>
<th>Location</th>
<th>% Of total accidents</th>
<th>National Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen/Utility</td>
<td>9.7</td>
<td>261 949</td>
</tr>
<tr>
<td>Bathroom/Toilet</td>
<td>3.5</td>
<td>94 854</td>
</tr>
<tr>
<td>Lounge/study/living/dining/play area</td>
<td>11.5</td>
<td>311 621</td>
</tr>
<tr>
<td>Bedroom</td>
<td>8.6</td>
<td>231 589</td>
</tr>
<tr>
<td>Stairs (inside)</td>
<td>8.4</td>
<td>226 382</td>
</tr>
<tr>
<td>Hall/lobby/passage/corridor</td>
<td>2.2</td>
<td>59 881</td>
</tr>
<tr>
<td>Landing</td>
<td>0.6</td>
<td>16 072</td>
</tr>
<tr>
<td>Loft/attic</td>
<td>0.2</td>
<td>6 417</td>
</tr>
<tr>
<td>Cellar/basement</td>
<td>0.1</td>
<td>1 394</td>
</tr>
<tr>
<td>Store/cloak room/airing cupboard/pantry</td>
<td>0.0</td>
<td>451</td>
</tr>
<tr>
<td>Balcony</td>
<td>0.0</td>
<td>1 271</td>
</tr>
<tr>
<td>Porch/threshold</td>
<td>1.8</td>
<td>47 827</td>
</tr>
<tr>
<td>Conservatory</td>
<td>0.2</td>
<td>6 089</td>
</tr>
<tr>
<td>Indoors (other)</td>
<td>0.2</td>
<td>5 616</td>
</tr>
<tr>
<td>Indoors (unspecified)</td>
<td>11.1</td>
<td>299 526</td>
</tr>
<tr>
<td>Unspecified internal location</td>
<td>20.4</td>
<td>552 024</td>
</tr>
<tr>
<td>Garden/grass/lawn/plant beds</td>
<td>11.1</td>
<td>299 136</td>
</tr>
<tr>
<td>Hard surface besides house</td>
<td>4.7</td>
<td>127 408</td>
</tr>
<tr>
<td>Patio/terrace/veranda</td>
<td>0.7</td>
<td>18 840</td>
</tr>
<tr>
<td>(Outdoors) Stairs/steps</td>
<td>1.1</td>
<td>28 782</td>
</tr>
<tr>
<td>Garage</td>
<td>1.0</td>
<td>27 060</td>
</tr>
<tr>
<td>Greenhouse</td>
<td>0.0</td>
<td>1 251</td>
</tr>
<tr>
<td>Outbuilding</td>
<td>0.3</td>
<td>8 528</td>
</tr>
<tr>
<td>Other</td>
<td>2.5</td>
<td>67 363</td>
</tr>
<tr>
<td>Totals</td>
<td>100</td>
<td>2 701 331</td>
</tr>
</tbody>
</table>

18
Clearly there are certain areas within the home where there is an increased risk of unintentional injury and where greater numbers of accidents occur. The majority of non-fatal injuries are sustained in common living areas within the home where people spend the majority of their time and where they are exposed to hazards within the home for longer.

For a large number of domestic injuries however, the location of the accident is unspecified in HASS (unspecified indoors/ unspecified other), and the summary totals shown may not be totally accurate, providing only an indication of trends. Despite this limitation, the large number of reported injury-based incidents occurring within all common locations within the home (kitchen/ living area/ bedroom/ stairs etc) offers an indication of the major extent of this problem.

2.2.6 Types of injuries
The type of injury sustained by any individual involved in a home accident will obviously be related to the nature of the incident itself. For example, 90% of the injuries sustained during food preparation during 1996 resulted in cuts or lacerations or burns and scalds (DTI, 1999). A breakdown of the types of injuries sustained in the home during 2002 is given in Table 2.3.
Table 2.3. Types of injury sustained in a home accident: 2002.
(Based on data from DTI 2003)

<table>
<thead>
<tr>
<th>Injury Category</th>
<th>% of total accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open wound</td>
<td>22.9</td>
</tr>
<tr>
<td>Soft tissue injury</td>
<td>19.7</td>
</tr>
<tr>
<td>Bone injury</td>
<td>12.9</td>
</tr>
<tr>
<td>Bruise/contusion</td>
<td>12.0</td>
</tr>
<tr>
<td>Joint/ tendon injury</td>
<td>7.1</td>
</tr>
<tr>
<td>Superficial injury</td>
<td>4.6</td>
</tr>
<tr>
<td>Concussion, unconsciousness</td>
<td>3.5</td>
</tr>
<tr>
<td>Burn</td>
<td>3.1</td>
</tr>
<tr>
<td>Chemical injury</td>
<td>2.4</td>
</tr>
<tr>
<td>Non injurious foreign body</td>
<td>2.3</td>
</tr>
<tr>
<td>Injurious foreign body</td>
<td>0.9</td>
</tr>
<tr>
<td>Systemic injury</td>
<td>0.2</td>
</tr>
<tr>
<td>No diagnosed injury</td>
<td>2.1</td>
</tr>
<tr>
<td>Other injury</td>
<td>3.5</td>
</tr>
<tr>
<td>Unspecified injury</td>
<td>2.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

2.2.7 Vulnerable groups
The majority of non-fatal accidents involve individuals in the 15 to 64 age band, yet this is unsurprising as most of the population fall into this bracket. Proportionally, however, children and older people are more at risk of certain types of accident in the home (DTI, 1999) for example, falls.

Approximately 230,000 falls in the home each year involve infants and toddlers (DTI, 1999). The majority of these falls are non-fatal and occur whilst individuals are playing or walking (DTI, 1999). Children aged 5 years and over are also involved in a large number of falls within the home environment and these occur whilst they are engaged in normal everyday activities such as playing, walking and resting (DTI, 1999).
Falls are a major cause of injury mortality among older people in several European countries, including the UK (European Network for Safety among Elderly, 2005). In 1999 for example, 1,110 people aged over 75 years died in the UK as a result of a fall within the home (DTI, 2001a). Due to the prevalence of age-related physiological changes older individuals are more prone to serious injuries following an accident such as a fall (Swift, 2001) and this may explain a high fatality rate for individuals in the older age groups. More accidents in the older age groups involve females as opposed to males, but this may be due to the fact that females live longer than males and therefore are disproportionately represented within the population.

Young children and the elderly have also been found to be at higher risk for house fire death (Warda, Tenenbein & Moffatt, 1999). This could be due to a number of reasons including the fact that young children are more likely than older children to play with fire and that they are developmentally unable to react appropriately and plan escape (Warda et al., 1999). Older people may be at increased risk due to being mobility impaired or hearing impaired whereby they may not hear any warning alarm (Warda et al., 1999).

The burden of unintentional injury is disproportionately heavy on the most disadvantaged in society whereby low-income groups sustain more home injuries and fatalities. The key findings from research undertaken by the DTI show that residential areas with higher proportions of lower social class and low income households have higher overall accident rates (DTI, 2001b). The relationship was significant for children under the age of 16 and in particular for children under the age of 5 years. The research did not identify a statistical link between social class and accident rates amongst older people.

2.2.8 The cost to society
Unintentional home injuries impose a significant cost to individuals and to society in terms of medical and other indirect costs such as lost quality of life. Unintentional home injuries cost United States society at least $217 billion during the year 1998 (Zaloshnja, Miller, Lawrence & Romano, 2005).
and the associated economic cost of unintentional home injuries within the UK is estimated at £25 billion annually (Royal Society for the Prevention of Accidents [ROSPA], 2005).

2.2.9 Section summary
Unintentional injuries sustained in and around the home are a major public health problem within the UK and abroad. Whilst there are limitations in the methods of data collection, data collected up to and including 2002 within the UK highlights the magnitude of this problem. Much is known about the extent of the problem, high risk locations within dwellings and the vulnerable groups most at risk of sustaining an unintentional injury within the home. The increasing number of home accidents overall and the associated economic burden highlights the fact that despite efforts to increase awareness and improve health and safety in the home, domestic accidents remain a significant concern.

2.3 The causes of unintentional home injuries
A number of studies have focused on the causes of domestic accidents and these studies have linked such incidents to environmental, behavioural or structural factors (van Erdewijk, 1988; Bonnefoy et al., 2004; Moore & Ormandy, 2004; Ormandy, 2007). The home environment itself can present physical dangers: structural features can introduce additional hazards and occupier behaviour can contribute to, or be the sole cause of an accident.

2.3.1 Environmental risk factors
The importance of designing homes to prevent injuries was recognised some time ago especially in relation to preventing falls, unintentional fires and pedestrian accidents (Neutra & McFarland, 1972). Constituent parts of dwellings can contribute to or directly cause accidental injury (van Erdewijk, 1988). For example, a wet floor which is slippery may contribute to an accident and cause injuries at the same time and yet an individual may also trip over a step and sustain injuries as a result of hitting a separate feature. In 1988 it was estimated that within the European region between 17,800
and 21,000 individuals died each year as a result of an accident involving a structural feature within the home and that 5.4 million people sought medical treatment due to such incidents (van Erdewijk, 1988).

Falls are the most common cause of both fatal and non-fatal unintentional injuries in the home environment and a number of fall hazards are common in many households (Marshall et al., 2005). The environment has been reported to be a risk factor in many falls, with hazards including slippery floor surfaces, tripping obstacles, poorly designed or maintained stairs with or without handrails (Hill, Haslam, Howarth, Brooke-Wavell & Sloane, 2000).

Rennie and Ford (1995), identified a number of hazards which were present within new dwellings in the North West of England. Their study found many constructional features which were likely to increase the probability of falls occurring; mid flight winders on stairs, beds located by first floor windows which were easily opened and changes of level in drives and pathways. In addition, other features which would increase the severity of any injury in the event of a fall were also identified, for example, radiators located at the foot of stairs and concrete paths beneath windows. Other hazards identified in these dwellings included a lack of storage provision within the homes, water temperatures that were sufficiently high to cause scalding and a lack of safe storage provisions for medicines or other toxic household substances.

Heimplaetzer and Goossens (1991) argue that many accidents within the built environment can be defined as 'architecturally triggered', in that they are not to be blamed on architecture alone, but could be largely avoided by changes in architectural design. Indeed, Pickett (2003) identified a finger-trapping hazard created by internal self-closing fire doors within three storey houses on a new development in Bristol, whereby the self-closing mechanism on the door applied a continuous force until the door hit the latch. The requirement for internal fire doors within dwellings is a consequence of recent changes to building regulations. Pickett recorded that over 700 internal self-closing fire doors had been fitted in the 64 three-storey properties on the development. Over 30,000 domestic
incidents of finger trapping occur annually (Pickett, 2003) and he concluded that as more families occupied the properties, there was further potential for injury. In addition, he commented that tenants were likely to wedge the doors open or disconnect the closing mechanism on the door. Indeed, a recent report by the Department for Communities and Local Government (DCLG, 2007d) describes a project which aimed to determine the current level of satisfaction with self-closing fire doors within homes in the UK. The project identified that within the majority of premises where self-closing fire doors were installed users are likely to disable them to meet family needs. This report is based on a limited amount of data due to individuals being mindful about admitting to disabling or removing their fire doors (DCLG, 2007d). Given these limited findings the DCLG recommended that further, more detailed investigation was required to ascertain if the findings could be replicated in a larger sample population.

Recognition of the difficulties encountered with self-closing fire doors within dwellings has led to a proposal to amend Approved Document B (Fire Safety) to remove the requirement for self-closing devices on doors. This consultation process is currently on-going (ODPM, 2005). Meacham (1999) highlights the fact that fire safety engineers should recognise human behaviour and response factors in their designs. Where such factors are not considered, the level of safety subsequently afforded is considerably lower than anticipated. The protection afforded by fire and smoke doors for example is negligible if they are wedged open or unable to close.

The careful design of dwellings can help to minimise the risk of unintentional injury yet despite this being widely recognised within government and advisory groups, injury in the home remains common. In 2002, 20% of home accidents in the UK were associated with a construction feature within the home (DTI, 2003). Features involved in these accidents included stairs, banisters, stair posts, walls, windows, doors and doorframes. The HASS database does not allow convenient extraction of causal mechanisms however and the degree of contribution of each feature to injury has not been established.
2.3.2 Behavioural risk factors

Various behaviours have been identified as a risk factor for unintentional injuries within the home, for example, careless DIY activities (Ormandy, 2007), poor quality and inaccuracy of parental risk assessment (DTI, 2001b), and hurrying or carrying bulky items on the stairs (Hill et al., 2000).

The range of DIY tasks undertaken within the home and the associated risks which arise is varied. A lack of knowledge and awareness amongst those undertaking DIY activities has been identified as a risk factor for unintentional injuries (Whittaker, Baldwin, Ikram & Luff, 1999; Ormandy, 2007) and more recently by Bhogal, Tomlins and Murray (2007), who during a case note review of patients requiring surgery for penetrating ocular trauma, identified that in all cases arising from DIY or gardening activities (n=17), patients had failed to wear eye protection. Speed and Dickson (2000) suggest that awareness and knowledge of how to prevent an accident when carrying out DIY activities does not always result in safer behaviour. They identified a number of complex factors which can influence the assessment of risk which are cost of hiring professionals or suitable equipment, pride in not being beaten by the task, over-estimation of knowledge and under-estimation of the task.

Following a review of HASS data for the years 1990, 1993, 1996 and 1999, the DTI reported that human behaviour was a contributory factor in 24.7% of fatal home accidents, 31.5% of those where a serious injury had been sustained and 44.8% of accidents resulting in a non-serious injury (DTI, 2002). The main behavioural factors implicated as a cause of unintentional injury were identified as use of alcohol, undertaking a hazardous action (e.g. climbing trees, walls, fences and roofs etc.), leaving unsuitable items (e.g. medicine) in reach of a child, smoking related incidents, working up a ladder/stepladder and careless action by another person (DTI, 2002).

It has also been reported that occupiers do not necessarily take the recommended safety precautions in the safe use of household items. For example, Speed, Dickson and Birtles, (1999) examined the extent of
knowledge amongst home occupiers about the hazards of carbon monoxide from faulty domestic heating systems and what precautions, if any, are taken to reduce the risk of such home accidents occurring. They found that whilst general awareness of the carbon monoxide hazard is reasonably high, practical and specific knowledge ranges from poor to non-existent. A particular problem identified amongst owner-occupiers was that in 3 out of 10 households with a gas boiler or heating system, the boiler or heating system had not been serviced in the previous 12 months.

Hazardous actions seem to be an important contributory factor for unintentional injuries within the home. Previous research by the Building Research Establishment (BRE), (Building Research Establishment [BRE], 2003) identified a number of acts undertaken by a dwelling owner or tenant which would impact on the health and/or safety of current or future occupants, visitors or neighbours (a potentially detrimental action (PDA)). A list of 60 PDA's was compiled and distributed to 360 Chartered Surveyors, local authorities, housing associations and registered social landlords. These individuals were asked to record whether they had seen a detrimental consequence of each action or if they thought there could have been such a consequence if the action had not been noticed. If a PDA’s had been identified, a supplementary sheet asked them to record how many times the PDA had been seen in the last 5 years. Of the 360 questionnaires distributed, 40 were returned. Table 2.4 lists the PDA’s witnessed by at least half of the respondents (n=20) in decreasing order. The frequency is the mean of all responses from the supplementary sheets.
Table 2.4. A list of PDA’s witnessed within dwellings
(Adapted from BRE, 2003)

<table>
<thead>
<tr>
<th>Description of PDA</th>
<th>Frequency</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrying out any incompetent DIY electrical work</td>
<td>63.38</td>
<td>36</td>
</tr>
<tr>
<td>Piling earth or absorbent materials, such as flower beds, against an external wall</td>
<td>38.25</td>
<td>36</td>
</tr>
<tr>
<td>Removing batteries from smoke alarm, or turning them off (e.g. due to false alarm)</td>
<td>42.69</td>
<td>35</td>
</tr>
<tr>
<td>Removing chimney breast</td>
<td>29.13</td>
<td>33</td>
</tr>
<tr>
<td>Removing handrails on stairs or slopes</td>
<td>31.15</td>
<td>31</td>
</tr>
<tr>
<td>Adding double glazing without allowing for adequate room ventilation or fire escape</td>
<td>25.69</td>
<td>31</td>
</tr>
<tr>
<td>Blocking ventilation necessary for safe and efficient burning of gas appliances</td>
<td>24.85</td>
<td>31</td>
</tr>
<tr>
<td>Excessive notching of timber floor joists to install heating and electrical cables</td>
<td>19.79</td>
<td>31</td>
</tr>
<tr>
<td>Removing or not installing insulation materials in the building envelope or roof space</td>
<td>45.69</td>
<td>29</td>
</tr>
<tr>
<td>Installing cupboards in party walls, washing machines on party floors, pull switches on ceilings, or slamming door closers</td>
<td>41.07</td>
<td>29</td>
</tr>
<tr>
<td>Installing insulation in loft spaces</td>
<td>40.08</td>
<td>28</td>
</tr>
<tr>
<td>Changing pipe work and drainage when altering or building driveways or extensions</td>
<td>11.69</td>
<td>28</td>
</tr>
<tr>
<td>Adding electrical socket outlets on the wrong circuit or in locations that are not specified by the Building Regulations</td>
<td>59.07</td>
<td>26</td>
</tr>
<tr>
<td>Replacing clay tiles with heavier concrete tiles</td>
<td>15.20</td>
<td>26</td>
</tr>
<tr>
<td>Disabling or blocking vented gas appliances and under-floor ventilation airbricks</td>
<td>22.75</td>
<td>25</td>
</tr>
<tr>
<td>Removing members in roof construction to gain better access to the loft</td>
<td>8.33</td>
<td>25</td>
</tr>
<tr>
<td>Installing showers or sinks near electrical equipment or sockets</td>
<td>13.67</td>
<td>25</td>
</tr>
<tr>
<td>Removing door closers on fire doors</td>
<td>22.09</td>
<td>24</td>
</tr>
<tr>
<td>Replacing, altering or adding windows or patio doors in a way that causes structural distress</td>
<td>19.80</td>
<td>24</td>
</tr>
<tr>
<td>Fitting recessed down lighters to plasterboard in ceilings</td>
<td>39.43</td>
<td>24</td>
</tr>
<tr>
<td>Installing gas fires without lining the flue</td>
<td>22.00</td>
<td>23</td>
</tr>
<tr>
<td>Adding an extension with DPC that has inappropriate detailing or is incorrectly fitted</td>
<td>10.40</td>
<td>22</td>
</tr>
<tr>
<td>Installing paraffin heaters</td>
<td>7.60</td>
<td>21</td>
</tr>
<tr>
<td>Adding hidden cables that do not follow prescribed routes</td>
<td>24.75</td>
<td>21</td>
</tr>
<tr>
<td>Removing or relocating ventilation inlet/outlets</td>
<td>17.50</td>
<td>21</td>
</tr>
<tr>
<td>Disabling or blocking passive stack ventilation systems and trickle ventilators in window frames and doors</td>
<td>7.75</td>
<td>21</td>
</tr>
<tr>
<td>Changing the situation of a flue, by adding an obstruction or a window nearby or adding a flue in an incorrect position.</td>
<td>15.00</td>
<td>20</td>
</tr>
</tbody>
</table>
The explanations of the PDA’s fell into five categories which the BRE report as follows:

- Ignorance of consequences
- Inexperience of installers, which also covers unscrupulous builders
- DIY
- Poor design or specification
- Cost and corner cutting

(BRE, 2003).

Many respondents to the BRE questionnaire explained that door closers were removed on fire doors because they caused noise, are hard to open and may trap fingers (BRE, 2003).

Clearly, this research identifies how occupier actions can affect the health and/or safety of others in and around the dwelling in a number of ways. A number of the unsafe actions identified by the BRE have since been addressed through building regulations, for example, all replacement window installations in England and Wales are now subject to regulation (ODPM, 2006b) and electrical safety within dwellings was regulated in 2005 to reduce the number of deaths, injuries and fires caused by faulty electrical installations (ODPM, 2006c). However, these regulations only cover the replacement of glazing and electrical works and therefore a number of the other detrimental actions identified by the BRE in their research may still be practiced within dwellings in the UK.

2.3.3 The interaction between behaviour and dwelling design

The individual contribution of both human behaviour and dwelling design to home accidents has been examined by Bonnefoy et al.,(2004). In their review of evidence on housing and health for the World Health Organisation, human behaviour and dwelling design were shown to be important individual contributory factors for domestic injuries. They identified structural features within the home that can present physical dangers, (steps, stairs and balconies) and categorised behaviours which can contribute to unintentional
injury, (a lack of knowledge in the young, impaired sight or mobility of older people, rushing and carelessness). They also identified that human behaviour and dwelling design can interact to lead to an increased risk of unintentional injury. Occupiers can create additional hazards by leaving obstacles on stairs, having loose carpets and leaving medicines and other hazardous products easily accessible to young children. In conclusion, Bonnefoy et al., (2004) suggest two lines of action for home accident prevention: home safety awareness campaigns and actions to ensure potentially dangerous dwelling features are removed from dwellings.

Human behaviour can be a risk factor for unintentional injury by influencing the environment in two ways, either through different types of use or by changing the environment itself. This has been demonstrated by Haslam et al., (2006), for example, who identified a number of unsafe behaviours in relation to stair use amongst older people, including hurrying and the carrying of bulky or heavy items. They also identified patterns of behaviour that changed the nature of the environment, such as leaving obstacles on stairs.

This interaction between occupier behaviour and design of the home has also been illustrated by Roys (2001) again in connection with stairs. Roys identified at least three major reasons for stair falls, these being user behaviour, maintenance and design. Typical behaviours identified by Roys include tripping over objects left on the stairs, missing steps or running up or down the stairs, and although very little maintenance is usually required for stairs, broken items or loose treads present a hazard. Roys concludes with a call for the redesign of domestic stairs to reduce the number of unintentional injuries occurring as a result of an accident. However, he does acknowledge that there is pressure within the housing market for stairs to take up less floor space in the home, and any re-design to increase safety is not likely to be congruent with other market influences.

In their review of the influences of human and housing factors on home accidents Moore and Ormandy, (2004) indicate that housing factors are a
frequent contributory cause for home accidents but they conclude that research has been relatively superficial and provides little information as to the degree of contribution made by human behaviour or dwelling design and maintenance. Indeed, most intervention studies have focused on changing the environment or changing occupier behaviour, few have considered tackling the two factors simultaneously.

These studies have considered the behaviour-design interaction but only in relation to one specific feature within the home, i.e. stairs. This thesis will attempt to build on this knowledge by considering how behaviour may interact with other environmental features within the home. In addition, this thesis will demonstrate the importance of environmental, behavioural and social factors in shaping the interactions which occur within the home environment.

2.3.4 Consumer products

Most unintentional home injuries occur whilst individuals are participating in ordinary everyday events and common home and environmental items are involved in a large number of incidents leading to injury (DTI, 2001a). These items are listed in the HASS database and are classified under 41 general categories. As this system is generally biased towards more serious injuries, not taking into account minor accidents that have occurred, those items involved in minor injuries are therefore less likely to be recorded by the HASS scheme.

Although the articles are described within the HASS database as being involved in an accident, this does not necessarily imply that the article was the cause of the accident (DTI, 2001a). Despite this, HASS data can provide a useful indication as to the features and articles that are commonly associated with home-based injuries, although there are limitations relating to the data which originate in the reporting and recording of detail (discussed previously in section 2.2.1). For example, in 2002, 5.9% of home injuries are documented where the article involved is 'unspecified'. The totals reported for specific features are therefore likely to be an
under-representation of the true figure. From the data where an article or feature has been recorded, 20.1% of all home accidents during 2002 involved a construction feature of a building, 1.1% of accidents involved a built feature within the garden or street and 7.1% were associated with an outdoor surface (grass, road, ice etc) (DTI, 2003).

Product safety within the UK is achieved by a number of different means including regulation, design standards and consumer safety initiatives. The safety of any particular product is affected by two factors; the physical characteristics of the item itself and the extent to which the limitations on its use and the hazards associated with the item are recognised by the user (Leonard & Wogalter, 2000). Domestic accidents involving a consumer product may therefore arise due to a number of factors including poor product design, product failure, misuse or unintentional use of the product by the individual. Whilst individual product failures can occur, some of these failures can emanate from careless use or abuse by the individual (Gagg, 2005). Careless use can arise as a result of poor product design, for example, Crawford, Wanibe and Nayak (2002) identified differences between the measured opening torques of some food products and the capabilities of study participants. Where difficulties arise, individuals may improvise, using items such as knives, for example, to open food products within glass containers or to remove tamper-evident bands not intended for removal.

In 2002, the DTI reported that product fault was a contributory factor in 2.8% of fatalities, 1.4% of serious injuries and 1.3% of non-serious injuries sustained within the home (DTI, 2002). In most cases however, the product fault was due to the article not having been serviced or maintained correctly, rather than due to a fault in manufacture. This is in line with the suggestion made by Gagg (2005). The findings reported by the DTI were based on analysis of HASS data and it is possible that insufficient information had been recorded to fully understand the accident scenario; the limitations associated with the collection and coding of information for this database have been referred to and discussed previously (Section 2.2.1.).
The findings reported above suggest that there is a low level of involvement of product fault in unintentional home injuries and this is supported by other studies which have also suggested that only a small number of accidents involving consumer products can be attributed to product fault alone (Schoone-Harmsen, 1990).

2.3.5 Risk perception
The research involving the safety of consumer products may be very relevant to the area of home injury prevention, particularly in the area of product design. Potential misuse of a product by an individual or individuals is now considered during the design phase of any consumer based product. If knowledge was available concerning the way individuals interact with environmental features within their home, designers and architects may also be able to address environmental aspects which contribute to unintentional injuries. This thesis will attempt to improve knowledge and understanding which may inform future dwelling design to reduce the incidence of unintentional injury in the home.

Safety behaviour within the home will be influenced by a number of factors, including an individuals' understanding of the risk involved. Risk perception and awareness of individuals involved in an accident have rarely been studied in the consumer product area (Weegels & Kanis, 2000), yet such studies may provide industrial design engineers with important information relevant to the safer design of products. Manufacturers may assume that members of the public are aware of hazards associated with products, because those involved in the design and development are experts (Leonard & Wogalter, 2000).

In a study which explored risk perception and awareness in consumer product usage, Weegels and Kanis (2000) reconstructed domestic accidents and conducted interviews with 42 individuals who were involved in the original incident. They found that the majority of participants had no idea that they were running any risk of injury whilst they operated the product.
(n = 20), some participants were aware of some risk (s) but not the risk of the particular incident under investigation (n = 12). In a limited number of cases, participants were aware of the possibility of an accident (n = 10), but in these cases, participants were not always able or willing to change their behaviour or adapt their way of use. Weegels and Kannis suggest that risk should be made explicit in featural and functional product characteristics.

Whilst such studies may offer useful information for designers in relation to individuals’ risk perception when using everyday consumer products, the responses were elicited from individuals who had been involved in some form of accident involving the product. Their involvement in such may have influenced their perceptions of risk and this needs to be considered when evaluating the results.

Hayward (1996) suggests that an individual’s perception of comparable danger of products is an unreliable guide to the actual risk of injury. He determined the risk of injury for a range of consumer products used both within the home and also within the leisure sphere. Seventy-six consumer products, known to be involved in a considerable number of accidents involving adults were selected for study. A large sample of adults was interviewed about their use of these items and participants were asked to rate how dangerous they felt each product was for an adult to use. These data were then combined with hospital data to provide a risk-of-injury-per-hour-of-use for each product. Participants were found to rely on constructs of sharpness and power in relation to the products as opposed to making an assessment of the situations that can arise during the use of the product (Hayward, 1996).

Leonard and Wogalter (2000), found that some hazards associated with consumer products are not well recognised without a cue and they suggest that safety warnings are needed as reminders to the general public and also to provide additional safety information regarding the product. In addition they reported that during their study which assessed consumer knowledge of hazards posed by common household products, most of their participants
were aware of many hazards, but such an awareness did not necessarily translate into understanding the sorts of actions necessary to avoid the hazards.

Wogalter, Brelsford, Desaulniers and Laughery (1991) examined factors associated with individuals' hazard perceptions of consumer products and found that perceived hazard and willingness to read warnings are strongly associated. In a further study, Wogalter, Brems and Martin (1993), found that perceived injury severity was strongly related to both participant's risk estimates and their precautionary intent ratings. These findings have been supported by other studies, for example, Lewis, Ennis, Kashif and Dickson (2004) reported that over half their participants were unaware that wet cement causes burns and therefore they took no precautions during its use when undertaking DIY tasks around the home.

2.3.6 Section summary – the causes of home accidents
Unintentional home injuries have been linked to environmental, behavioural and structural features. Environmental risk factors can present physical dangers within the home for example steps, stairs and balconies (Bonneyfoy et al., 2004) and a number of fall hazards are common in many homes (Marshall et al., 2005). Studies have also shown that occupier behaviour is a contributory factor in the cause of many unintentional injuries (DTI, 2002) and these factors include the use of alcohol (DTI, 2002), undertaking a hazardous action (BRE, 2003) and insufficient knowledge and awareness on behalf of the individual (Bhogal et al., 2007).

Previous research has to a large extent investigated the contribution of each of these factors in isolation, ignoring the possible influence of interactions between these aspects. Occupier behaviour and dwelling design can interact to lead to an increased risk of unintentional injury and whilst some studies have addressed this fact (Roys, 2001; Haslam et al., 2006) these studies have been limited to just one feature within the home, i.e. stairs.
Consumer products are involved in a number of incidents leading to injury but consumer product failure is not a frequent cause of injury. One of the main causes of accidents involving a consumer product appears to be inappropriate use or misuse of the item involved (Gagg, 2005). The safety of consumer products has increased in recent years as designers and manufacturers have recognised, amongst other things, the potential role of misuse of the product by consumers. Whilst research has identified the role of unsafe behaviour in the use of some consumer products, very little is known about the way in which we use our homes and the features and systems within those homes. A thorough understanding of the way individuals interact with their homes, and the way in which they use and misuse dwelling features may benefit architects and designers responsible for the design of new homes and also those responsible for promoting home safety.

2.4 The influence of housing on health

The residential environment is known to be an important determinant of quality of life and well-being and within the health literature references to the importance of the physical and social environment on health are common (Fuller-Thomson, Hulchanski & Hwang, 2000). The influence of the residential context on health and well-being has been increasingly recognised and many of the topics central to studies within the field of Environmental Psychology may contribute to our understanding of how the environment influences health (Fuller-Thomson et al.).

2.4.1 Environmental Psychology

Environmental Psychology has established itself as a strand of psychology over the past 40 years and is concerned with the study of human behaviour and well-being in relation to the sociophysical environment (Stokols & Altman, 1991, p1). A specific area of focus which has received a great deal of academic interest is the interrelationships between people and the built environment. Moos (1976, chap.1) describes the three intellectual traditions
that initiated interest in the behavioural effects of physical spaces; functionalism, psychiatry and the sanitary reform movement.

Functionalism was a major concern within architectural schools during the 20th Century, whereby architects were encouraged to concentrate on designing efficient and functional buildings and as a consequence the architectural profession's concern with the effects of architectural features on human behaviour was initiated.

A second tradition of concern with the effects of architecture grew from psychiatry whereby during the 19th Century there was a growing interest in the effects of architecture within psychiatry. Architectural properties of mental hospitals and the importance of psychiatric architecture in creating a restorative environment was initiated. Psychiatrists and psychologists working in asylums sought help from design professionals to improve the physical spaces used for treating psychological illness.

By the middle of the 20th Century, it was realised that the public housing programme had not alleviated the problems of disease and crime. Many of the continuing social problems experienced were directly attributable to the poor design of the public housing projects. Social scientists became interested in the behavioural consequences of physical spaces and architects looked to psychologists to provide information on cognition and human behaviour. Following this growth of interest in the relationship between human behaviour and the physical setting, the field of Environmental Psychology emerged with the aim of identifying and explaining such relations which could be applicable in other human settings (Lawrence, 2002).

2.4.2 The built environment
Based on the positivist tradition of behavioural sciences, environmental psychology has traditionally been concerned with the influence of physical and social settings on behaviour, whereby behaviour was treated as the dependent variable and the environment as the independent variable. More
recently however, researchers have adopted a more transactional approach in which the direction of influence can be bi-directional and research and theory in environmental psychology are now dominated by this perspective (Altman & Rogoff, 1991).

2.4.3 The residential environment
The term residential environment can refer to a number of different settings and has been used as a neutral term to represent both home and housing, neighbourhood and community (Tognoli, 1991). Each of these settings has been investigated within fields as diverse as ecology, behavioural sociology, ergonomics, geography, psychology and architecture with studies focusing on post occupancy evaluation, mobility, cross cultural observations, housing and the elderly, household roles, residential crowding and the perception and meaning of home (Tognoli, 1991). Each discipline has focused on different aspects of the meaning and experience of home, and although the word 'home' can refer to a diverse set of meanings, the association between home and the physical dwelling or house is commonly acknowledged in the relevant interdisciplinary literature (Mallett, 2004). The term 'home' is used within this thesis to mean a person's dwelling or house.

2.4.4 The concept of home
The home, or dwelling, is an essential factor for human survival and has been the topic of rich psychological exploration. Throughout the years, researchers have attempted to classify the meaning of home and the focus within psychology has been on the interaction between the person and the dwelling in a direct experiential sense (Moore, 2000). A wealth of studies have explored different aspects of the psychological significance of the dwelling for particular individuals or groups of individuals (Korosec-Serfaty, 1984; Sixsmith, 1986; Dupuis & Thorns, 1996; Imrie, 2004a). Despite a wealth of previous psychological enquiry there has been little focus on the non-affective interactions between people and a dwelling and the physical aspects of the dwelling have been under explored in research (Moore, 2000).
2.4.5 The housing – health relationship

Health can be defined as ‘a state of being with physical, cultural, psychosocial, economic and spiritual attributes, not simply the absence of illness’ (Marks, Murray, Evans & Willig, 2001).

A number of specific health hazards relating to housing have been identified and include; the potential for unintentional injuries; exposure to lead; exposure to allergens that may induce or intensify asthma; fungi (mould); rodent or insect pests and indoor air pollution (Matte & Jacobs, 2000; Jaakkola, Hwang & Jaakkola, 2005). One large study undertaken on behalf of the World Health Organisation, the Large Analysis and Review of European housing and health Status (LARES) (World Health Organisation [WHO], 2007) aimed to identify environmental risk factors for unintentional injuries within dwellings within eight European cities. Based on self-reported accident outcomes, the study found that unintentional injuries are more likely in dwellings where there is poor lighting, where the dwelling is considered overcrowded by the occupants, where there is insufficient workspace in the kitchen or where there is noise at night.

An increasing body of evidence has associated poor housing conditions with increased morbidity from infectious disease, chronic illness and injuries (Krieger & Higgins, 2002). Following their review of the literature on the housing-health relationship, Fuller-Thomson et al., (2000) identified four main areas of research focus, these being:

- specific physical or chemical exposure
- specific biological exposure
- physical characteristics of the house
- social, economic and cultural aspects of housing

Each of the categories identified in their review (Fuller-Thomson et al.) contain environmental aspects that can be detrimental to human health. For example, residents can be exposed to carbon monoxide (Raub,
Mathieu-Nolf, Hampson & Thom, 2000; Homer, Engelhart, Lavins & Jenkins, 2005) and toxic household products, (Coyne-Beasley et al., 2005). Biological agents such as fungi can lead to an incidence of respiratory conditions (Denning, O'Driscoll, Hogaboam, Bowyer & Niven, 2006), and many infectious intestinal diseases arise within the home environment as a result of the transmission of pathogenic agents (Curtis et al., 2003). The physical characteristics of the home can be a potential source of material hazards (Ormandy, 2007) and the social, economic and cultural characteristics of the home can influence accident rates (Newcombe, Lyons, Jones & Patterson, 2005). A summary of the review findings reported by Fuller-Thomson et al. (2000) is shown in Tables 2.5 – 2.8. The ‘strength of the evidence’ is a qualitative rating for the strength of the evidence supporting a causal relation between the housing exposure or characteristic of the health effect. The criteria used for each rating areas follows:

- **definitive** (numerous well-designed studies showing the effect, most or all causal criteria met, essentially complete agreement among experts that a health effect exists)
- **strong** (some well-designed studies showing the effect, the most causal criteria met, a preponderance of opinion among experts that a health effect exists)
- **possible** (small number of studies showing the effect, some or few causal criteria met, no consensus among experts that a health effect exists)
- **weak** (conflicting or negative evidence regarding the effect, few or no causal criteria met, consensus among experts that a health effect is not proven or is unlikely)

(Fuller-Thompson et al)
Table 2.5. Physical or chemical hazards present within or around dwellings.
(Adapted from Fuller-Thomson et al., 2000)

<table>
<thead>
<tr>
<th>Type of exposure or characteristic</th>
<th>Effects on health</th>
<th>Location within the dwelling</th>
<th>Strength of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Neurological and intellectual deficits</td>
<td>Lead-based paint/water supply.</td>
<td>Definitive</td>
</tr>
<tr>
<td>Asbestos</td>
<td>Cancer</td>
<td>Lagging/insulation on pipe work/cold water tanks</td>
<td>Definitive</td>
</tr>
<tr>
<td>Radon</td>
<td>Lung Cancer</td>
<td>Air/private water supplies</td>
<td>Strong/Definitive</td>
</tr>
<tr>
<td>Urea formaldehyde</td>
<td>Asthma, chronic respiratory conditions, respiratory tract cancer</td>
<td>Cavity wall insulation</td>
<td>Possible</td>
</tr>
<tr>
<td>Electromagnetic fields</td>
<td>Cancer, pregnancy outcome, psychological distress</td>
<td>Transmission lines/electricity substations</td>
<td>Weak</td>
</tr>
</tbody>
</table>
Table 2.6. Biological hazards present within or around dwellings.  
(Adapted from Fuller-Thomson et al., 2000)

<table>
<thead>
<tr>
<th>Type of exposure or characteristic</th>
<th>Effects on health</th>
<th>Location within the dwelling</th>
<th>Strength of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damp/Mould</td>
<td>Asthma</td>
<td>Bathrooms/kitchens and areas where there is condensation</td>
<td>Possible</td>
</tr>
<tr>
<td>Damp/Mould</td>
<td>Respiratory symptoms</td>
<td>Bathrooms/kitchens and areas where there is condensation</td>
<td>Possible</td>
</tr>
<tr>
<td>Damp/Mould</td>
<td>Respiratory tract infections</td>
<td>Bathrooms/kitchens and areas where there is condensation</td>
<td>Possible</td>
</tr>
<tr>
<td>Damp/Mould</td>
<td>Psychological Distress</td>
<td>Bathrooms/kitchens and areas where there is condensation</td>
<td>Possible</td>
</tr>
<tr>
<td>Damp/Mould</td>
<td>Rheumatic fever</td>
<td>Bathrooms/kitchens and areas where there is condensation</td>
<td>Possible</td>
</tr>
<tr>
<td>House dust mites</td>
<td>Asthma</td>
<td>Bedding / carpets</td>
<td>Strong/Definitive</td>
</tr>
<tr>
<td>Cockroaches</td>
<td>Asthma</td>
<td>Kitchen</td>
<td>Strong/Definitive</td>
</tr>
</tbody>
</table>
Table 2.7. Physical hazards present within or around dwellings.
(Adapted from Fuller-Thomson et al., 2000)

<table>
<thead>
<tr>
<th>Type of exposure or characteristic</th>
<th>Effects on health</th>
<th>Strength of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various locations</td>
<td>Falls</td>
<td>Definitive</td>
</tr>
<tr>
<td>Heating system</td>
<td>Burns, smoke inhalation, CO₂ poisoning</td>
<td>Definitive</td>
</tr>
<tr>
<td>Smoke Detectors</td>
<td>Burns, smoke inhalation</td>
<td>Definitive</td>
</tr>
<tr>
<td>Carbon Monoxide Detectors</td>
<td>Carbon Monoxide poisoning</td>
<td>Possible</td>
</tr>
<tr>
<td>Building type</td>
<td>Psychological distress</td>
<td>Possible</td>
</tr>
<tr>
<td>Floor level</td>
<td>Psychological distress</td>
<td>Possible</td>
</tr>
<tr>
<td>High rise structure</td>
<td>Psychological distress</td>
<td>Possible</td>
</tr>
<tr>
<td>High rise structure</td>
<td>General physical health</td>
<td>Possible</td>
</tr>
<tr>
<td>Density/Overcrowding</td>
<td>Psychological distress</td>
<td>Possible</td>
</tr>
<tr>
<td>Density/Overcrowding</td>
<td>General physical health</td>
<td>Possible</td>
</tr>
<tr>
<td>Density/Overcrowding</td>
<td>Mortality</td>
<td>Possible</td>
</tr>
<tr>
<td>Density/Overcrowding</td>
<td>Haemophilus influenza type B infections</td>
<td>Possible</td>
</tr>
<tr>
<td>Density/Overcrowding</td>
<td>Helicobacter pylori infection</td>
<td>Possible</td>
</tr>
<tr>
<td>Density/Overcrowding</td>
<td>Hepatitis B infection</td>
<td>Possible</td>
</tr>
<tr>
<td>Density/Overcrowding</td>
<td>Type 1 diabetes mellitus</td>
<td>Possible</td>
</tr>
</tbody>
</table>

Table 2.8. Socioeconomic characteristics which affect health
(Adapted from Fuller-Thomson et al., 2000)

<table>
<thead>
<tr>
<th>Type of exposure or characteristic</th>
<th>Effects on health</th>
<th>Strength of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing tenure</td>
<td>Cancer incidence/survival</td>
<td>Possible</td>
</tr>
<tr>
<td>Housing Tenure</td>
<td>Sudden Infant Death Syndrome</td>
<td>Weak</td>
</tr>
<tr>
<td>Housing Tenure</td>
<td>General Physical Health</td>
<td>Possible</td>
</tr>
<tr>
<td>Housing tenure</td>
<td>Mortality</td>
<td>Possible</td>
</tr>
</tbody>
</table>

The literature suggests that there are various conceivable mechanisms through which the residential environment may influence physiological or psychological health outcomes. Fuller-Thomson et al.'s review suggests physical characteristics within each home can lead to unintentional injuries.
or ill-health and research interest has tended to focus on these physical properties in isolation, ignoring the potential interaction with behavioural influences. Where behaviour has been considered, e.g. Haslam et al, 2006, this has usually been in relation to one specific physical feature, e.g. stairs. This thesis will attempt to explore the extent to which similar behavioural influences exist during the interaction with other physical features within the home.

2.4.6 Housing tenure – health and disability

People with poor health or disabilities may face barriers to their access of the owner occupier market (Thomas, 2004). Housing tenure (whether or not the dwelling is owned or rented within the private or public sectors) has consistently been found to be associated with mortality and morbidity (Macintyre et al., 2003). For example, multi-dwelling housing is associated with adverse psychological health (Evans, Wells & Moch, 2003; Howden-Chapman, 2004). Whether this association is an indicator of material well being or, whether different categories of housing expose people to different levels of health hazards has not been extensively explored (Ellaway & Macintyre, 1998). In their study however, Ellaway and Macintyre found that housing stressors, house type and neighbourhood conditions may be associated with poor health, independent of income, tenure, gender and area of residence.

In addition to material wealth, disability is another barrier to privately owned housing. In 2000 – 2001, 18% of adults in England aged 16 and over reported having some form of disability, 5% of whom reported having a serious disability. The most common type of disability reported amongst adults was loco motor disability (Department of Health, 2003a).

Up until the 1990's, the majority of housing within Britain was not accessible to wheelchair users (Barnes, 1991), and the provision of housing for the disabled was guided by policies which were firmly rooted within an individual model of disability (Stewart, Harris & Sapey, 1999). The paradigm shift from the individual, or medical model of disability to the social model of disability
informed British housing policy during the 1990’s and reflected a growing acceptance of a collective responsibility to create a fully inclusive environment. Stewart et al. for example, argue that the inability to access a dwelling in a wheelchair is not the result of a disability, but due to the fact that architects have consistently failed to design dwellings which are accessible to everyone. Instead of viewing the needs of the disabled as ‘special needs’, requiring separate provisions for housing, the social model of disability supports a collective response to a socially created problem.

In 1999, the scope of Part M of the Building Regulations, relating to disabled access to public buildings, was extended to include new dwellings. These regulations have had a major impact upon dwelling design, but have also been the subject of intense disapproval by builders on the grounds of impracticality and cost, and dissatisfaction among disabled groups on the grounds that they do not go far enough (Ridout, 1997). Indeed, the overall aim of the regulations, to promote ‘visitability’ housing, has been heavily criticised. Madigan and Milner (1999) argue that such a label places emphasis on the occasional visitor rather than emphasising the more important objective - to make homes adaptable for a whole range of future occupiers.

Imrie (2004b) argues that the physical design of the dwelling and home environment can have a significant impact on the health and well-being of an individual and that the design of the majority of dwellings is underpinned by values that do not relate to disabled people. Heywood (2004a) identified a number of health outcomes that were associated with unadapted or badly adapted housing fully supporting Imrie’s argument. These health outcomes included pain from climbing the stairs or trying to bathe, accidents, particularly falls whereby a fear of falling would lead people to stop taking baths or showers, exacerbated illness whereby inadequate heating became an issue for those with painful conditions and psychological illness, particularly depression which arose due to the dependency brought about by unsuitable housing.
Previous reviews of the literature on the housing-health relationship have criticised empirical studies claiming that these contributions often lack a broad conceptual framework (including the social context of housing) and they rarely address practical guidelines or policy issues (Lawrence, 2004a). The health literature also fails to address a possible behavioural component within the housing-health relationship. Hartig and Lawrence (2003) suggest that our understanding of the relationship between housing and health will improve with closer attention to the characteristics of residents, their activities in relation to their housing and social ecological factors that set the boundaries for those activities.

Whilst there has been increased understanding of the relationship between the built environment and particular health outcomes, some areas have received little attention. For example, Stevenson (2006), argues that scant attention has been paid to the health outcomes that could be achieved if safety / injury prevention was a leading priority in the design of built environments. Lawrence (2004b) suggests that future research on the effects of housing on health and well being would benefit from a multidisciplinary approach, due to the multitude of dimensions which form the interrelated nature of housing and health. Additionally, he adds that an ecological perspective may provide a broad framework for comprehending all these factors and the interrelations between them.

The term 'ecology' derives from the ancient Greek words “oikos” and “logos” and means "science of the habitat" and describes a science that deals with the interrelationships between organisms and their surroundings (Lawrence, 2004b). An ecological perspective considers interrelated factors such as behavioural, biological, cultural, economic, social, physical and political factors which can influence the housing-health relationship.

2.4.7 Section summary
There is an established body of research within the health literature which has explored the effect of housing on health and well-being. Previous studies have identified that poor dwelling conditions are associated with
increased risk of unintentional injuries and lower levels of physiological health (Krieger & Higgins, 2002). Housing tenure itself has been linked to lower levels of physiological and psychological health (Evans, Wells & Moch, 2003). Individuals with poor health or disabilities may face barriers in accessing the owner-occupier market (Thomas, 2004), and therefore face further challenges to their healthy independent living within unadapted or badly adapted housing. It is interesting to note that many of these studies linking housing to lower levels of health have focused on single mechanisms in isolation, despite there being an interrelated nature amongst the factors involved (Lawrence, 2004b). This thesis will attempt to identify and delineate the role of certain environmental, individual, and social factors which contribute to the health, safety and well-being within the home.

2.5 Housing within the UK
The following section introduces government policy in relation to housing within the UK and offers an examination of current practice within the house building industry. Regulations controlling the design and construction of new homes are also considered.

2.5.1 Housing development programme
In the UK, due to increased demand for home ownership, there is currently an extensive housing development programme. There is a commitment from government to increase the rate of house building from 150,000 completed dwellings per annum to 240,000 completions annually by 2016 (DCLG, 2007a). In addition to this, there are revised density guidelines (DCLG, 2006a) and a further commitment to increase affordable housing for ownership and rent, and proposed planning reforms to ensure planning is more responsive to local housing needs (DCLG, 2007a). Innovative features can make new homes more attractive to prospective purchasers, and research shows that there is continued growth in customer preference for new build housing (New Homes Marketing Board, 2003). Despite the continued growth in preference for new build properties, overall consumer
satisfaction is showing a downward trend (The Housing Forum, 2003; Ozaki, 2003).

2.5.2 Consumer satisfaction

Volume house-building firms provide the bulk of all new private housing within the UK and it is important that they should provide new housing that meets the needs of those who occupy it (Leishman, Aspinall, Munro & Warren, 2004). However, whilst usability and user involvement have become an established part of the consumer product design process, this is not common within architectural design (Luten, 2006). Within Europe, consumer participation in dwelling design has become widespread (Ozaki, 2003), but this is something which has not yet been adopted within the UK. Here there has been relatively little research examining house purchasers' needs and preferences and so very little is known about the extent to which our new-build housing meets occupiers' needs (Leishman et al., 2004).

Following an audit into the quality of new private housing built within the UK, The Commission for Architecture and the Built Environment (CABE) reported that recurring problems reported by residents within new dwellings include a lack of space to meet changing needs, poor quality of construction and concerns in relation to the provision of car parking (CABE, 2005, 2007). A large majority of those participating in the audit reported inadequate car parking provision for the level of car ownership and demands for visitor parking and described attempts to restrict parking spaces as a means of curbing car ownership as unrealistic. Residents from some developments found the garages too small for the size of their vehicles and on other developments the location and lighting of the parking area was identified as a security issue. A lack of storage provided within individual properties meant that, in some cases, occupiers used their garages to store household items and as a consequence there was increased on-street parking (CABE, 2005).

The utilisation of the garage as additional storage space is not new, indeed Forrest and Murie (1993) identified that among potential home buyers, many
considered moving in order to have a garage and so increase their storage space. Leishman et al., (2004) reported similar findings but also identified that some house buyers found their garages to be less useful than expected; complaints included having a garage without water or electricity and dissatisfaction regarding the size of the garage.

In her review of housing supply within the UK, Barker (2004), highlighted the need to improve standards across the house building industry after identifying that a substantial number of consumers expressed concern about the quality of service and the standards of construction and finishing of their new homes. Indeed, new guidance issued in December 2006, Planning Policy Statement 3 (PPS3): Housing, (DCLG, 2006a) attempts to ensure design quality is an important consideration in the future housing growth agenda.

Sommerville and McCosh, (2006) suggest that despite previous calls from the government for improvements in the quality of the finished product delivered by the construction industry within the UK, new homes continue to be built with a large number of snags (errors, defects and omissions). Following an inspection of 1,696 dwellings over a period of 40 months, Sommerville and McCosh found a large number of snags present in newly built properties which they suggest detract from consumer satisfaction. Indeed, in a recent report by CABE, the design quality of new homes in the East Midlands, West Midlands and the South West area of the UK was described as overwhelmingly disappointing, with only 8% of new housing across the three regions being identified by the agency as very good (CABE, 2007).

### 2.5.3 Housing quality – government policy

The quality of existing private sector housing has consistently been a focus for government policy and intervention through three main routes. Firstly, building regulations aim to ensure safe and decent housing, secondly, the external appearance and layout of schemes has been achieved via planning and thirdly, social housing and low cost home ownership is regulated by
government agencies (Kintrea, 2005). Following an evaluation of housing policy, Kintrea (2005) identified a number of policy drivers which have influenced and shaped housing policy within the UK. These drivers include: developer dominance within the private sector; changes in the planning system and the passing of The Planning and Compensation Act, 1991; the emergence of sustainability as a concern; the increasing awareness of the rights of people with disabilities with housing standards moving to address inclusiveness and a move to improve the efficiency of the development process.

Many government policies have arisen as a result of the influential Latham Report, (Latham, 1994) which highlighted concerns within the construction industry. Subsequent to this report a Construction Task Force was established with the aim of implementing and extending the initial recommendations made by Latham (1994). As part of its terms of reference the Task Force looked at improving the efficiency and quality of housing construction. In their final report, (Egan, 1998) The Task Force envisaged:

'We wish to see, within five years, the construction industry deliver its products to its customers in the same way as the best consumer-led manufacturing and service industries'

Clearly, the findings of recent studies reported above, (Barker, 2004; CABE, 2005; Sommerville & McCosh, 2006) suggest that further improvements in housing quality are yet to be made.

2.5.4 Building regulations

One major element of housing policy that contributes to the quality of dwellings is building control (Kintrea, 2005). Building Regulations are a major legislative approach to health and safety within the built environment and include provisions for the prevention of unintentional home injuries. The Building Act of 1984 provided the necessary consolidation of various building control statutes that had been passed during the previous 100 years and today's building regulations are made under powers provided
within this Act. The current regulations are the Building Regulations 2000 which came into force on 1st January 2001. The 2000 regulations have been amended twice since then, the latest being the Building (Amendment) Regulations 2002. Heavily influenced by the Health and Safety at Work Act 1974, current regulations grew out of concerns for health and safety and aim to serve the following broad purposes:

- ensuring the health, safety, welfare and convenience of people in and around buildings and those who may be affected by matters connected with buildings.
- ensuring the conservation of energy, fuel and power.
- the prevention of waste, misuse or contamination of water.

The regulations are constantly reviewed to match growing demand for better, safer buildings. Although the Building Act 1984 provides the main controls over buildings, there are in fact other many legislative Acts in addition to the Building Act and building regulations which affect buildings in design, construction, use and subsequent demolition. This is regardless of whether such buildings are subject to building regulations. Some legislation applies to the design and construction of a building such as the Construction (Design and Management) Regulations 2007, (Health and Safety Commission [HSC], 2007) and other legislation to its actual use, for example the Fire Precautions Act 1971).

The effectiveness of building regulations has been criticised both within the UK and within the United States (Ridout, 1997; Hammitt, Belsky, Levy & Graham, 1999). Ridout (1997) points out that some UK based proposals have met intense lobbying from house builders on the grounds of impracticality and cost, and Hammitt et al., (1999) argue that higher construction costs can lead to increased house prices and a subsequent 'income effect' whereby new home owners have less income remaining for other goods which contribute to health and safety.
Building Regulations apply to new homes or existing dwellings that are undergoing ‘Building Work’ (ODPM, 2002a). The health and safety of occupiers in current dwelling stock can now be assessed by environmental health officers or surveyors using the Health and Safety Rating System (HHSRS) (ODPM, 2003a). This is a means of evaluating the potential effect of any faults in any particular dwelling on the health and safety of occupants, visitors, neighbours and passers by. The principles underlying this system are:

- any dwelling should be free from both unnecessary and avoidable hazards, and
- where any hazard is necessary and unavoidable, then the likelihood of a harmful occurrence and the potential harm which could result should be reduced to a minimum.

The HHSRS is capable of assessing various hazards within a dwelling, taking into account the likelihood and severity of the occurrence of injury or other type of harm. This allows for improvements in architectural features that may give rise to an injury, such as the design of stairs, windows and kitchens (Stewart, 2002).

2.5.5 Section summary
An extensive housing development programme is currently underway within the UK to meet an increased demand for homes. The government has responded to this increased demand with a commitment to increase the rate of house building to 240,000 completions annually (DCLG, 2007a). Whilst there appears to be a growth in preference for new build housing (New Homes Marketing Board, 2003), there are indications that overall, consumer satisfaction in relation to new build dwellings is following a downward trend (The Housing Forum, 2003).

The quality of new homes within the UK has been the focus of government policy for the past few decades, with major revisions to central policy being undertaken following the Latham Report (Latham, 1994). Building
Regulations within England and Wales are a major element of housing policy that contributes to the quality of new dwellings by ensuring safe and 'decent' homes (Kintrea, 2005). However, the effectiveness of these regulations has been criticised both within the UK and within the United States (Ridout, 1997; Hammitt, Belsky, Levy & Graham, 1999).

The planned growth within the new build housing sector presents a challenge to those responsible for the design and planning of new dwellings. With the current drive for improved design quality, (CABE, 2005), it is evident that developers and designers would benefit from knowledge regarding the needs and views of residents in order to be able to incorporate effective changes into their designs.

2.6 Injury prevention
2.6.1 Models and frameworks
A number of models and frameworks have been utilised within the area of injury prevention complimenting a number of different injury paradigms. Early approaches to health and disease were based upon the Medical Model (Engel, 1977) and injury prevention was conceptualised in a way which understands a person and their injury risk in terms of individual behaviour. Such an approach is criticized for its reductionist approach and its subsequent failure to address psychological, environmental and sociocultural factors as individual and collective determinants of injury (Allegrante et al., 2006).

One early framework for injury prevention which realised the importance of environmental factors was the Haddon Matrix (Haddon, 1970,1980). The matrix assumed that injuries were the product of the interaction between the host (the individual), the agent and the environment (physical and sociocultural). Haddon also incorporated a temporal perspective under the headings of Pre-event, Event and Post-event. Developed initially for the problem of traffic safety the matrix has since been applied to in many areas
of injury prevention. One example where the matrix has been adapted for home safety by Runyan, (1998) is shown in Table 2.9.

**Table 2.9 Haddon Matrix applied to residential fires caused by ignition of furniture (Adapted from Runyan, 1998)**

<table>
<thead>
<tr>
<th>Pre-event</th>
<th>Event (during fire)</th>
<th>Post-event (after child injured by fire)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host (children in home)</td>
<td>Agent (cigarette, matches and upholstered furniture)</td>
<td>Provide first aid and CPR to all family members</td>
</tr>
<tr>
<td>Teach children not to play with matches</td>
<td>Redesign cigarettes so they self-extinguish before ignition of upholstery</td>
<td>Design heaters with quick and easy shut off device</td>
</tr>
<tr>
<td>Redesign lower flammability of structures</td>
<td>Install smoke detectors, increase number of usable exits</td>
<td>Design heaters with less toxic building materials</td>
</tr>
<tr>
<td>Improve efforts to curb smoking initiation</td>
<td>Improve smoking cessation efforts</td>
<td>Increase availability of burn treatment facilities</td>
</tr>
<tr>
<td>Improve policies and rules</td>
<td>Pass ordinances requiring smoke detectors and/or sprinkler systems</td>
<td></td>
</tr>
<tr>
<td>Host Environment (Home)</td>
<td>Agent Environment (community norms, policies and rules)</td>
<td></td>
</tr>
<tr>
<td>Host Environment (Home)</td>
<td>Social Environment (community norms, policies and rules)</td>
<td></td>
</tr>
<tr>
<td>Teach children to stop, drop and roll. Plan and practice a fire escape route with children upholstery</td>
<td>Design furniture with materials that are less toxic when alight. Design flame retardant upholstery</td>
<td></td>
</tr>
<tr>
<td>Install smoke detectors, increase number of usable exits</td>
<td>Increase availability of burn treatment facilities</td>
<td></td>
</tr>
</tbody>
</table>

The Haddon Matrix is an example of a model which contrasted engineering solutions with behavioural solutions and there has been much debate over the years concerning the merits of the engineering approach against behaviour modification (Stokols, 1996). Such a debate is based on the assumption that the two approaches are mutually exclusive but it will be demonstrated later on in this chapter, that this is not the case.
Whilst engineering solutions were successful in preventing unintentional areas within public environments such as the workplace and road environment it was realised that within some environments effective means of conveying the countermeasures was necessary (Spinks, Turner, McClure & Nixon, 2004). The community based model of injury prevention assumes a shared ownership of the injury problem and the paradigm underpins a number of growing global initiatives including the World Health Organisation (WHO) Safe Communities (WHO, 2004). Such initiatives act at a community level to target unintentional injuries through education via media campaigns and retail promotions, community empowerment, environmental changes and legislation.

Following a review of the 'WHO Safe Communities' Model, Spinks et al., (2005) identified only seven WHO 'Safe Communities', of more than 80 worldwide, which had undertaken controlled evaluation using objective sources of injury data. These seven Safe Communities had utilised a range of approaches to target many types of unintentional injury including traffic injuries, school injuries, injuries arising from sports activities, fractures in the elderly, home injuries and injuries arising as a result of physical activity. They found that Safe Communities within Sweden and Norway have resulted in significant reductions in injury rates but similar projects in Australia and New Zealand were unable to replicate the same level of success (Spinks, et al., 2005). Whilst unintentional home injuries and aspects of home safety were targeted in addition to other types of unintentional injury, home injuries were not the sole focus for any of the community based programmes. Community-based approaches to injury prevention adopt an ecological approach in that they address the physical, psychological and social influences on injury causation simultaneously. This topic will be addressed in more depth later in this chapter.

Reducing the incidence and severity of unintentional home injuries within the UK is a public health priority (Secretary of State for Health, 1999, Department of Health, 2003b), and various preventative measures targeting unintentional injuries have been introduced. These may be divided into
three main categories; changing attitudes and behaviour through education, environmental modification and legislation. Such approaches reflect the bioengineering approach and the behaviour-change approach to injury prevention. Each of these three main groups of preventative measures influence two categories of risk factors, human behaviour and the physical environment (Lund & Aaro, 2004), and each have been implemented previously in the prevention of unintentional injuries within the home.

'Primary' interventions are engineering approaches which attempt to eradicate human factors from a situation and rely on structural or environmental modification, such as improved stair design to prevent serious stair injuries. 'Secondary' prevention strategies attempt to modify an individual's behaviour, and as such, focus on the beliefs, attitudes and behaviours of individuals. Elsewhere within the literature, terms such as 'active' and 'passive' have been used as another way of categorising approaches which rely on behaviour change or modification of the environment, respectively.

2.6.2 Modification of the environment
The role of design in home accident prevention was recognised over thirty years ago. Neutra and McFarland (1972) highlighted the role of the residential environment in accident causation and identified a number of ways in the environment influenced the outcome of injury. They identified the need for research into the causes of accidents and the application of research findings by government and private industry. This review focused on a number of common injuries such as poisoning, falls and pedestrian accidents within the United States. Thirty years later, these mechanisms remain a common cause of home accidents here in the UK; in 2002, 33,272 people were injured through poisoning, 221,154 were struck by a moving object and 1,247,960 were injured as a result of a fall in the home (DTI, 2003).

Low cost design improvements to increase safety within the home have been recommended by the Royal Society for the Prevention of Accidents
Their recommendation includes ten improvements to the design of new dwellings to reduce the number of unintentional injuries. The ten recommendations include:

- provision of secure cupboards, which cannot be accessed by children, for storing chemicals and/or medicines
- staircases with provision for fixing points for a British Standard stair gate
- fireplace with provision for fixing points for British Standard fireguard
- installation of window restrictors on windows above ground level
- window controls to be easily accessible
- water temperatures to be safely controlled
- provision of a second handrail to staircases
- provision of grab rails to the bath and WC
- provision of safety advice for the home and garden
- an increase in staircase size

In addition to these structural changes, RoSPA also propose that new homes should have safety checklists provided, one for the house and one for the garden. These should be fixed, with a protective cover on a wall in an appropriate location within the house (RoSPA, 2002). A number of these suggestions made by RoSPA are supported within the academic literature. For example, Pressley and Barlow, (2005) suggest that window guards are associated with reduced injury resulting from falls from buildings and should be mandatory in multi-family dwellings where small children reside, and obligatory efforts for safer water temperatures within dwellings has been proposed by Cerovac and Roberts, (2000) and Stone, Ahmed and Evans (2000). Despite the recommendations made by RoSPA and the accompanying support within the literature such modifications are not mandatory and are rarely implemented in new dwellings within the UK.

The risk of some types of injury may be related to the built form of the home (Newcombe et al., 2005), yet there has been little work looking at whether
particular types of homes are more hazardous than others. In a recent population-based study within the UK, Lyons et al., (2006), assessed whether unintentional injuries occur more commonly in different types of homes. As part of a larger project their work involved linking injury data with domestic property classification. Over a two-year period between 1999 and 2000, 18,044 attendances at a hospital for treatment following an injury sustained within the home were recorded within a population of 112,248 inhabitants. From these 18,044 attendances, 14,081 records were identified as relating to the individuals first attendance within the study period and were linkable with property classifications.

Older properties were not associated with an increased risk of unintentional injury and property size was only weakly associated with increased risk. Adjusted odds ratio of injuries for residents of purpose-built apartments however was substantially elevated for all injuries (OR = 2.07; 95% CI 1.87-2.30) and poisoning episodes (OR = 5.6; 95% CI 3.8 - 8.3). One explanation for this is the fact that such apartments may have been situated within the city centre within close proximity to a main hospital with an accident and emergency department. Proximity to healthcare has previously been demonstrated to influence emergency department attendance (Lyons, Lo, Heaven & Littlepage, 1995).

This project (Lyons et al., 2006) was restricted to just one geographical area within the UK where the distribution of property type differs from that in England. The project area contained older terraced housing, a higher percentage of post 2nd World War semi-detached housing and fewer high rise apartment buildings. The study is however, one of the first to investigate the relationship between built form and injury risk and offers valuable information regarding which homes may present greater risks. Most research focusing on primary interventions have been concerned with those groups who are at a high risk of sustaining a home injury, for example, young children and older people. Over 40% of all childhood accidental injuries occur in the home and in the garden (Child Accident Prevention Trust [CAPT], 2004), and children under the age of 5 years are most
vulnerable to injuries in the home, this being the place where they spend the majority of their time.

### 2.6.3 Primary interventions to reduce injuries to children

Primary interventions to reduce childhood accidental injury have included the provision of free smoke alarms to reduce injuries sustained in a fire (Mallonee et al., 1996), the installation of railings through which a child cannot pass to reduce falls from balconies (Committee on Injury and Poison Prevention, 2001), the installation of stair safety gates to prevent falls (Kendrick, Watson, Mulvaney & Burton, 2005) and the installation of window guards to prevent falling (Spiegel & Lindaman, 1977).

Primary interventions to reduce the number of unintentional poisonings amongst children have included guidelines and advice for the safe storage of household chemicals and medicines in child proof medicine and product containers. Despite these recommendations, studies in the United States (Coyne-Beasley et al., 2005) and the Netherlands (Beirens, van Beeck, Dekker, Brug & Raat, 2006) have identified that children remain at a substantial risk from improperly stored poisonous substances within their own homes. Both of these studies identified unsafe storage of poisons within at least 50% of homes surveyed where children were resident. The method of data collection in both studies relied on self-report data. This limitation may have led to an underestimation on the level of unsafe storage, with respondents providing socially acceptable responses and the problem may be worse than reported.

In a further study, Gibbs et al., (2005) identified that although parents were aware of safety strategies in relation to household poisons, and were implementing these strategies to a certain degree, there were a number of knowledge based, environmental and behavioural factors acting as barriers to the uptake of safe storage strategies. For example, some parents were unaware that substances not sold in child resistant containers could be dangerous to children; a lack of storage options within properties affected the implementation of safe practices and the issue of convenience was a
barrier to safe storage. Although this study was undertaken in Australia, there may be relevant information that may be useful for injury prevention within the UK. Gibbs et al., conclude that additional education campaigns may be effective in improving the implementation of environmental safety measures, however there is little evidence that such campaigns are effective in reducing unintentional injuries (Towner, Dowsell & Jarvis, 2001).

There is conflicting evidence in relation to the effectiveness of specific home modifications such as the installation of smoke detectors to prevent fatal and serious injuries from fires. Within the United States an intervention initiative involving a smoke alarm giveaway was found to reduce the incidence of injuries from residential fires (Mallonee et al., 1996), yet inconsistent results from an identical study within the UK have also been reported. Following a cluster randomised controlled trial in inner London, mirroring the study in the United States (Mallonee et al. 1996), DiGuiseppi et al., (2002) concluded that a smoke alarm giveaway programme did not result in a reduction of injuries related to fire. DiGuiseppi et al., suggested that the different results obtained within the UK may be due to population differences which affected the likelihood of alarms being installed and maintained. In both of these intervention studies the provision of smoke alarms was the sole intervention initiative; with an absence of any education or behavioural initiative in support of this primary modification, behavioural differences may have indeed led to conflicting results. The study also identified that despite the provision of free smoke alarms, few alarms had actually been installed or were maintained. Such findings are consistent with those reported by Shults et al., (1998) and more recently by Runyan et al., 2005c). Shults et al found that in 26% of households with non-working detectors, residents reported that they had forgotten to replace the battery and Runyan et al identified that less than 20% of households reported checking their alarm at least every 3 months. Other studies have reported disappointing findings in relation to a behavioural response to smoke alarm installation (Thompson et al., 2004) and as such highlight the fact that alongside safety improvements arising from design measures, a behavioural adaptation is often also required (Carlson-Gielen & Sleet, 2003; Thompson, Waterman & Sleet, 2004).
2004). This is an issue which will be explored in more detail later on in this chapter.

Reviews of evidence for the effect on injuries of modifying the home environment have found that there is insufficient evidence to show that such changes reduce the number of general injuries in the home to children (Towner et al., 2001), or to older people and the general population as a whole (Lyons et al., 2003). The lack of effect found within these reviews may be due to a number of reasons including insufficient timescale for follow-up and the small sample sizes used, however without robust scientific evidence, there is little support for modification of the environment as a sole method of reducing home injuries in general.

2.6.4 Primary interventions to reduce injuries to older people
The ability of an older person to remain independent usually centres on the extent to which they can continue the normal routines of daily life on their own, despite frailty or impairment (Lansley, Flanagan, Goodacre, Turner-smith & Cowan, 2005). The home is the most common site for unintentional injuries among older people with falls being the most frequent cause of injury (Healy & Yarrow, 1998). Approximately 30% of people aged over 65 years of age and living in the community fall each year (Gillespie et al., 2004) and certain home environmental factors have been associated with an increased risk of falling (Carter, Campbell, Sanson-Fisher, Redman & Gillespie, 1997) and a higher risk of hip fractures (Clemson, Cumming & Roland, 1996). In a more recent study Marshall et al., (2005) found that fall hazards were prevalent in many types of households and the use of fall prevention measures was not universal. However, this study was undertaken within the United States, and the distribution of housing types across countries similar in cultural and socioeconomic factors can still vary widely and act to increase or decrease injury risk (Lyons, et al., 2006).

Primary preventative efforts to reduce home falls amongst the elderly have included extrinsic interventions aimed at reducing the number of domestic hazards within the home. Several reviews of the literature on falls
prevention in the home through environmental modification have yielded conflicting findings. Lamb (2001), for example concludes that the effectiveness of home hazard modification for older people is unclear, whereas Scott, Dukeshire, Gallagher and Scanlan, (2001) conclude that the inclusion of home modification within intervention programmes is an effective strategy for reducing falls. This is when environmental modification is combined with education and counselling on reducing risks and the appropriate targeting of older people who are motivated and willing to change their behaviour. Other reviews also suggest that environmental modification as a prevention strategy is best supported with additional strategies such as medical or environmental assessment (Feder, Cryer, Donovan & Carter, 2000) or where there is a history of falling (Gillespie et al., 2004).

Wells and Evans, (1996) found that neither design professionals well acquainted with design projects for the elderly nor older people themselves had particularly accurate perceptions of home injury risk. However, whilst older people may not have accurate perceptions of the level of home injury risk, Morgan et al., (2005) found that a home checklist was a reliable self-report instrument for measuring home fall hazards. Although it appears that environmental modification may be a feasible intervention to reduce home falls, many studies which have investigated the influence of such hazards on the incidence of falls have yielded inconsistent results (van Bemmel, Vandenbroucke, Westendorp & Gussekloo, 2005).

A number of environmental modifications aimed at reducing the number of accidents within dwellings have been incorporated into building regulations and standards throughout the UK and elsewhere in the developed world. An example of this would be the minimum requirements for the design of stairs here in the UK. Heimplaetzer and Goossens (1991) claim that this approach can be problematic because it is not always evident to designers and architects what problems the codes and standards are supposed to solve and under what circumstances they will be most effective. Due to the mandatory nature of building codes Heimplaetzer and Goossens argue that
they ‘kill’ the creativity of designers by prescribing them what to design. Such a view is supported by Farquhar, Barrow, Church, Fortin and Bank (1998) who suggest that regulation can stifle design innovation.

Heimplaetzer and Goossens also argue that building codes are often interpreted by architects and those involved in the building process as a guarantee that a maximum level of health and safety is provided. This leaves little motivation for the designer or architect to provide additional safety measures within their designs. A similar criticism has recently been made of volume house builders and developers within the UK by CABE, (CABE, 2007) where case studies within three areas of the UK identified that developers will comply with the requirements asked of them by the planning system, but in most cases will go no further.

Heimplaetzer and Goossens go on to suggest that mechanisms should be developed which allow the distribution of knowledge about solutions to safety problems to even the smallest of architectural firms. This is an issue which has been recognised more recently by Stevenson (2006), who expands it further by arguing that integrating safety into the built environment requires partnership between government, industry, non-government organisations, community groups and individuals.

Heimplaetzer and Goossens (1991) also suggest that many of the primary solutions aimed at avoiding domestic accidents have been chosen on the basis of partial or incomplete modelling of these solutions. For example, in preventing children from falling down stairs a closure may be fitted at the top of a flight of stairs, but the consequences of this modification for adult occupants is overlooked. In this manner, safety measures introduced to protect occupiers from one element of danger can introduce additional hazards within the home. Sime (1991) argues that insufficient attention has been directed towards social and psychological factors in safety design documentation and calls for a greater integration of perspectives as opposed to ‘reactive legislation’. The focus of research should be on the interrelationships between people, activities and environmental settings.
This is the approach adopted throughout this thesis, which will identify the individual, environmental and social factors which influence health and well-being in the home.

2.6.5 Secondary interventions

Secondary interventions aimed at reducing the number of unintentional home injuries endeavour to change an individual's behaviour in some way and numerous attempts have been made to try and lower the incidence of particular injuries through education aimed at encouraging safe practices within the home. A number of unintentional injuries arise from unsafe behaviour. This has been highlighted by Clark and Webber (1982) for example, who found that the most important behavioural factor common to many home accidents was that the victim was at the time of the accident acting towards a feature in a way that the designer or engineer might not have foreseen. In recent years there has been an increased emphasis on targeting injury prevention amongst those at greatest risk, i.e. neighbourhoods and families which are socioeconomically disadvantaged (Kendrick et al., 2005).

Behaviour based interventions have been used in an attempt to modify behaviour related to a number of common injuries sustained within the home and in a number of cases, these have met with some success. For example, Miller, Reisinger, Blatter and Wucher (1982) found that a brief educational programme delivered by paediatricians to parents of children seen for a routine health check resulted in increased smoke alarm ownership within a target population compared with that of a control group. However, the follow-up period for this intervention was very short and the long-term maintenance behaviours required for the efficient functioning of the smoke alarm were not examined. In a systematic review, Roberts, Kramer and Suissa (1996), examined a number of home visiting programmes against their effect on injury and child abuse outcomes. Although they found that few had been rigorously evaluated, they concluded that home visiting programmes have the potential to significantly reduce the rates of childhood injury. This is supported by Bablouzian, Freedman,
Wolski and Fried (1997) who found that a home visiting program incorporating education regarding injury prevention practices led to increased home safety.

Towner and Ward, (1998) identified a number of interventions which have been demonstrated to lead to a change in behaviour and thus reduce injury risk include. Those relevant to home safety include

- educational campaigns to increase the use of safety devices such as smoke alarms
- parent education on home hazards

Despite focusing on only three types of home injury; house fires, falls and scalds, the findings from this review (Towner & Ward, 1998), suggest that some areas of unintentional injury prevention can benefit from behaviour based interventions.

There is a substantial body of work which has examined the link between risk taking behaviour and subsequent injury (e.g. Turner, McClure & Pirozzo, 2004) and it is believed that many risk behaviours can be avoided through secondary efforts focusing on encouraging safer practices. This approach has been widely applied within other areas of injury prevention and health promotion for example, workplace injuries (Hanlon et al., 1998) and sexual health (Kelly et al., 1991). A number of studies have also shown that such an approach can also be effective in reducing childhood home injuries (Clamp & Kendrick, 1998; King et al., 2005).

A fundamental aspect of behaviour change strategies is promoting a change in individual attitudes. This is because it is widely accepted that successful behaviour change strategies need to take into account individual attitudes because attitudes influence behaviour under certain specifiable conditions. (Ajzen & Fishbein, 1970,1977; DeBono, 1995). Attitude change is a significant topic in itself and this review will not attempt to fully examine this
wide ranging area but will be limited to a definition and a brief examination of some relevant points.

An attitude can be defined as 'a general evaluation or assessment, of the people, objects and ideas that surround us' (Aronson, Wilson & Akert, 2004 p 217). Early theoretical approaches assumed that changing an individual's attitude towards a situation would result in a matching change in behaviour, but it has since been demonstrated that this relationship depends on certain conditions (Olson & Zanna, 1993).

Ajzen and Fishbein (1977) reviewed over one hundred studies of the attitude-behaviour link and concluded that attitudes could only be used to predict behaviour if the attitudes were highly specific in respect to that behaviour. They also proposed four important factors which would influence the relationship, these are; action, (the closer the correspondence between the activity and the behaviour, the greater is the likelihood that behaviour will be influence by the attitude), target, (the closer the target behaviour is to the attitude, the greater the likelihood of attitude change), situation, (the closer the context within which attitudes and behaviour are linked, the stronger the relationship) and time frame, (the attitude must be recently connected to the behaviour to have an influence).

Bem (1967) suggests the formulation of and change in our attitudes are often based on our perception of our own behaviour. This helps to prevent cognitive dissonance as proposed by Festinger (1962) whereby people strive to maintain a consistent balance between their attitudes and behaviour and an uncomfortable state occurs when there is inconsistency between the two.

The theory of reasoned action (Fishbein and Ajzen, 1975), proposes that complex processes are involved in the route from attitudes to behaviour. This offers a central role for social cognitions in the form of social norms. Conformity to social norms however does not necessarily stem from an
individual's attitude, and behaviour may not reflect a privately held positive attitude.

The theory of planned behaviour was developed by Ajzen (1991) and builds on the theory of reasoned action. This approach considers an individual control component which is influenced by an individual's intention to act. An intention to act in a particular way will be influenced by three factors:

1. the individual's prevailing attitude towards the behaviour;
2. perceived social norms, derived from immediate groups;
3. perceived behavioural control

This final factor can be related to an individual's perception of hazards and risk and their ability to control those risks. For example, climbing a ladder at home would be influenced by an individual's perception regarding the safety of ladders and their own ability to do so successfully. A social and behavioural science application of this suggests that people who feel personally susceptible to a particular health outcome that can lead to severe consequences are much more likely to adopt the recommended preventative measures (Janz, Champion & Strecher, 2002). Indeed, Yang, Peek-Asa, Allareddy, Zwerling and Lundell (2006) identified that a perceived high risk of a home fire was associated with the presence and practice of fire escape plans.

Lund and Aaro (2004) examined the effectiveness of three injury prevention strategies; attitude modification, behaviour modification and structural modification on a number of injuries, including those injuries sustained within the home. They found that attitude modification programmes such as mass media campaigns, films and posters did not have any effect on behaviour or on the incidence of injuries, except when the target groups were 'highly motivated'. Motivation was measured as being high when safety information directly affected participants own children. This may help to explain the success of behaviour based interventions targeting parents of young children. Messages were more influential when they were repeated.
and when they were tailored to a specific behaviour. This offers support for Ajzen and Fishbein's (1975) suggestion that the context is important when addressing behaviour and attitude change, in that the closer the context within which attitudes and behaviour are linked, the stronger the relationship.

From Lund and Aaro's review six interventions based on behaviour modification alone showed positive results whilst five were found to have no effect. Those interventions aimed at a single behaviour were more likely to be successful than those aimed at a range of hazards. They also found that behaviour modification programmes may produce a change in behaviour without any noticeable change in attitudes, but this finding may reflect conformity with social norms, and may be an example of where a behaviour does not necessarily reflect a positive internal attitude.

Lund and Aaro (2004) also found that the use of regulation and enforcement had a strong positive effect on the incidence of accidents and injuries particularly for road traffic safety and also for home accidents. They also found that not all environmental changes proved to be effective which is in line with other studies referenced in previous sections (Sections 2.6.2 and 2.6.3.).

Lund and Aaro's review identified that all combined prevention programmes, i.e. those utilising more than one intervention approach, were found to yield a positive result. Those programmes which proved to be most successful were those where legislation, environmental changes and education were combined. The mutual influences of these factors seemed to have stronger effects than where one category was used in isolation. The limited success of previous home injury prevention programmes may therefore be due to a lack of a combined approach which tackles influencing factors simultaneously.

Many of the theories described above have been applied in a number of organisational and health settings but have not been applied to a large
extent to home safety. Campaigns to increase smoke detector use has resulted in more properties having them fitted, but individuals still remove the batteries and fail to adequately maintain these items. Such behaviour demonstrates that although public attitudes towards some home safety measures have changed, personal behaviours do not reflect a positive internal attitude change that is maintained. Safety campaigns are therefore unlikely to have a positive impact unless they are supported by other measures. Attitudes and behaviour are undoubtedly influenced by a number of extrinsic factors including risk perception, and this is an important concept within home safety. If, as in the case of fire, individuals feel detached from the hazards and associated risk, safety campaigns aimed at changing attitudes will be unsuccessful unless they are supported by additional means.

2.6.6 Section summary – reducing the incidence of unintentional injury

A number of models and frameworks have been proposed to explain the nature of unintentional injuries. Despite an early suggestion of a biopsychosocial model (Engel, 1977), prevention strategies appear to have been dominated by the medical model of injury. Preventative measures aimed at reducing the number of unintentional injuries within the home can be divided into three main categories; changing attitudes and behaviour through education, environmental modification and legislation.

Primary measures for home injury prevention have focused on making changes within the environment to reduce the number of hazards present in the home. These measures are varied but have included the provision of free smoke alarms to reduce injuries sustained by fire, the installation of stair safety gates to prevent falls among children and home hazard modification to prevent falls among older people. A number of primary measures of prevention have also been incorporated within building regulations within the UK. There is conflicting evidence in relation to the effectiveness of primary interventions as a sole method in reducing the number of injuries sustained within the home and this may be explained by
the fact that some environmental modifications, such as the provision of
smoke alarms need a behavioural adaptation to ensure their effectiveness.
This issue will be explored in more detail in section 2.7.

Secondary measures for home injury prevention aim to change an
individual's behaviour by encouraging safe practices within the dwelling. A
number of intervention studies have found that education can lead to a
change in behaviour and increased home safety but such studies have not
evaluated whether such behaviours are maintained. A number of
behavioural approaches have also focused on individual attitude change but
it is commonly accepted that the relationship between behaviour and
attitudes in a complex one which in influenced by many factors.

2.7 Theoretical models of health behaviour

Behavioural scientists have made a considerable contribution to the field of
public health through the application of theoretical models which aim to
predict health behaviours. Individual-level behaviour change models focus
on the influence of an individual's knowledge, attitudes and beliefs and the
influence of significant others, such as family and friends, on his or her
behaviour. Amongst the more well known models focusing on intra and
inter-personal levels are the Health Belief Model (Rosenstock, 1966), the
Theory of Reasoned Action (Fishbein and Ajzen, 1975), the Theory of
Planned Behaviour (Ajzen, 1991), and the Transtheoretical Model
(Prochaska & DiClemente, 1982).

2.7.1 Individual models of behaviour

Individual-level behaviour change models have been implemented in many
different areas of health promotion including improving health status
(Peterson et al., 2002), sexual health (Maguen, Armistead & Kalichman,
2000) and smoking (Haslam & Draper, 2000). There has also been strong
support for the implementation of these models to other areas such as
work-place protective behaviour (Dejoy, 1996), and more recently within
injury prevention, (Carlson-Gielen, 2002; Thompson, Sleet & Sacks, 2002;
Carlson-Gielen & Sleet, 2003). Indeed, in some areas the application of individual-level behaviour models has been shown to enhance efforts to reduce injuries, for example, in the reduction of sports injuries (Eime, Owen & Finch, 2004), the promotion of bicycle helmet use among teenagers (Lajunen & Räsänen, 2004) and in reducing occupational injuries (Whysall, Halsam & Haslam, 2005).

The extent to which these individual-level behaviour models have been applied to the area of injury prevention was recently reviewed by Trifiletti, Gielen, Sleet and Hopkins (2005). Whilst their review was not exhaustive they did identify gaps in the research on the application of behavioural and social science theories and models to unintentional injury prevention. They found that several important theories had never been applied to unintentional injury prevention yet argue that behavioural change theories are constantly emerging and many could have direct application to the area of injury prevention.

Individual-level behaviour models do not consider the influence of wider aspects of society on an individual’s behaviour, for example the influence of organisational settings and social and health policies. Allegrante et al., (2006) argue that health is not “merely a product of individual biological, psychological and behavioural factors, it is the sum of collective social conditions and the nexus of transactions that is created when people interact with the environment in which they live, work and play” (Allegrante et al., 2006, p105.) and consequently improving health and preventing unintentional injury requires attention to the entire social system.

2.7.2 Community models of behaviour

The Community-based approach to injury prevention discussed previously (Section 2.6.1) adopts an approach whereby multiple levels of influence are targeted for health promotion. As such, it is ecological in nature. In 1988, McLeroy, Bibeau, Steckler and Glanz proposed an ecological model of health behaviour that identified a number of levels of influence on health. In
this model, behaviour is the outcome of interest and is viewed as being
determined by the following:

1. intrapersonal factors – characteristics of the individual such as
   knowledge, attitudes, self-concept, skills etc. This includes the
developmental history of the individual.
2. interpersonal processes and primary groups – formal and informal
   social network and social support systems, including the family, work
   group, and friendship networks.
3. institutional factors – social institutions with organisational
   characteristics, and formal (and informal) rules and regulations for
   operation.
4. community factors – relationships among organisations, institutions
   and formal networks with defined boundaries.
5. public policy – local, state and national laws and policies.

McLeroy et al., argue that “The purpose of an ecological model is to focus
attention on the environmental causes of behaviour and to identify
environmental interventions” (1988, p.366) and whilst health promotion has
embraced an ecological perspective on health that realises the importance
of both the physical and social environments and the interaction of the
individual with the environment, the application of such an approach has not
been a major focus in the prevention of unintentional injury (Allegrante et al.,
2006).

Hanson et al., (2002, 2005) propose an ecological approach to planning
community-based interventions to prevent unintentional injuries and
presents this as a model based upon the injury iceberg (Stone, Jarvis &
Pless, 2001) (See Figure 2.1). The three dimensions of the individual and
their behaviour, the physical environment and the social environment can be
analysed across the five ecological dimensions similar to those described
above (intrapersonal factors, interpersonal factors, institutional factors,
community factors and public policy). Hanson argues that safety is
inherently an ecological concept and interventions must address the ecological system as a whole.
Figure 2.1. Ecological Injury Iceberg (adapted from Hanson, Vardon & Lloyd, 2002)
In reviewing the effectiveness of community-based approaches to injury prevention, Nilsen (2004) identified the importance of contextual conditions of the programme whereby structural and process elements may work in one context but not in another. Successful programmes implemented within affluent and reasonably cohesive communities were not successfully replicated in other areas where community cohesion levels were very different. Standardised intervention programmes therefore cannot be developed as a tool-kit approach to injury prevention (Nilsen, 2004). Each aspect of the ecological system will be different within different contexts. To date, there is no published literature which proposes an ecological community-based approach to the reduction of unintentional home injuries within the UK. Indeed, very little is known regarding the interacting influences which operate at each level within this ecological concept.

Ecological models of behaviour change are multifaceted and are concerned with environmental change, in addition to individual factors, as well as the interaction between the two. This multilevel theoretical approach has intuitive appeal for the prevention of unintentional injury within the home whereby initiatives to change individual behaviour may be combined and supported with environmental change through policy and regulatory initiatives. In applying an ecological framework to the prevention of unintentional home injuries, the influence of the individual, the home environment and wider social influences in unsafe practices can be brought together.

Previous work examining unintentional home injuries has identified that an individual's behaviour is determined by a complex interaction of behavioural, psychological and sociocultural factors (Haslam et al, 2006; Ormandy, 2007). However, current strategies aimed at preventing injury do not address these factors simultaneously, focusing instead on either behaviour or environmental change alone. Very few studies have examined how occupier behaviour can interact with the home environment to lead to an increased risk of injury of ill-health, and this had led to a paucity of knowledge of this area.
There is now strong support for an ecological approach to injury prevention (Carlson-Gielen, 2002; Sallis & Owen, 2002; Carlson-Gielen & Sleet, 2003; Trifiletti et al., 2005) and a number of studies have demonstrated the potential value of such an approach in other areas of health promotion and injury prevention such as the promotion of physical activity (Sallis et al., 2001) and preventing child and adolescent unintentional injuries (Kidd, Reed, Weaver, Westneat & Rayens, 2003; LaScala, Gruenewald & Johnson, 2004). Injury prevention and control and the promotion of safety have physical, psychological and sociological dimensions and thus should be considered an ecological concept (Allegrante et al., 2006), a similar approach has recently been suggested for understanding motor vehicle accidents (Factor, Mahalel & Yair, 2007). For such an approach to be useful in reducing unintentional home injuries a greater understanding is required of the multiple interactions that occur within the home environment. To date, no published work has addressed this area and very little is known about the multiple causative factors which lead to a risk of injury.

2.7.3 Section summary
The application of theoretical models to predict health behaviours has made a considerable contribution to the field of public health. More recently there has been strong support for the implementation of such models to other areas such as injury prevention (Carlson-Gielen, 2002; Sallis & Owen, 2002; Carlson-Gielen & Sleet, 2003; Trifiletti et al., 2005). Individual-level behaviour change models such as the Health Belief Model and the Theory of Planned Behaviour are useful in understanding individual behaviours but they do not consider the importance of the physical and social environment in determining behaviour. Ecological models of health behaviour realise the importance of both the physical and social environment in addition to the interactions which arise within both and as such have an intuitive appeal for the prevention of unintentional injury within the home. Such an approach requires an understanding of the different interactions which arise within the home environment and how these interactions influence the risk of injury or ill-health.
2.8 Chapter Summary

Unintentional home injuries are a priority concern within the UK. Each year around 4000 deaths occur and approximately 2.7 million injuries are sustained within the domestic environment which necessitate the casualty seeking hospital treatment (DTI, 2003). Home-base injuries are also a concern elsewhere, in the United States, for example, they are the leading cause of death (Runyan et al., 2005a) and within Europe 20 million home and leisure accidents are recorded annually (Bonnefoy et al., 2004). In addition to these figures, a large number of injuries and deaths occur due to fire. Each year within the UK, 400 people are killed and over 10,000 injured as a result of a house fire (DCLG, 2007b) and in the United States residential fires led to almost 3,000 deaths during 1999 (National Centre for Injury Prevention and Control, 2001).

Occupier behaviour and dwelling design have been identified as individual risk factors for domestic injury. Structural features within the home such as steps, stairs and balconies can present physical dangers and occupier behaviour can contribute to, or be the sole cause of an accident (Bonnefoy et al., 2004). Some studies have identified specific behaviours which increase the risk of injury or ill-health and these include the use of alcohol (DTI, 2002) and undertaking a hazardous action (BRE, 2003). A large number of consumer products are also involved in incidents which lead to injury. The safety of consumer products has increased since the introduction of legislation governing their design and consequently very few injuries are recorded due to consumer product failure. One of the main causes of injuries involving a consumer product appears to be inappropriate use or misuse of the item on behalf of the individual involved (Gagg, 2005).

An increasing body of evidence has demonstrated the influence of housing on health (Fuller-Thompson et al., 2000). Poor dwelling conditions, for example, can lead to an increased risk of unintentional injury or ill-health (Krieger & Higgins, 2002) and housing tenure has been linked to lower levels of psychological and physiological health. Within the UK, the quality
of existing private sector housing has been a focus of government policy and there is currently commitment from central government to increase the rate of house building significantly. Despite a number of influential reports highlighting the need to improve quality within the house building industry (Latham, 1994; Egan, 1998) it would appear that little progress has been made and further improvements are still required (Barker, 2004; CABE, 2005, 2007).

The medical model of injury (Engel, 1977), which conceptualises injury risk in terms of individual behaviour, has dominated prevention efforts for a number of years. Strategies aimed at reducing the incidence and severity of domestic injuries have focused on primary or secondary measures. Primary intervention measures rely on environmental modification to reduce the presence of hazards within the home whereas secondary measures focus on the beliefs, attitudes and behaviours of individuals. Carlson-Gielen and Sleet (2003) however, argue that for virtually all primary modifications, a behavioural adaptation is also required, but to date, prevention strategies have not considered the two simultaneously.

A small number of studies have identified the importance of an interaction between individual behaviour and environmental design in relation to safety on stairs (Roys, 1991; Haslam et al., 2006). This interaction between behaviour and the dwelling environment is an area that has not received attention through injury prevention measures here within the UK. Current knowledge in relation to the interaction between individual behaviour and the home environment is restricted to only one dwelling feature, i.e. stairs, and other interactions may arise within the home environment which lead to an increased risk of injury or ill-health.

There is strong support for the application of behaviour change models to other areas such as injury prevention (Carlson-Gielen, 2002; Thompson et al., 2002). Whilst a number of individual-level theories have proved useful in some areas, they do not consider the influence of social factors on an individual's behaviour. Allegrante et al., (2006) argue that injury prevention
and the promotion of safety have physical, psychological and sociological dimensions and thus should be considered an ecological concept. The community-based approach to injury prevention offers the opportunity for an ecological basis for preventative efforts whereby individual factors, the physical environment and social factors can be addressed simultaneously. Previous work has identified that an individual's behaviour is influenced by a complex interaction of behavioural, environmental and social factors (Haslam et al., 2006; Ormandy, 2007). This multilevel theoretical approach therefore has intuitive appeal for the prevention of unintentional injury within the home. This has been shown to be a successful approach to reducing many types of unintentional injuries within some 'WHO Safe Communities' within Sweden and Norway (Spinks et al., 2005).
Chapter 3

HOME INTERVIEWS WITH NEW BUILD OCCUPIERS

3.1 Introduction
As outlined in Chapter 2, injury prevention and control and the promotion of safety have physical, psychological and sociological dimensions and thus may be considered an ecological concept (Allegrante et al., 2006). There is now strong support for a more integrated approach to injury prevention as a whole through the implementation of models from behavioural health (Carlson-Gielen, 2002; Sallis & Owen, 2002; Carlson-Gielen & Sleet, 2003; Trifiletti et al., 2005). However, there has been limited application of such models in the area of home-based injuries. This may be due to the paucity of knowledge currently available regarding the way individuals use the features and systems within their homes together with little understanding of the environmental and social aspects which underpin behaviour. An exploration of the different ways in which individuals use and interact with their home would identify the behavioural, environmental and social influences that can interact as determinants of injury. Such insight may assist in the development of an ecological approach to the prevention of home-based injuries.

3.2 Outline of research presented in this chapter
This chapter describes the findings from home interviews which were conducted with new build occupiers*. New homes were chosen as the basis for study for the reasons outlined in Chapter 1. In total, 40 face-to-face, in-depth, semi-structured interviews were conducted to obtain information on the personal experiences of individuals inhabiting a new-build home.

*Aspects of the study presented in this chapter are reported in the journal Accident Analysis and Prevention. [McDermott, H.J., Haslam, R.A. & Gibb, A.G. (2007). The interaction between design and occupier behaviour in the safety of new homes. Accident Analysis and Prevention, 39, 258-266.]
Topics within the interview schedule included how participants interacted with features within the property; what changes, if any, had been made to the property; what problems, if any, the occupiers experienced within their properties; the maintenance of the property and the extent and sources of occupiers' knowledge in relation to health and safety within the home. A home inspection was also undertaken within each property during which occupiers were able to identify where problems arose with design features and describe any modifications that had been made.

3.2.1 Aims and objectives
The aim of this initial exploratory study was to collect information on the experiences of new home occupiers and to gain an understanding of the interactions people have within their new homes affecting health and safety.

- explore the ways in which individual's interact with the features and systems within their home
- identify the problems occupiers have in using the features and systems within their properties
- establish how these problems lead to occupier modifications or an increased risk of injury or ill-health.
3.3 Methods

The study used semi-structured interviews as a way of gaining insight and knowledge of the problem. Using semi-structured interviews allowed flexibility to follow up interesting responses and the investigation of underlying motives.

An interview schedule was prepared at the beginning of the study. This was piloted with two households before producing the final version. Broad, open-ended questions were used with additional questions to clarify responses or probe interesting issues. Such an approach permits respondents to comment on issues from their own perspective. The interview schedule is shown in Table 3.1. Due to the nature of semi-structured interviewing some interesting themes were raised by participants which were not within the interview schedule.
Table 3.1. Participant Interview Schedule

<table>
<thead>
<tr>
<th>Topic</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Details</td>
<td>• Gender, age, occupier status, length of occupation</td>
</tr>
<tr>
<td></td>
<td>• Household composition</td>
</tr>
<tr>
<td>Facts about property</td>
<td>• Type of property, number of bedrooms, purchase price</td>
</tr>
<tr>
<td></td>
<td>• Name of builder, stage of construction at purchase</td>
</tr>
<tr>
<td></td>
<td>• What changes did you ask the builder to make prior to completion?</td>
</tr>
<tr>
<td></td>
<td>• Did you compile a snagging list?</td>
</tr>
<tr>
<td></td>
<td>• What information was provided on property?</td>
</tr>
<tr>
<td></td>
<td>• How much of this information has been read?</td>
</tr>
<tr>
<td></td>
<td>• How were you introduced to the features within your home?</td>
</tr>
<tr>
<td></td>
<td>• Were you told about any safety features within your home?</td>
</tr>
<tr>
<td></td>
<td>• How were you introduced to the safety features within your home?</td>
</tr>
<tr>
<td>Changes to property</td>
<td>• What changes have been made to the property?</td>
</tr>
<tr>
<td></td>
<td>• Why were these changes made? restrictions to making changes</td>
</tr>
<tr>
<td></td>
<td>• What changes are planned for the future? Why?</td>
</tr>
<tr>
<td></td>
<td>• Would you undertake these changes yourself, or employ a professional?</td>
</tr>
<tr>
<td></td>
<td>• What factors influence such a decision?</td>
</tr>
<tr>
<td></td>
<td>• Do you engage in DIY activities?</td>
</tr>
<tr>
<td></td>
<td>• Erected any additional walls? Replaced any glass? Drilled through</td>
</tr>
<tr>
<td></td>
<td>floors? Removed members in roof construction for loft access?</td>
</tr>
<tr>
<td></td>
<td>• Removed fire doors? Removed closers on fire doors? Removed gravity-</td>
</tr>
<tr>
<td></td>
<td>driven rising butt hinges? Blocked any air vents? Installed</td>
</tr>
<tr>
<td></td>
<td>additional electrical sockets? Changed stepped approaches to sloped</td>
</tr>
<tr>
<td></td>
<td>approaches? Removed hand rail from stairs? Installed recessed down</td>
</tr>
<tr>
<td></td>
<td>lighters in ceiling? Removed smoke alarm battery due to false alarms?</td>
</tr>
<tr>
<td></td>
<td>Fitted security locks on windows?</td>
</tr>
<tr>
<td>Use of property</td>
<td>• Are all rooms used for their intended purpose?</td>
</tr>
<tr>
<td></td>
<td>• Do occupiers have difficulties in using any feature?</td>
</tr>
<tr>
<td></td>
<td>• Do you use the loft for storage?</td>
</tr>
<tr>
<td></td>
<td>• How do you gain access to the loft?</td>
</tr>
<tr>
<td></td>
<td>• Garage use</td>
</tr>
<tr>
<td>Home Safety</td>
<td>• What safety features are fitted within the home? (list)</td>
</tr>
<tr>
<td></td>
<td>• Knowledge of smoke alarm, testing of smoke alarm, false alarms</td>
</tr>
<tr>
<td></td>
<td>• Fire plan</td>
</tr>
<tr>
<td></td>
<td>• Incidence of home accidents / house fires</td>
</tr>
<tr>
<td></td>
<td>• Features the give cause for concern, problems with any features</td>
</tr>
<tr>
<td>Garden</td>
<td>• Describe garden</td>
</tr>
<tr>
<td></td>
<td>• What type of work have you completed in the garden? Do you feel your</td>
</tr>
<tr>
<td></td>
<td>garden presents any health and safety risks?</td>
</tr>
</tbody>
</table>
3.3.1 Sampling

Sampling was on a convenience basis, but was purposive in that participants from the chosen sample group were most likely to be able to provide useful insights into the problem under investigation. Patton (2002) argues that 'The logic and power of purposive sampling lies in selecting information-rich cases for study in depth' (Patton, 2002: p169).

The participants in this study were recruited using a range of methods to achieve a structured convenience sample. Over a period of four months, letters inviting participation were delivered to all completed and occupied properties on new build developments in the area of Leicestershire/Nottinghamshire within the UK. All known residential developments within a 20 mile radius of Loughborough University were targeted during recruitment. Two press releases detailing the study objectives were also used to raise awareness of the study and to encourage participants to respond to the mailing. These resulted in several articles in local newspapers.

The primary criterion for inclusion in this study was new build occupancy within the previous two years. The sample composition intentionally covered a broad range of property types (detached house, town house, apartment etc) and reflected different types of occupancy status (owner occupier, tenant, shared accommodation etc). This was to ensure that different types of dwellings were included in the study and that different types of occupant status were reflected in the sample. The properties were constructed by both small private firms and large commercial builders.

3.3.2 Procedure

Having agreed to participate the participants were briefed verbally about the nature of the research and supplied with written information (Appendix A). Written, informed consent was obtained from all participants.
Of the 40 interviews undertaken, 27 were conducted with a single participant and 13 were conducted with partners present. Where a single participant was interviewed, these were either the sole occupiers of the property or the resident that made contact with the researcher. The interviews were tape recorded with the knowledge and consent of the interviewees. The same researcher, trained in interview techniques, conducted each interview. Each interview lasted approximately one and a half hours.

At the conclusion of the interviews the researcher accompanied occupiers around their properties to identify where problems had arisen with design features and where modifications had been made. Each room was visited and the participants were asked to describe whether they had made any changes within that room or whether they had experienced any problems or had concerns regarding any features. The time taken for this varied from property to property and was dependent on the number of changes made or the nature of the problems experienced by the participants. The typical duration was 30 minutes. During these home inspections, where appropriate, photographs were taken with the knowledge and consent of the interviewee.

3.3.3 Analysis
The recorded interviews were fully transcribed and the transcriptions were imported into the qualitative software tool, NVivo (Version 2). The qualitative analysis of the interview data was conducted following the three steps developed by Miles and Huberman (1994); data reduction, data display and conclusion drawing/verification. Data reduction was achieved by reviewing the verbatim transcripts and descriptive codes were applied to chunks of data. Descriptive codes describe the event(s) reported. An example of the descriptive coding is shown in Appendix B. These codes were then organised into a number of themes in line with the original objectives of the study. During the course of analysis, the codes were reviewed and revised as key categories emerged from the data. Validation of the coding was achieved by independent review of a sample of the data and subsequent interpretation by
another researcher experienced in qualitative data analysis, independent of the study. The sample data were independently coded by the two researchers and it was found that similar codes were applied to the same chunks of data. During subsequent discussion there were no disagreements between the two researchers over codes, definitions or blocks of data. The pattern coding from the qualitative analysis provided the basis for the data summary tables which are presented within the results section below from which the conclusions within this study have been drawn.

Of the 40 interviews undertaken, qualitative data is available for only 37 of these as during 3 of the interviews the digital recording equipment failed. Where analysis has been undertaken on the qualitative data, the percentages and other calculations are from a total sample of 37. All other analysis, based on the home inspections, is reported from a sample of 40.

3.4 Results

3.4.1 Participant information

The age of participants ranged from 20 years to 65 years, (mean = 37.5 years, SD = 12.9 years) and the sample comprised 26 males and 27 females. The composition of the households studied is shown in Table 3.2. All participants were recruited on the basis of being the first occupiers of the property.
Table 3.2. Composition of households interviewed

<table>
<thead>
<tr>
<th>Composition of households</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lives alone</td>
<td>9</td>
</tr>
<tr>
<td>Single parent living with children</td>
<td>2</td>
</tr>
<tr>
<td>Living with spouse/partner (no children)</td>
<td>15</td>
</tr>
<tr>
<td>Living with spouse/partner (with children)</td>
<td>10</td>
</tr>
<tr>
<td>Multi occupancy dwelling</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

The mean length of occupation of the properties in this study was 12.5 months (SD = 8.6). Within the sample, 35 of the properties were owned by the occupiers, 3 were rented properties and 2 were multi-occupancy houses. No other occupancy status was reported. The composition of properties covered a broad range of housing types which are detailed in Table 3.3. This range of property types together with the varying status of occupiers ensured that the study captured the experiences of both owners and tenants within a variety of dwelling types. The sample drew properties from 11 different house builders/developers and whilst not all developers within the UK were represented, the composition of house types studies reflects current trends in building styles within the UK (DCLG, 2007e).

Table 3.3. Property type

<table>
<thead>
<tr>
<th>Property type</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached (Separate houses)</td>
<td>4</td>
</tr>
<tr>
<td>Semi-detached (adjoined by one wall)</td>
<td>3</td>
</tr>
<tr>
<td>Terraced (adjoined by two walls)</td>
<td>5</td>
</tr>
<tr>
<td>Town-house (three storeys)</td>
<td>20</td>
</tr>
<tr>
<td>Apartment/flat (one floor only)</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>
3.4.2 Environment – behaviour Interactions

Participants reported a number of specific interactions with a number of design features and systems within their home. In some instances, these interactions had led to unsafe behaviour on the part of the occupant.

External area - sloped access to property

Table 3.4. Summary of findings in relation to sloped access to property

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sloped access to property</td>
<td>Slippery during wet and icy weather</td>
<td>Surface finish and weather</td>
<td>Slips, trips and falls</td>
</tr>
</tbody>
</table>

‘Sloped yeah, very dangerous with the ice last week”

A number of the properties visited during the course of this research had been constructed with sloped paths permitting non-ambulant access to the property. This is in line with current building regulations (England and Wales) which require the surface of such approaches to be ‘firm enough to support the weight of the user and his or her wheelchair and smooth enough to permit easy manoeuvre’ (ODPM, 2004b, p 64). One example of a sloped threshold is shown in Appendix G. Participants from two properties described these slopes as becoming difficult to use during wet and icy conditions. A 33-year-old male participant stated:

‘There are aspects I would argue that I am not particularly happy about, the one that comes to mind is the disabled access to the house, obviously it comes off the road, slopes downwards and goes in, it makes a ski ramp when there is frosty conditions’
And another 33-year-old male made a similar comment:

'Sloped yeah, very dangerous with the ice last week'

External area – parking provision

Table 3.5. Summary of findings in relation to parking provision

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking Provision</td>
<td>Difficulties carrying items from vehicle, difficulties during maintenance</td>
<td>Parking area located some distance from the property</td>
<td>Increased risk of musculoskeletal injuries and/or falls</td>
</tr>
<tr>
<td></td>
<td>'It is a big issue, I didn't realise how much of a big issue until we moved in, carrying the groceries for instance, I mean that's, and you can't get the car anywhere near to clean it'.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A number of participants also reported that instead of having a garage attached to their property, they were allocated either a garage within a block of garages or a parking space within the communal parking area, and these were located some distance away from their property. A number of problems were reported as a result of this, including difficulties in carrying groceries from the parking area to the property, increasing the risk of back pain and/or falls, insufficient parking for residents and visitors, and remote access to the vehicle for maintenance.
A 50-year-old male, reliant on a wheelchair for mobility commented on the lack of parking facilities:

'We've got one parking space per seventy four apartments and no visitor parking spaces'.

This also caused difficulties for a retired participant, whose experience is presented in the small case study, Case Study 3.1.

**Case Study**

A 60-year-old female described the difficulties she experienced in carrying groceries from the car to the dwelling:

'...with only one parking space and it's right round the corner where we can't get to it, so you have to carry all your shopping [...] It is a big issue, I didn't realise how much of a big issue until we moved in, carrying the groceries for instance, I mean that's, and you can't get the car anywhere near to clean it'

Case Study 3.1. Case study describing difficulties experienced with parking
**External area – insufficient light**

### Table 3.6. Summary of findings in relation to insufficient light

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient light</td>
<td>Difficulty negotiating external areas, concern for personal safety</td>
<td>No provision for light within external area</td>
<td>Slips, trips and falls, personal safety</td>
</tr>
<tr>
<td></td>
<td>'It makes me worry about anybody who is lurking about that I might be attacked. It makes me worry that I can't see where I am stepping and I am going to fall over something, it's really bad'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A number of concerns were highlighted in relation to the provision of light outside of some properties. One 33-year-old male described the problems he encountered because the alleyway he used was not lit:

> 'The alleyway which runs down to the garage, well that is ten steps which go down to the garage but they don't go down in a consistent pattern, they are an irregular step, the heights are correct, but the distance between one step and the next differ as you go down. The fencing is quite high, you've got about seven foot of fencing each side [...] it could be at a push a meter wide and there's no lighting, so I put a motion sensor light, but you have to go down a couple of steps before that goes on. At night it's very dark down there and you can't see the steps'

A retired female described the parking area being dark:

> 'It's unlit that car park, there isn't a light, it's so dangerous. You can't see your car can you?''
She went on to describe her concern for her safety:

'It makes me worry about anybody who is lurking about that I might be attacked. It makes me worry that I can’t see where I am stepping and I am going to fall over something, it’s really bad'

External area – garage/car port

Table 3.7. Summary of findings in relation to garage/car port

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garage / Car Port</td>
<td>Difficulty parking vehicle. Difficulty exiting vehicle. No electricity within garage. 'The garage is only eight foot wide, again they are substandard, they say an integral, but you drive a vehicle in there and try and get out the doors'</td>
<td>Garage and car port too narrow. Electricity supply not installed by builders</td>
<td>Awkward postures, musculoskeletal injuries. Occupier modification</td>
</tr>
</tbody>
</table>

In some cases, participants reported that the garage that was supplied with their property was inadequate in size. One situation was described whereby because of the narrow width of the garage, once the vehicle was parked inside, it was difficult to exit the vehicle. One participant, a 60-year-old married male described this problem:

'...because the garage is only eight foot wide, again they are substandard, they say an integral, but you drive a vehicle in there and try and get out the doors!'

This type of problem could lead to an increased risk of back pain as a result of participants adopting awkward postures due to a lack of space.
A 40-year-old married female explained a similar problem:

'There is some storage out there as well because my car won't fit in. It won't fit in because it's wide, I've only got a Peugeot 206, but by the time I drive in, you sort of, it really is narrow. My husbands car won't go in and my son's car won't go in. So no, it's just used as a storage area'

In addition to the garage, one participant reported a similar problem with the car port which was located on the driveway of his property. He explained how he and his immediate neighbour could not park adjacent to each other on their driveways underneath the car port:

'When you drive onto your drive you cannot open the doors, we cannot park two abreast, so they've not gone wide enough'

Participants also reported difficulties due to there being no electrical supply within the garage. No legislation exists within the UK requiring the provision of electricity within a garage. Whether there was an electrical supply within the garage varied across the sample with the house type and it also varied between the construction companies. Some homes were provided with this as a standard feature by the builder, whilst others were not. Where no power was supplied to the garage, this led to a number of problems and in some cases led to unsafe behaviour by the occupant. A 25-year-old male described how his house-mate undertook some essential car repairs:

'[my house-mate] crunched his car and had to do a bit of bodywork and because it was weather like this, he wanted to keep it out the rain, but he had to do it all during the day with torches things like that and he couldn't use any power tools cause he had to do everything by hand cause he had no power'

A further participant, aged 33 years, explained that he was informed his garage would have no power because it was not adjacent to his property:
'No unfortunately that was another thing we were told it would have power and we were then told oh no it can't have power because you’ve got next doors house between yours. We’ve got a temporary light that runs off a portable battery'

This problem had also led to occupier modification, whereby an electricity supply had been fitted to a remote garage (located to the rear of the property) either by the participant themselves, or by a professional, employed by the occupier. Case study 3.2 presents one such account whereby the occupier had installed the supply of electricity himself.

**Case Study**

A 20-year-old male described his solution to the problem of not having electricity in his garage. He described putting in an electricity cable himself from his property to his garage but he was concerned that he had not buried it deep enough for it to be safe:

‘...I went under the path at the front which is shared between us and our neighbours, our cable does actually go up the drive of our neighbours next door but one, but I know them and they said it was fine to did a trench and put it in, but had [the company] done it when they built that house they could have put it under the ground deep enough for it not to be an issue’

**Case Study 3.2. Case study describing occupier modifications**

A further participant, a 51-year-old female described how she was intending to undertake a similar task to ensure she had access to electricity within her garage:
'I have no electricity in my garage, because it is detached. The regulations say I can't have wiring for me running through my neighbours property because if there was a problem with my electrics in my garage, they might have to have access to my neighbours house to sort the problem out. I shall do it, I shall run down the garden, down the back pathway and into my garage'

Internal area – fire doors

Table 3.8. Summary of findings in relation to fire doors

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'We picked up on why there were chains on all the doors...so we moved in and took them all off [the closers]'</td>
<td>'Otherwise they would slam shut all the time, also it's irritating when you are moving through the house carrying things etc'</td>
<td>Risk of injury from tampering with spring loaded self closure mechanism</td>
</tr>
<tr>
<td></td>
<td>'We've taken three closers off and we've got two wedges, so we wedge open the other two'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Among the 40 properties visited, 26 were fitted with self-closing fire doors in line with current Building Regulations (England & Wales). These regulations stipulate that within dwellings with a floor higher than 4.5m above ground level, the upper storeys (those above ground level) should be served by a protected stairway leading to at least two escape routes at ground level, each delivering to final exits and separated from each other by fire resistant construction and self-closing fire doors (ODPM, 2004a). In dwellings classed as flats, where all habitable rooms have direct access to an entrance hall, they should have a protected entrance hall (ODPM, 2004a). All of the town houses (n = 20) and 6 of the flats fell under these requirements. The remaining 14
properties were exempt from the requirement for fire doors.

In the 26 properties with internal fire doors, the doors were located at the entrances to habitable rooms in line with legislative requirements, but in some, additional fire doors were found to be installed on bathrooms and also airing cupboards. The provision of these going beyond what is required by legislation. In all of the properties with fire doors the owners/occupiers had interfered with the mechanism of the doors in some way. Participants reported interfering with the self-closing mechanism itself in 9 of the properties and for 25 of the properties, fire doors were wedged open in some way preventing them from closing. Case study 3.3 provides an example of participants’ comments regarding the fire doors fitted within their home.

**Case Study**

A 40-year-old female living in a three storey town house together with her husband and grown up son described how she kept some of her fire doors open and why she engaged in such behaviour.

‘...I tend to keep that one open because I don’t like to be closed into a kitchen, you just feel totally closed in, I keep that one open because they’ve got wedges underneath them because that just brings the light through, erm, the lounge one is always propped open and then the bedroom one’s, we usually keep the bedroom one shut anyway, so the bedroom door is shut. But they do slam, even if you are holding the door, they are very noisy, they are the noisiest doors I’ve had in a house, somebody gets up early in the morning and everybody’s awake’

Case Study 3.3. Case study highlighting occupier interference with fire doors

95
As previously stated, within 9 properties the self-closing mechanism on some fire doors had been disabled by the occupiers. Figure 3.1 shows an example whereby the self-closing mechanism on the door had been immobilised. Other examples are shown in Appendix F.

![Immobilised self-closing mechanism on fire door](image)

**Figure 3.1. Immobilised self-closing mechanism on fire door**

Although these were not irreversible interferences, in that the wedges could have been removed and the self-closers replaced, and not illegal in anyway, the act of disabling the doors resulted in reduced fire protection for all occupants within each dwelling. The process of disabling the self-closing mechanism itself also presented a risk of injury. Of these 26 properties, 22 were owner occupier properties, 2 were rented flats and the remaining two properties, both town houses, were multi-occupancy dwellings (each bedroom being rented to a separate individual). Although participants reported interfering with their fire doors, some explained that they felt that they were a good idea and they did appreciate the health and safety reasons behind the installation of fire doors within dwellings.
A 25-year-old male living in shared accommodation said:

'I think obviously they are a good idea...[but] I'm sure there's another way of doing it'

A 35-year-old married female commented:

'I understand the health and safety behind it but it drives me, it worries me, they really go [close] with a bang'

A 51-year-old female homeowner said:

'I understand why they are there, they are there for safety but they are a blooming nuisance'

Some participants explained why they disabled their fire doors, these explanations included inadequate internal lighting when the doors are shut, noise due to the doors slamming and the prevention of finger-trapping injuries. A full breakdown of these reasons is given in Figure 3.2. Where the reason is unspecified, the participants did not provide an explanation for interfering with the fire doors.
Accidents involving the interaction with internal fire doors were reported by 3 participants, two of which involved young children. In all cases, the injuries were caused by trapping the hand or fingers in the door. A 32-year-old male described one such incident:

'The kids were running in and she was the little one [...] she was about two or three [...] and so they were running away from her, opened the door and it just closed on her hand'
Internal area – excessive hot water temperatures

Table 3.9. Summary of findings in relation to excessive hot water temperatures

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot water system</td>
<td>Burns and scalds from high water temperatures</td>
<td>No thermostat fitted. Mixer taps fitted that don’t mix the water</td>
<td>Burns and scalds</td>
</tr>
<tr>
<td></td>
<td>&quot;I think it’s too hot still so I got them to come out and check it with their thermometer and they said it is right, it is very very hot water&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An accessible water thermostat, allowing the occupiers to adjust the temperature of their hot water was fitted in 21 of the properties within this study. No adjustable water thermostat was fitted in 14 homes and participants from 5 properties reported that they were either unsure or did not know if a water thermostat was fitted. In 5 of the properties with an adjustable water thermostat, the temperature setting had been altered by the occupiers, and in all these cases the temperature had been turned down.

Excessive hot water temperatures, sufficiently hot to reportedly cause scalding were described by 6 participants. Of these, 4 had a water thermostat fitted, although only two had made adjustments to this. In the remaining 2 properties where excessive water temperatures had been reported, no thermostat was fitted. In both of these homes, scalds were reported due to the temperature of the hot water. No physical check was made of the actual water temperature within these homes during the course of this study however. One mother of three described how she thought the water temperature was too high and highlighted a concern for her youngest child:
"We have tried to tell them that the water is too hot, even I can bum myself, what about the little one"

Safe limits on the delivery of hot water within dwellings are not currently contained within building regulations (England & Wales) or elsewhere within the UK. However a recent move to bring thermostatically controlled mixing valves within the scope of building control has been announced in an attempt to reduce the incidence of accidental burns and scalds (DCLG, 2004). Mixer valves, whereby hot and cold water are mixed at the point of use, had been fitted into some bathrooms but the design of these mixer valves was not always such as to prevent the problem of scalding. A 21-year-old female described the problem with her mixer taps, whereby the water was not sufficiently mixed to prevent scalding:

"Even when you have hot and cold on at the same time it still comes out in columns, and if you put your hand under, ironic as it sounds you can still actually scald yourself, even though the cold water's there"

Internal area - electricity cables/ water pipes

Table 3.10. Summary of findings in relation to electricity cables / water pipes

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity cables and water pipes</td>
<td>Drilling through walls without considering the location of pipes or cables</td>
<td>Insufficient knowledge of location of services</td>
<td>Electrical shock. Inadequate occupier repair</td>
</tr>
<tr>
<td></td>
<td>'I've knocked a nail into the wall and crossed fingers nothing's happened'</td>
<td>'No idea...so no, no idea where they were. It's just straight in'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>'I'd just take a guess and hope for the best'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

100
In all the properties visited, the internal service cabling and piping were located behind plasterboard within the walls. Occupiers reported that they had experienced problems whilst undertaking certain tasks within the home and were concerned about drilling though a pipe or cable. Of those interviewed, 27% (n = 10) reported that they did not consider or seek to locate the routes of these services before drilling into the wall. Risks typically arose when hanging pictures, curtain rails or putting up shelving. One 26-year-old homeowner said:

'We were incredibly dangerous doing it and we didn’t check for wires or pipes or anything'

A number of occupiers (40%, n=15) stated that they were unaware of these services but did consider where they might be when drilling. These households did not use a services detector tool but reported that they were careful not to drill into walls near electrical sockets or in the vicinity of radiators. One male participant aged 22 years described a situation where he was erecting a wall mounted ornament:

'Mum was scared when I was drilling it in case the wires ran down and me and my dad spoke over the phone whether or not I should move it a bit, we were unsure but we just took the risk in the end'

A 33-year-old male reported a similar concern whilst fixing a coat hook:

'The fuse board is in the lobby so, and I put a coat hook just underneath it, and I was a bit worried about that […] so I’m trying to work out, is there, everything is going to be going up, is anything going to be going down?'

Only 21% (n = 8) of the households had purchased a services detector tool. Of these, 2 of the tools located electricity cables only and in one instance, because of this, a water pipe had been damaged as a result of drilling. A
40-year-old female described how a contactor drilled through a pipe:

'Well that was the problem you see, because they are plastic pipes he had actually brought one of these metal detector things with him, and I said that will be no use because they are plastic pipes. So he said he would probably feel something, but he didn’t, it just went straight through'

Only 2 of the households recalled being given a services map by the house builder outlining the location of electricity cables. However, a corresponding map for the water pipes was not provided. In the remaining properties (n = 2), occupiers reported having knowledge of the location of these services because they had visited the property whilst it was being built and had taken photographs of the piping and cabling before the walls had been plastered.

Internal area - Service Points

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of services within the home</td>
<td>Inconvenient placement of service points</td>
<td>Location of service points within the home</td>
<td>Occupier modification</td>
</tr>
<tr>
<td></td>
<td>'I think the phone sockets are in silly places'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'The TV socket is behind there, you’ve got no option, it was the worst possible place because the sun comes in and you can’t see it for about three hours a day'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Participants reported a number of difficulties in relation to the placement of particular services within the home. The positioning of internal telephone points, television aerial points and electricity sockets were all commented on.
The fixed location of television points within the home was described as providing a lack of flexibility in the potential layout of the room. One 34-year-old female described this problem:

'So you've got to put stuff in certain places, so the TV socket is behind there, you've got no option, it was the worst possible place because the sun comes in and you can't see it for about three hours a day'

A further participant described the problem he had encountered with the placement of light switches within his home:

'This does irritate me slightly, there's a light here which is a two way light, there's a switch down the bottom of the stairs and one at the top. So when you want to go to bed, you want to turn the other light on, if I want to do that without killing myself, you've got to walk along to the end of the landing, turn that landing light on, walk back here and turn that one off and then walk back again. It really wants another light at the bottom of this set of stairs'

A 35-year-old female complained about the positioning of the telephone point:

'Yes, well the phone line was in a hideous place in the first place, it was in the hall, which is completely useless'

The placement of the electricity sockets for white goods within the kitchen or utility room was also an area of concern. In a number of properties these sockets were located behind the item itself underneath the work surface. The consequence of this being that the width of the worktop did not account for the additional width of the plug and various white goods were left protruding. This situation led to the occupier rectifying the situation themselves and was described by a 52-year-old male:
'Fitting the dishwasher and washing machine was a problem because of the plug, was plugged at the back, so it wouldn't push up against it, so we had to have it moved to there, otherwise it stuck out' 

This was not a problem that was related to a particular building company, a further participant; a retired male had faced a similar problem within his home:

'The builder very carefully had put power points below the units for all these washing machines but for a stand unit with a power point you couldn't push it back far enough. It's just the thickness of a plug, pretty stupid but they should think about it'

Internal area - allocation of space

Table 3.12. Summary of findings in relation to the allocation of space

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation of space within the home</td>
<td>Poor allocation of space leading to insufficient storage</td>
<td>Design of the home</td>
<td>Clutter within the home leading to slips, trips and falls. Occupier modification</td>
</tr>
</tbody>
</table>

A lack of provided storage within their homes or uneven storage within the home was commented on by a number of participants. This had led to problems in storing everyday items such as ironing boards and vacuum
cleaners. A 21-year-old male living in a shared house explained this:

'I don't know where the hoover is at the moment, probably just in a room somewhere, but really there is not enough room for them to be stored downstairs properly'

He also described how he felt the storage within the property was not entirely sensible:

'Storage is quite uneven, there's no storage down here at all except maybe the little alcove in the downstairs toilet, then on the top floor there a huge wardrobe'

A 33-year-old married female described the consequences of having little storage:

'There's very little storage, therefore you are leaving things lying around'

And a 45-year-old mother of three reported that she had to iron on the floor because of a lack of space to store her ironing board:

'I've got one of those silver things [heat absorbing thermal mat], I iron on the floor'

Other unsafe consequences of a lack of storage were also described, including one example whereby the route through to the fire egress window had been blocked by clutter. A 33-year-old male said:

'You can't actually get to the windows, there is clutter in front of the windows'

The lack of storage also led to a number of other problems, one 33-year-old male described how he had to hire tools because he had nowhere to store
these items:

'I have to hire a lawn mover from Handy Hire or Terra Truck and do it once a month'

Due to a lack of storage within the property, participants reported using the garage as additional storage area. Not all properties were built with a garage, but of the 24 which had a garage, occupiers in 15 homes utilised the garage for additional storage. Participants had also made changes within the property to create more storage. The case study (Case Study 3.4) provides an example whereby one participant had created additional storage:

**Case Study**

A 29-year-old female described how she had created additional storage within her home:

'We have added storage, we have added a set of wardrobes in the main bedroom for us and also a set of wardrobes in the spare room as storage, that is their sole purpose, so we have added storage, but we knew we were going to need it'

Case study 3.4. Case study describing occupier modification to create additional storage
Internal area - sound insulation

Table 3.13. Summary of findings in relation to sound insulation

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound insulation</td>
<td>Poor sound insulation leading to a lack of privacy</td>
<td>Design of the home</td>
<td>Occupier modification</td>
</tr>
<tr>
<td></td>
<td>'Some sounds travel through the house, like if you are in the kitchen stirring a cup of coffee you can hear it on the third floor'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Despite there being a number of regulations in place relating to sound insulation within dwellings, a number of participants commented on the fact that the sound insulation within the properties was poor. This became an issue in one house in relation to the use of the downstairs toilet. This was situated close to the main lounge within the house. A 35-year-old female explained:

'It's not the most private thing in the world, because people use that toilet and if you are sitting here you can hear everything, everything that is'

A further participant, a 29-year-old male, described a similar situation:

'You shouldn't be able to sit in your living room, which is a key room in the house, you've got friends round, anybody round, and somebody wants to use the loo or go and have a shower, and everybody can hear. It may be a British thing, but you don't want to go to the loo and have everybody hear, it's private'

In one instance the downstairs toilet had been removed from the property by the occupiers. A 43-year-old mother of three described what she had done:
‘There was a wall here and basically there was another door here and this was like a hallway and that was a downstairs loo, I think it’s planning regulations or building regulations that you have to have a downstairs loo, that is now my cloakroom’

She went on to say that this change was made because of a lack of storage space within the property and also because of a lack of privacy involving the location of the toilet:

‘I didn’t want a downstairs toilet being so close to the kitchen; you can hear too much when they go’

Internal area – layout

Table 3.14. Summary of findings in relation to the layout of properties

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout of home</td>
<td>Uncoordinated design leading to the obstruction of service points and other items. Inaccessible features</td>
<td>Design of the home</td>
<td>Slips, trips and falls. Occupier modification</td>
</tr>
<tr>
<td></td>
<td>‘Because the shower door opens about that much and then bangs onto the sink’</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A number of problems were described in relation to uncoordinated design within the internal layout of properties. These included the obstruction of service points with fitted furniture, ceiling-based light flexes obstructing the movement of internal doors and some features preventing the correct use of other features. For example, one 60-year-old female described how she could not open her dishwasher fully because of the location of the oven door.
handle:

'The dishwasher will only come down about that far before it fouls the oven door handle.'

A 33-year-old married male described a similar problem within his bathroom: (Figure 3.3)

'Because the shower door opens about that much and then bangs onto the sink.'

Figure 3.3. Example of poorly coordinated design

One 60-year-old male described how his bedroom electric sockets were obscured by fitted furniture which had been fitted by the builder:

'Electrical points, they were all behind cupboards and drawers [...] That took a lot of time to deal with, if you know you are going to put a load of bedroom furniture in, then generally you try and put the points where they are going to be accessible.'

A 40-year-old female explained how her ceiling lights caught on the nearby door whenever it was opened:
‘The entrance vestibule light and the hall light, the plastic wire was too low and it banged on the door when you opened it’

She went on to say that she did complain to the house builder regarding this problem, but that no action was taken. This led her to modify the situation herself:

‘Some things I complained about which they didn’t do [...] but they refused to do that. Well I couldn’t be bothered with the hassle of making them do it, so I did it myself’

One participant reported difficulties in accessing a window that was located above the stairs. This window is shown in Figure 3.4

![Figure 3.4. Inaccessible window on staircase](image)

The position of this particular window made it difficult to access for cleaning and maintenance and the participant described unsafe behaviour as a consequence of this. Case study 3.5 provides an insight into the problems this participant and his partner encountered.
Case Study

A 26-year-old male described how he and his partner had difficulties dressing an upstairs window within their home.

‘...that we had to put the curtains up ourselves, this curtain above the stairs, the window above the stairs, sorry, it's a, what do you call it, it's an arch window. It was an absolute nightmare trying to do anything with it [...] You can't put a ladder on sideways, it would be nice if they had done that for us, or done something with it for us, you know, we've, it's supposed to be a nice design feature. We had to prop a ladder up, and it's one of these stair ladders that you can stick on stairs, but because it [the stairs] curves at the bottom, you couldn't in that position

Case study 3.5. Case study highlighting the difficulties caused by an inaccessible window

When asked why they engaged in such behaviour the participant replied that he felt the job needed to be done:

‘Well I knew it was dangerous, but we needed to get it done’
Internal area - descending newel posts

Table 3.15. Summary of findings in relation to descending newel posts

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descending newel posts</td>
<td>Stair newel post descends into living space</td>
<td>Design of the home</td>
<td>Head injury, Occupier modification</td>
</tr>
</tbody>
</table>

"If you lean underneath to get to the phone and you forget it's there you come back and nearly knock yourself out. My dad nearly did knock himself out, he was on the floor. That's really well dangerous, really dangerous, we said to them and they said 'well that's how it comes'"

In 2 of the 40 properties, the occupiers identified stair newel posts as dangerous features within their homes (newel posts are located at the top and bottom of a stair case and positioned at stair turns for structural support). These presented the risk of head injury as the result of impact. Building Regulations (England & Wales) state that a clearance of 2 meters is adequate on the access between two levels (ODPM, 2003b). A 22-year-old male described how he had caught his head on the newel post within his home:

"If you lean underneath to get to the phone and you forget it’s there you come back and nearly knock yourself out. My dad nearly did knock himself out, he was on the floor. That’s really well dangerous, really dangerous, we said to them and they said ‘well that’s how it comes’"

The heights of the newel posts identified in this study were not measured, but
examples of the two where the occupiers reported concerns are shown in Figures 3.5 and 3.6.

Figure 3.5. Example of newel post descending into living area

A further male participant also reported problems with this feature:

'I whack my head on there. I think that's bad design, because it's quite sharp'

Figure 3.6. Descending newel post on staircase
Internal area – sloped ceilings

Table 3.16. Summary of findings in relation to sloped ceilings

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sloped internal ceilings</td>
<td>Sloped internal ceilings providing insufficient head clearance</td>
<td>Design of the home</td>
<td>Head injury</td>
</tr>
</tbody>
</table>

'It is more of an annoyance to me, the roof above the stairs, it's not low, you wouldn't have a problem, but I've banged my head on it twice.'

Another feature which presented an increased risk of impact or head injury was sloped internal ceilings. These were located above the stairs and also within bathrooms on the top floor of the three storey properties. No regulatory advice is provided within the UK regarding the minimum height of ceilings within domestic buildings, and whilst a number of occupiers reported no problems with sloped ceilings within their homes, in 3 properties visited, occupiers complained of having struck their head due to these low ceilings. (See figure 3.7).
Figure 3.7. Example of sloped internal ceiling

One 32-year-old married female described the problem faced by her husband in the en-suite toilet:

‘And he nags [bangs] his head when he has a wee because we have a sloping [ceiling]’

A 60-year-old male described how the location of an internal door contributed to the problem:

‘You are actually too close to the cupboard under the stairs and you are forever clouting your head’
Internal area – loft space

Table 3.17. Summary of findings in relation to loft space

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loft access hatch</td>
<td>Use of inadequate ladders and step ladders to access the loft. Use of furniture and banister rail to gain entry. Position of loft access hatch.</td>
<td>Design of the home. No loft ladder fitted as standard</td>
<td>Slips and falls</td>
</tr>
<tr>
<td></td>
<td>'I have clambered up there using stools and using B [wife] to stand on, it’s quite bad'</td>
<td>'We had just moved in and wanted to get things up there'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>'If you weren't too steady and were worried about it and you fell off you would probably fall to the ground floor'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Of the 40 properties visited, 32 had been constructed to include a loft (roof void accessible via a hatch). In 24 of these properties, the occupiers reported having accessed that area. In the majority of properties where a loft space was constructed, the occupiers reported using this space for additional storage (n = 20). In 8 of the properties with a loft, boards had been laid by the occupiers themselves within the area to facilitate access and storage. Three of those interviewed were aware that modern construction methods do not support loading within the loft space. A 60-year-old male explained:

'We have got some stuff in the roof, it’s not strictly meant for storage of course. They are not actually designed to carry huge weights'
A 55-year-old female said:

'They [the builders] would board the loft for you as an extra but they don’t recommend you store the stuff in the loft'

A purpose built extending loft ladder had been fitted by the occupiers in 5 of these properties subsequent to occupation. In one instance, the occupier had removed members of the roof construction for access to the loft space above his garage.

A loft access ladder had not been provided as standard by any of the house builders involved in this study. In the remaining properties access to the loft was described as being achieved by various means including the use of general-purpose ladders, stools, chairs, furniture and other fixtures. Of those that had accessed their loft (n=24), 8 reported no problems in using such items to gain access, but for some (n=12) this was a cause for concern. Case study 3.6 gives an example of one participant recounting how they gained access to the loft.

**Case Study**

One 33-year-old male participant described how he gained access to the loft:

‘...Dangerously, there’s a railing, the top of the railings of the stairs and I get a chair, step onto the chair and put one foot onto the railing and use brut strength to pull myself up and the girlfriend putting her hand underneath my foot to give me a lift up’

Case Study 3.6. Case study describing occupier action in accessing the loft
One other male participant, aged 34, explained that he had recently purchased a fitted loft ladder, but prior to this, he had used another method to gain access to his loft:

'For eighteen months it was a rickety old wooden step ladder so it was pretty dangerous, and I had to stand right on the top of the handles to climb in'

One 26-year-old described how he used his wife to stand on:

'That's definitely a major hazard because I've clambered up there using stools and using [my wife] to stand on, it's quite bad'

Participants did report that they were able to choose extra items to be included in their property over and above what was provided as standard by the builder. Some participants' reported that they were offered a fitted loft ladder but the excessive cost of this item was a barrier to its installation. A 29-year-old female reported:

'They did offer a loft ladder, but it was about two hundred quid, but you can buy one at Wicks for thirty quid!'

Within the UK, the location of the loft access hatch is typically positioned in the ceiling on the top landing of the property (Figure 3.8 and Appendix G). Whilst participants were not directly asked about the location of their loft access, some participants spontaneously commented on this. A 34-year-old male occupant described his concerns:

'The only problem would be its quite, if you weren't too steady and were worried about it and you fell off you would probably fall to the ground floor'
One 26-year-old described how he had fallen whilst climbing into the loft and how he almost fell down the stairs:

'So I could have fallen down the stairs quite easily. It's right next to the stairs. It fell that way fortunately, if it hadn't, I would have gone over the stairs'

![Figure 3.8. Position of loft access hatch above the stairs](Photograph taken from the stairs)

A few of the participants reported that they would have liked an electricity supply within the loft space in their home. A number of reasons were provided for this including the need to run a booster for the television aerial and also to permit the installation of a light. A 35-year-old male commented upon the need for a source of power:

'We were going to need a booster and we needed a power point up there'

And a further participant described how he carried a light into the loft during each visit:

'Now every time we go up we just run a light up on an extension cord'

Participants reported that although the service cabling for a television aerial was in place within the property when they moved in, no actual aerial had
been installed in the loft by the house builders. A 26-year-old male described this situation:

'The points are there, and the cabling is in the attic, but there's no aerial'

Another participant described how he faced difficulties whilst installing his own television aerial:

'All the rooms have got television points already fitted in, great idea, so up in the roof there is six cables twisted together, well where do they go, into the six rooms, which room is which?'

**Internal area – egress windows**

**Table 3.18. Summary of findings in relation to egress windows**

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egress windows</td>
<td>Restricted egress from property. Concern regarding falls.</td>
<td>Design of the home</td>
<td>Restricted egress. Falls</td>
</tr>
</tbody>
</table>

Some participants reported that they had restricted emergency egress from their properties and this had led to a concern in case of emergency. This was highlighted by a 51-year-old female occupant:
'Some of the windows don't open wide enough to allow a person to get out so if there is a fire you can't get out'

A window provided for emergency egress purposes should have an unobstructed openable area that is at least $0.33m^2$ and at least 450mm high and 450mm wide (ODPM 2004a). Where these were installed within a number of the properties, some participants commented that they were a cause for concern, particularly for children in relation to falls. Examples of these windows are shown in Appendix G. An emergency egress window was fitted on the first floor in 18 of the properties visited. In the remaining properties, the occupiers stated that they were not aware of having a designated fire window. In 13 of these, the window was not fitted with a window lock. In 8 of the properties the opening of the window could be limited by a specific window restrictor bar, which could be over ridden in an emergency. In 6 of the properties the windows could not be locked or restricted in any way. This led to a concern for the safety of children. A 40-year-old female explained:

'I say the windows, if I had small children, my youngest is twenty but if I had young children, then the windows would be locked'

A 24-year-old mother of one described her concern for her young child:

'I'm just concerned obviously that they do open that wide and if, you know, kids are going to mess with things aren't they and that did concern me'

In addition to this, one occupier of an apartment complained that security bars were fitted on his windows and because these were fixed they prevented his safe egress. He described them during interview:
'So if I wanted to get out I would struggle because these here, you can see here they've got those things there, so how the hell I get out is not anyone's guess'

The security fittings had been fitted to each window within the property and were soldered into position to prevent movement, 'that's soldered, that doesn't move'. They were physically checked by the researcher during the home inspection and no method of releasing them in the event of an emergency was found.

**Internal area – lighting**

**Table 3.19. Summary of findings in relation to lighting**

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal lighting</td>
<td>Insufficient internal lighting</td>
<td>Design of the home</td>
<td>Slips, trips and falls</td>
</tr>
<tr>
<td></td>
<td>'It wasn't light enough and wherever I stood in the kitchen, I was working in my own shadow and it drove me to distraction'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The positioning of some lighting within the properties was also problematic for occupants and this had led to unsafe behaviour. For example, one landing light was placed in the ceiling above the stairs and away from the banister. To access the light for cleaning or to change the bulb, the participant described leaning over the banister:

'You'll see where the lights are, they are actually overhanging, so I had to lean over the banister to do it'

A number of changes were made to the properties because of a lack of
installed lighting. One 51-year-old female described how she had changed her low wattage kitchen light for a halogen one:

'Wherever I stood in the kitchen I was working in my own shadow and it drove me to distraction, so I put in one of these long halogen [...] I did it myself'

A 29-year-old male also added extra light in the kitchen due to it being dark:

'We've added some lights in the kitchen, sort of just because this particular house, poor design feature, the lighting in the, you could do with under cabinet lighting, so we've added a little bit of that'

A 25-year-old male living in shared accommodation explained about the lack of light at the top of the stairs.

'It did concern me slightly, [...] once you get to the top of the stairs it's dark, it's dingy, it doesn't seem like a nice place to be. It is actually a concern'

A 40 year old female described her flat as being dark:

'One of the things I don't like about this flat is it is very very dark'
### Internal area – unsafe behaviour

**Table 3.20. Summary of findings in relation to unsafe behaviour**

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall air vents</td>
<td>Obstruction of air flow</td>
<td>Design of the home</td>
<td>Build up of noxious fumes within the home</td>
</tr>
<tr>
<td>Inaccessible window</td>
<td>Climbing to open / close window</td>
<td>Design of the home</td>
<td>Slips and falls</td>
</tr>
<tr>
<td>Accessing high shelving</td>
<td>Risk taking behaviour</td>
<td>Design of the home</td>
<td>Slips and falls</td>
</tr>
<tr>
<td></td>
<td>'Inside the wardrobe I've got like a three shelf thing to be able to get my balance, I actually stand on the bed like that to put my bedding up on top. I know I am going to crush myself but I do it every week. This thing can't hold my weight and I know it, but I do it'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Egress</td>
<td>No plan for egress in the event of fire</td>
<td>Occupier attitude to fire safety</td>
<td>Injuries in the event of fire</td>
</tr>
<tr>
<td></td>
<td>'Never spoken about it at all'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoke alarms</td>
<td>Lack of maintenance of smoke alarms</td>
<td>Insufficient occupier knowledge</td>
<td>Injuries in the event of fire</td>
</tr>
<tr>
<td></td>
<td>'I've never checked the battery'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other examples of unsafe behaviour were also reported by participants. Some of these behaviours are described below.

In one property, during the home inspection process, one example was found whereby a wall air vent had been blocked by the occupants with silver foil. This had been done to prevent a draught and is shown in Figure 3.9.

![Figure 3.9. Photograph showing blocked wall vent](image)

A 29-year-old female described how she stood on the internal shelves of her wardrobe to gain access to a higher shelf:

'I've got like a three shelf thing, to be able to get my balance, I actually stand on the bed like that to put my bedding up on top. I know I am going to crush myself but I do it every week. This thing can't hold my weight and I know it, but I do it'

One 24-year-old participant reported having to climb up above her sink in order to both open and close the window. This was because the opening for the window was located over the sink in a small recess. The example is illustrated in Figure 3.10.
Despite some recent public information campaigns within the UK on the importance of making a fire plan, an escape plan in the event of fire (ODPM, 2002b), over 70% of the sample questioned (n = 29) had not considered a fire escape plan for themselves or their family:

A 35-year-old female explained that she and her husband had not made a fire plan:

'Never spoken about it at all'

A 29-year-old married male explained:

'It's funny, it's something we've never discussed'

A 60-year-old male described the additional problem of living in a three storey property:

'No, it's a three storey, you'd kill yourself if you got out of there'
Eleven participants described having thought through a fire escape plan. There were no differences in the reported risk perceptions of fire between those who had and those who had not made such a plan. For example, one 58-year-old male who had not considered how he would escape from the property in the event of a fire explained that he thought he was at low risk of being involved in house fire:

‘I don’t consider it probable, no. You’ve got to start a fire first haven’t you?’

A 26-year-old female expressed a similar view:

‘There isn’t much of a risk, but in terms of that, we don’t put things on radiators’

Although eleven participants reported that they had considered how they would exit the property in the event of a fire, they did not express concerns regarding undue risk: For example, one 24-year-old female who had made an escape plan stated:

‘I think it’s very low risk, I know there are concrete floors, the risk comes from other properties, I don’t think there is a significant risk’

And a 33-year-old male who had discussed a fire plan with his partner explained why he felt he was not at a risk of experiencing a house fire:

‘Because it’s the latest building regulations, it’s been constructed to the latest building regulations, the latest safety materials on fire and environmental friendly materials and new procedures in electrics [...] I feel pretty safe’

All of the properties visited were fitted with a mains powered smoke alarm with battery as a secondary power supply. They were located within homes in
accordance with Building Regulations (England & Wales). No physical check was made of these smoke alarms by the researcher. In 8 properties the occupiers were unaware that the alarms had a permanent electricity supply in addition to having a battery (in line with current building regulation requirements). In 13 of the properties, the occupant had experienced false activation of the smoke alarm during food preparation. In 15 of the properties, the occupants had not tested the battery within their smoke alarm since moving into the property and in 8 properties where occupants stated they made regular checks of the smoke alarm, the frequency of these checks varied between 3 months and 12 months. Smoke alarm manufacturers typically indicate that weekly tests are required. A 60-year-old male described how often he tested his smoke alarm battery:

'I probably test them twice, three times a year, something like that'

A 24-year-old female said she had never checked the smoke alarm battery within her property:

'I've never checked the battery'

One participant described herself as 'fire conscious' and had made a fire escape plan with her family. When asked about the smoke alarm within her property she explained that this would be tested 'every year'.
Table 3.21. Summary of findings in relation to the garden

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden</td>
<td>Difficulty accessing garden</td>
<td>No back gate supplied</td>
<td>Occupier modification</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garden</td>
<td>Garden built on a slope</td>
<td>Design of property</td>
<td>Musculoskeletal disorders, occupier modification</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buried service cables in garden</td>
<td>Concern after exposing a live cable</td>
<td>Cable not buried at sufficient depth</td>
<td>Electric shocks, electrocution</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External water tap</td>
<td>Inconvenience due to position of external water tap</td>
<td>Location of external water tap</td>
<td>Occupier modification</td>
</tr>
</tbody>
</table>

'We were fenced in basically, you could not get to the back garden without coming through the house, that would mean taking your lawn mower through the house'

'The garden's still on a slope and that's a pain in the backside erm, mowing and that'

'The cable wasn't buried deep enough, it didn't have any warning over it, they'd obviously used, they had a lot of cable and instead of cutting it they had coiled it all up so what we found at a very shallow depth in the garden was electric cable'

'Yeah, that was stupid, putting a tap on the kitchen front window. I would say that is quite a big bad thing for most people'
A number of participants reported difficulties accessing their garden, either from within the property itself or externally, i.e. from the front of the house. One occupier, a 26-year-old male, described that he could only access his garden from the front via the garage:

'We haven't actually got a back gate; you have to go through the garage to get to the garden'

He went on to comment that he felt this was a good thing in terms of security, but it meant that a contracted window cleaner was not able to gain access to the rear of the property to clean the windows:

'I mean we can't have a window cleaner because of the back access, which is a pain in the back side really'

Another participant, a 33-year-old male, also commented on his frustrations at not having access to his rear garden from the front of the house:

'We were fenced in basically, you could not get to the back garden without coming through the house, that would mean taking your lawn mower through the house for example'

Two participants reported not having any access to the garden from inside the property itself. A 40-year-old female commented:

'So to get into my garden I would have to walk out the front door, go into the car park and then go through the back gate'
And a 60-year-old male said:

'So actually there was no access to the rear decking other than going through the garage. So you had to go out the side door, open the garage door, the back door to the garage and out onto the decking'

Because of the restricted access to the garden, a number of changes to the property had been made by the participants. These had been undertaken at the occupier's expense, post occupancy. A 40-year-old female described how she had asked the builders to create her an exit during the construction of the property but they had refused to make such an alteration and she therefore had to employ builders after taking over the property:

'But they refused to do that for me, they wouldn't do that for me, I had to get a builder to do that for me after I had moved in'

One 35-year-old female participant commented that her garden was built on a slope and that this had caused her problems in relation to maintenance. Despite her attempts at modifying the garden since moving in, the slope remained:

'The garden's still on a slope and that's a pain in the backside erm, mowing and that'

A further participant aged 33 described difficulties in negotiating some stepping stones which had been laid by the builder within his garden:

'And they are slippery when they are wet [...] I've nearly slipped when I have been in my slippers'
This participant described difficulties in negotiating an outdoor feature wearing his indoor footwear. Here a combination of wet stepping stones and insufficient tread on the soles of his slippers led to an increased risk of a slip, trip or fall.

Problems were also reported in relation to external electricity cables buried in the garden. One particular occupier described how a member of his family had inadvertently dug up a buried live cable:

'My Father-in-law was using the rotovator and luckily stopped it in time, but basically the cable, [...] the cable wasn't buried deep enough, it didn't have any warning over it, they'd obviously used, they had a lot of cable and instead of cutting it they had coiled it all up so what we found at a very shallow depth in the garden was electric cable'

Another participant, a 22-year-old male described how he was aware that an external cable was there and felt that it was his responsibility to pass this information on to the next owner in the event of a sale:

'If you dug down very far on this side you would go straight into the armoured cable that takes the power to the garage, if you didn't know it was there [...] I know it's there and I would have to pass on that information to the next owner'

A number of participants commented on the provision of an external water tap for their properties. In 1 of the properties, the occupier had been told by the builders that an external water tap may be fitted, but it would be fitted at the front of the house. The 51-year-old female participant described the situation:

'I can have an outside tap as long as it is at the front of the house, what use is that when I need to water my back garden, absolutely no use whatsoever'

A 29-year-old female participant described a situation whereby her external
water tap had been located at the front of the property. The solution to this was for her partner to change the position of this:

'Because the tap that is provided was under the kitchen window at the front. [...] that was stupid, putting a tap on the kitchen front window. I would say that that is quite a big bad thing for most people. So what [my partner] did when he designed the garden, he actually pulled a pipe through under the ground and set it up in the garden'

The provision of an external water tap was not a standard installation amongst the house builders. A 29-year-old male participant explained that the provision of an 'extra' feature, such as a tap, was expensive:

'We've not got a particularly big garden but we do like gardening, so to me it was quite key that we could get water into the back to do watering and so forth. The house didn't come with any outside tap, if you want an outside tap fitted it, I can't remember the exact price, but it was certainly over one hundred pounds'
### 3.4.3 Inclusive Design

Table 3.22. Summary of findings in relation to wheelchair user

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Behaviour/Concern</th>
<th>Contributory Factors</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude of house builder</strong></td>
<td>Organisation reluctant to make preferred changes</td>
<td>Design of the home</td>
<td>Occupier modification</td>
</tr>
<tr>
<td><strong>Fire Doors</strong></td>
<td>Inability to open fire doors in wheelchair. Removal of self closing mechanism</td>
<td>Design of fire doors</td>
<td>Reduced fire protection</td>
</tr>
<tr>
<td><strong>No sloped exit</strong></td>
<td>No safe rear exit from property</td>
<td>No sloped exit from property provided</td>
<td>Occupier modification</td>
</tr>
<tr>
<td><strong>Inaccessible features</strong></td>
<td>Difficulties accessing features in a wheelchair</td>
<td>Location of features</td>
<td>Inconvenience, occupier modification</td>
</tr>
</tbody>
</table>

- "We asked for changes to be made, they weren't interested"
- "There's no way I could open the doors in a wheelchair, it's just not possible, so I've had to take them off"
- "I've had real problems, I built that ramp out these, I've got another ramp outside as well, but if you saw me going out, you'd have a fit!"
- "It's no good to me because I couldn't reach it anyway"
One participant in this study was a 57-year-old male who was reliant on a wheelchair for mobility. He had purchased a two-bedroom, ground floor apartment where he lived with his ambulant wife and 32-year-old son. At the time of the study, the family had been resident in this property for 9 months. The study identified a number of problems which had arisen due to the physical design and layout of the property, affecting the participant's mobility and functioning within the dwelling. Some of these design features relate to the provisions contained in Schedule 1 of the Building Regulations (England & Wales), whilst others were not the subject of any legislation.

**Attitude of house builder**
The property was purchased by the occupier 'off plan' (prior to construction), and there were a number of changes to the property that the occupier requested from the house builder during construction to assist him with his disability. These changes included alterations in the bathroom in order that a fully accessible bathroom could be fitted. It was reported that the house building company were reluctant to make any changes or deviate from the standard plan, even though the request was made very early on in the process:

"We asked for changes to be made, they weren't interested. They knew they could sell them [the homes] ten times over"

Despite such reluctance, the occupier pushed the company to make a change to the bathroom:

"They agreed to that, we had a lot of arm twisting to do it, they didn’t want to obviously. Why go to any hassle if somebody’s prepared to pay the price as it stands"
Fire Doors
The main entrance door to the accommodation block where the apartment was located was fitted with a self-closing fire door in line with the provisions contained in Approved Document B of the Building Regulations (England & Wales). This fire door caused problems for the participant in gaining entry to the block:

‘You cannot get into this building in a manual wheelchair, I think you would struggle to get out, there is quite a strong swing on it [the door]’

A self-closing fire door was also fitted to the front door of the apartment itself preventing the occupier from gaining easy access to his own property:

‘There was a self-closer, I had to take it off, have you tried opening it with a wheelchair? I wouldn’t be able to get in to start the fire’

Self-closing fire doors were also fitted to all habitable rooms within the dwelling itself and once again they caused problems for the occupier:

‘No, there’s no way I could open the doors in a wheelchair, it’s just not possible, so I’ve had to take them off’

No ramped exit
Although the main entrance to the apartment was accessible, the rear exit of the property had a raised door threshold. The occupier was concerned regarding his own safe exit from the property to his garden:

‘That doesn’t have to be suitable for myself, as long as I can get in that’s all right’

The difficulties he had experienced in exiting to the garden had resulted in the occupier building a DIY ramp to assist him with his exit:
'I've had real problems, I built that ramp out there, I've got another ramp outside as well, but if you saw me going out, you'd have a fit. I didn't like that!' Due to the rear exit of the property having a raised door threshold, the self built ramp was necessary for the occupier to gain entry to his garden. However, when negotiating the ramp, the participant's wheelchair tipped, leaving him at risk of falling forwards from his wheelchair. This is shown in Figure 3.11 with a further view is shown in Appendix G.

![Figure 3.11. Photograph showing wheelchair exit from apartment](image)

Features
There were a number of other features of the property that affected the occupier's daily functioning. These included the fuse box and the spy hole in the front door being at an inaccessible height and the fitted fire blanket being fitted high on the kitchen wall out of the reach of a wheelchair user. The communal letter boxes were positioned in the hallway of the block, with the occupier's own box being too high for him to access from his wheelchair. He also became aware that the disabled parking space provided for the block had been allocated to a first floor apartment, to a fully ambulant occupier. Interestingly, the issue of accessible design was raised by other participants within this study who were themselves fully ambulant. They were aware of
the provision of an accessible toilet on the ground floor of their properties, but commented on the fact that whilst the doorway was wide enough to allow a wheelchair to pass through, in their mind there was insufficient room for a wheelchair user to use the toilet due to the positioning of the sink. One example is shown in Figure 3.12. A 35-year-old female commented:

'There is no way anybody can get a wheelchair in there anyway'.

![Figure 3.12. Inaccessible ground floor toilet](image)

And a 25-year-old single male said:

'It's hardly worth saying it's access for a disabled person'
3.4.4 Sources of occupier knowledge

Table 3.23. Summary of findings in relation to the sources and adequacy of occupier knowledge

<table>
<thead>
<tr>
<th>Source of Information</th>
<th>Occupiers reflections</th>
</tr>
</thead>
<tbody>
<tr>
<td>New home owners pack</td>
<td>'I wasn’t too interested in the detail, because they told us most of it as well'</td>
</tr>
<tr>
<td></td>
<td>'Yes it was informative, there was a booklet, I think we have still got it upstairs, and they gave me all the guarantees for the cooker and the appliances'</td>
</tr>
<tr>
<td>Introduction to property</td>
<td>'It was all done in a rush and the walk through they did do, what they did tell me was very, not patronising but it was such simplistic stuff they did tell me, such common sense stuff they were saying which didn’t really need saying, and some of the more, I would like to have heard some of the more advanced stuff, but didn’t'</td>
</tr>
<tr>
<td>After sales service</td>
<td>'And the customer service after you have moved in is very very bad'</td>
</tr>
<tr>
<td></td>
<td>'When I asked them, they said ‘oh well its’ I didn’t push it because they were pretty good on other things'</td>
</tr>
</tbody>
</table>
New Home Owners Pack
A new home owners pack had been issued by the house builders to the occupiers of 32 properties involved in this study. These packs typically provide information on the operation and maintenance of the home together with instructions for some fitted appliances. Although it is common practice to issue a pack to each new home owner, the information and level of detail within each pack can vary from company to company. Of the 32 participants in this sample who had received a pack, 3 of the packs were incomplete, in that information was missing, 'leaflets' (as opposed to a specific pack) were received by 2 households; both of these properties had been built by the same company. For 3 interviews, no data was recorded, and for a further 3 occupiers, who were tenants, no information had been passed on by the landlord of the property. Occupants from 2 properties reported that they had received electrical drawings within their home owner's package in addition to other material.

Of the 32 that had received a new home owner's pack, only 7 reported that they had thoroughly read the information within the pack. Of these, 4 occupiers reported that the pack was informative, 1 described the pack as useful, 1 described it as being a bit 'excessive' and 1 occupier said that the pack was not informative.

In the remaining properties, 5 occupiers reported that they had read most of the pack, 4 occupiers said they had read some of it and 15 occupiers reported that they had read very little or none of the information. When asked why they had not read the information, a number of reasons were given. A 35-year-old female said that she had not read the information because she was not interested in this detail:

'I wasn't too interested in the detail, because they told us most of it as well'

A number of participants expressed a similar attitude towards the pack. A
40-year-old female said that she didn’t need to know the information:

‘On a need to know basis really’

A further participant, a 26-year-old male said that the pack was not well constructed:

‘It’s not well laid out [...] things are just crammed in, in any old fashion. It’s not great ordering’

A further 3 participants reported that the information within the pack was difficult to understand. A 32-year-old female said:

‘But it doesn’t explain to you in plain English, this is why it’s important to use these documents’

One participant, a 22-year-old male reported that he felt the information within the home owners pack was linked to the house builder’s marketing policy:

‘Well most of it’s marketing rubbish. It’s a sales pitch for buying your next house from them, full of smiling happy customers’

Introduction to property

A large number of participants reported that they had received information about their properties during an official inspection of the completed property accompanied by a representative of the house builder. The timing of this inspection and the amount of actual time allocated to the visit varied greatly both between and within the construction companies. In 26 of the properties, the occupiers remembered receiving information and having the opportunity to ask questions during such a visit, but participants from 10 properties reported having received no information whatsoever. Amongst these, 4 were tenants and therefore would have not come into contact with the house builders. A
further 6 were owner occupiers. A 34-year-old female reported:

'Oh God no, we had nothing like that [...] I think it was a case of 'here's the keys, if you've got any questions, come down and ask'

One occupier reported that they had received no information because the visit was cancelled by themselves due to other commitments.

Of the 26 properties where an inspection had taken place, the level of detail and information supplied during the visit varied greatly. Some participants reported that detailed information was lacking, a 49-year-old male said:

'She didn't go into it at length or anything'

A 55-year-old female said:

'But I don't think it was as comprehensive as I would have really liked, showing how different things worked and that'

And a 25-year-old male reported:

'When they took me around they weren't too concerned with going into details and explaining how everything worked'

A number of participants commented on the timing of this inspection visit, mentioning that it was held at a stressful time, either immediately subsequent to moving in or on the day of occupation itself. This led to them forgetting information that had been passed onto them. This was highlighted by one participant, a 37-year-old male, who commented:

'I think they did but it is so stressful when you are moving in, it can go in one ear and out of the other'
Of the 26 properties where self-closing internal fire doors had been fitted, no information regarding the doors had been provided at any stage to the occupiers of six of these properties. Of these 6 properties, 3 were privately owned and three were rented. An additional 2 occupants reported that they could not remember if they had been given information on their fire doors. In the properties where information had been provided on the fire doors, one occupant, a 40-year-old female reported being told that the self-closers on the door could be removed:

'I think they mentioned that you can actually take the chain off. I think the plastic surgeon [repair man] that came to fix the doors told me how to do it, you just take the chain out don't you, there's a chain that goes through the door. He said if you don't want them you take these, this comes out and then it doesn't slam shut'

In 19 of the properties the occupiers remembered having the smoke alarm(s) pointed out to them. In 10 of the properties the occupiers had not received any information concerning this safety feature. A further 5 occupiers reported that they could not remember if the operation of their smoke alarm had been explained to them.

After Sales Service
A number of participants mentioned after sales service by the house builder and in most cases this was described as being poor. A 45-year-old female reported:

'And the customer service after you have moved in is very very bad'

One of the most common complaints regarding the after sales service was in relation to the length of time it took for some snagging problems to be rectified. A 51-year-old female reported:
'Their after sales service, it was terribly slow, they said they would come on so and so a date and nobody came'

Even where a positive comment had been made by one 40-year-old female participant regarding customer service, the issue of time taken to rectify one of her problems was still considered to be an issue:

'The only thing I felt was not good customer service was the length of time it has taken for that door, over a year'

Participants also identified advantages and disadvantages of being one of the first to occupy a property on a new build site. With the construction of other homes being undertaken around them, some participants thought that this was an advantage, for example contractors were on hand to deal with small snagging matters and sales staff were close by to answer any questions. One 29-year-old female explained:

'And it also helps that we have a sales office on site and a site office on site and that again is one of the advantages of them continuing to build, they are not now disappearing off into the blue yonder'

In total, 3 participants made spontaneous comments about the advantages of living on an active site, yet others reported this as a disadvantage. In addition to problems associated with mud and dust, other problems were highlighted. One 27-year-old female explained that the builders had left some pipe ends sticking out of the ground over a period of time which she felt were a hazard for falls:

'There's been huge craters and I think the worse thing was there's probably about eight pipe ends which are about this big, they were flexible, not rigid, if you drive over them, they were sticking up and in the winter when it was dark, there's no lighting around there, I felt it was incredibly dangerous'
Poor workmanship and quality of fittings

Table 3.24. Summary of findings in relation to poor workmanship and quality of fittings

<table>
<thead>
<tr>
<th>Building Feature/System</th>
<th>Reported Concern</th>
<th>Health and Safety Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal workmanship</td>
<td>Poor standard of workmanship</td>
<td>Occupier modification</td>
</tr>
<tr>
<td></td>
<td>'There's a lot of bad workmanship in the house I think'</td>
<td></td>
</tr>
<tr>
<td>Quality of fittings</td>
<td>Poor quality of fittings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>'The fittings are shocking, the quality was poor of the fitting, internal fitting'</td>
<td></td>
</tr>
</tbody>
</table>

Although a matter not directly asked about, a number of participants spontaneously commented upon the standard of workmanship within their new homes, reporting that they felt it was of a poor standard. A 51-year-old female described what she felt as poor workmanship:

'The plastering in the whole house was to my mind of a very poor standard, they must have had an apprentice on the job, which they denied. The ceiling going up the stairs is curved, it's probably fairly difficult to do, but they've made a horrendous job of those. The walls in many places have got peated streaks down them'

Despite his property being located on another development and constructed by a different house builder, a 22-year-old male reported a similar problem within his home:
'Some of the plastering was absolutely atrocious, I mean I could have plastered it better and I've no clue on plastering. All the sockets, whoever comes in to paint, they just paint over switches and things like that'

In addition to comments made on the quality of workmanship, five participants also made comment about the quality of fixtures and fittings within their home. These were described as being of poor quality. A 52-year-old male explained:

'The fittings are shocking, the quality was poor'

A retired male also thought the quality of fittings was poor:

'And the quality as well, it's very poor, all the fixtures and fittings'

Participants from 30 properties described having made a snagging list; a report on problems found within the property. In the case of rented properties, the snagging would have been completed by the owner of the property and therefore no information on the snagging of these properties was available. In 19 cases the snags reported were minor in nature but in the remaining 11 cases, more significant problems were reported. A 34-year-old female described what was on her snagging list:

'The shower in our en-suite was, it rocked. All the stairs had dropped so they all creaked, every single stair. The kitchen window was broken, not the glass but the plastic frame. There was a lot of big things'

A 22-year-old male described his experience:
'I did lists on lists of problems. The first thing I noticed when I came in the front door was they had put the wrong kitchen in and the wrong sink...there was a great hole in the concrete floor, and the porch they were still building as they were trying to give us the keys at the time, there was cracking left, right and centre.'

A 45-year-old female described how the snagging of her property had dragged on and that she felt that her health had suffered as a result:

'My health has deteriorated and I've got a report, since we moved I am going each month, at the beginning it was twice, three times to the doctors [...] so much is pending'

3.5 Discussion
This section provides a summary of the key findings from the home interviews undertaken with occupiers of new homes and considers the importance of these findings in relation to the study aims. The section goes on to discuss the implications of the findings for future home safety initiatives. A full consideration of the limitations associated with this study is also presented.

3.5.1 Summary of key findings
Consistent with the aims of this study, the data provides evidence of how occupiers interact with their new homes and how this can lead to an increased risk of accidental home-based injury or ill-health. The findings also reveal how psychological, environmental and social factors influence behaviour within the home. The key findings from the interview study are summarised below:

Occupiers reported concerns regarding a number of dwelling features which they considered to be hazardous, for example, fire doors, fire egress windows, descending newel posts and sloped internal ceilings. In addition to these concerns participants highlighted problems which were encountered with features and the provision of essential services within the home such as
electricity and water, insufficient storage and insufficient light. Specific difficulties with dwelling features were reported by one non-ambulant participant.

A number of unsafe behaviours were found to be practised by occupiers. These behaviours arose as a direct result of the occupant's interaction with the building features and systems within the home. For example, fire doors were propped open and self-closers were removed and unsafe means of accessing the loft was reported. In addition, one example was observed whereby a wall air vent had been blocked due to a draught. Occupiers reported low levels of safe practices within the home in relation to fire escape plans and smoke alarms; few had considered making a fire plan and few maintained their smoke alarms in accordance with manufacturers guidelines.

A number of sources of information were accessible to new build occupiers. The level of engagement with these sources varied amongst participants. A home ‘walk through’, intended to introduce the occupants to the property is usually undertaken by sales staff, but these important meetings were typically undertaken on the day of occupancy and the full attention of occupiers was not achieved; few participants could remember in detail the content of their introductory meeting. In some cases participants expressed disappointment with the standard of workmanship and the quality of fittings within their new homes.

3.5.2 Environmental influences on home safety

This study has provided further evidence for how environmental features within the home have the potential to affect occupier safety. This is consistent with previous findings reported in the literature (Heimplaetzer & Goossens, 1991; Rennie & Ford, 1995; Bonnefoy et al., 2004). A number of dwelling features are present within new homes which are considered hazardous by some current occupiers. These features include loft access hatches, descending newel posts and internal self-closing fire doors. Further design
elements can also introduce difficulties for a number of occupiers. A full list of features is shown in Table 3.25.

**Table 3.25. Dwelling features considered hazardous by occupiers**

<table>
<thead>
<tr>
<th>Environmental risk factor</th>
<th>Nature of risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sloped access paths</td>
<td>Slips, trips and falls</td>
</tr>
<tr>
<td>Distance parking</td>
<td>Musculoskeletal injuries and/or falls</td>
</tr>
<tr>
<td>Insufficient external lighting</td>
<td>Concerns for personal safety, slips, trips and falls</td>
</tr>
<tr>
<td>Garage too small</td>
<td>Difficulties parking vehicle, difficulties exiting vehicle, awkward postures</td>
</tr>
<tr>
<td>Internal fire doors</td>
<td>Finger trapping incidents</td>
</tr>
<tr>
<td>Excessive hot water temperatures</td>
<td>Burns and scalds</td>
</tr>
<tr>
<td>Hidden service cabling</td>
<td>Electric shocks, damage to water pipes</td>
</tr>
<tr>
<td>Unsuitable location of service points</td>
<td>Occupier modification</td>
</tr>
<tr>
<td>Insufficient storage provision</td>
<td>Clutter, slips, trips and falls</td>
</tr>
<tr>
<td>Stair newel posts</td>
<td>Head injuries, occupier modification</td>
</tr>
<tr>
<td>Sloped internal ceilings</td>
<td>Head injuries</td>
</tr>
<tr>
<td>Loft Access Hatch</td>
<td>Slips, trips and falls</td>
</tr>
<tr>
<td>Egress windows</td>
<td>Falls</td>
</tr>
<tr>
<td>Insufficient internal lighting</td>
<td>Slips, trips and falls</td>
</tr>
<tr>
<td>Sloped garden</td>
<td>Musculoskeletal injuries, trips and falls</td>
</tr>
</tbody>
</table>

A number of these features (sloped access paths, internal fire doors and egress windows) are primary solutions to domestic architectural problems and are examples of solutions based on partial or incomplete modelling (Heimplaetzer & Goossens, 1991). For example, sloped access paths are intended to make access into buildings easier for some people, yet they can
become slippery in wet and icy conditions presenting a fall risk for others. Egress windows aim to allow safe egress in the event of a fire, yet present a hazard for falls. Fire doors are a primary solution to prevent the spread of fire, yet they introduce the risk of finger-trapping injuries. These primary efforts therefore have been incorporated into modern dwelling designs without consideration of the ecological context in which they are used. Because of this, those responsible for the implementation of such measures have not foreseen the additional hazards that result as a consequence.

The reported problems that arose due to the level and design of parking provided on new build sites appears to be a common problem on new sites within the UK, (CASE, 2005, 2007). The design of the physical environment surrounding new dwellings is controlled by planning policy (Kintrea, 2005) and therefore is very difficult to change. Where dwellings were provided with a garage, participants from this study reported that they tended to be utilised for additional storage thereby compounding the problem of on-street parking. Designers may see the garage as a space to park a vehicle but this is consistently at variance with how occupiers actually behave (CASE, 2005). Social factors such as planning policy therefore have a strong influence on home-based behaviours and ultimately shape an individual's interaction with the home environment. The influence of wider aspects such as planning and government policy have hitherto been ignored in home injury prevention.

Where garages were supplied with the properties in this study, these were not always considered useful by the occupiers. Reported difficulties arose due to the garages being inadequate in size and some not having an electrical supply. The problem of garages being considered too small has been identified in previous studies (Leishman et al., 2004; CABE, 2005, 2007) and arises as a consequence of planning guidelines. It may also be a consequence of developers providing the bare minimum required by planning (CABE, 2007). No current legislation controls the provision of services within integral or detached garages and the installation of these services in the garage was inconsistent across the sample interviewed. It may be the case
that some developers do not provide such services as standard practice in an effort to reduce building costs. However, as this study has identified, this contributes to reduced satisfaction among consumers. If such services were provided as standard this may lead to increased satisfaction among new home owners and would reduce the potential for occupier modification.

Planning policy can also influence the level of storage provided within new homes. With growing demand for greater density housing (DCLG, 2007a) developers are required to meet these requirements yet still provide a marketable home. Indeed, this is what has led to increased provision of a third storey on new properties (David Wilson Homes, 2004). Space within new homes is therefore at a premium. A lack of storage space within dwellings can result in clutter and therefore is a potential hazard for slips, trips and falls. Complex interactions therefore arise between social and environmental factors which shape the design of new dwellings. The consequences of certain housing policies for the end user may not be widely understood, but as this study has demonstrated, this is an important area to consider in addressing the problem of unintentional home injuries.

Insufficient light within their properties was reported by some participants within this study and in one instance poor lighting was reported at the top of the stairs 'once you get to the top of the stairs it's dark, it's dingy'. Previous studies have sought to identify the main environmental risk factors for home based injuries (WHO, 2004; Ormandy, 2007) and the large scale LARES study found that most unintentional injuries occurred in dwellings where there was poor lighting; where the dwelling is considered overcrowded by the occupants; where there is insufficient workspace in the kitchen or where there is noise at night. Low levels of internal lighting within dwellings is an environmental hazard which can increase the risk of slips, trips and falls and it is concerning that such a problem exists in modern new dwellings. Insufficient lighting can also lead to occupier modification which introduces the additional risks associated with DIY tasks (Ormandy, 2007).
It is clear from the findings presented here that the loft access hatch presents a hazard for falls within the home. There is no current legislative requirement for a loft ladder to be fitted within new homes, indeed, none of the properties visited during the course of this study were supplied with a purpose extending loft-ladder. Further more, the excessive cost of purchasing this item from the developers was reported as a barrier to it's installation. This offers support for Hammitt et al., (1999) who suggest an ‘income effect’ whereby increased house prices leave the occupier with very little to spend on additional safety items. With occupiers being unwilling or indeed unable to install such basic safety measures themselves, a mandatory requirement for the installation of a loft ladder would eliminate some of the risks associated with hazardous behaviour.

A number of participants reported that they had been advised that modern construction methods are not conducive with the storage of items within the roof void of new homes. Despite knowing this, some of these participants reported accessing their loft and utilising the area for storage. Environmental and cultural influences may help to explain this behaviour. The loft access hatch may offer occupiers the affordance for entry into the loft space, i.e. the possibility for action (Clark & Uzzell, 2002) and places in the home such as the attic and cellar are often identified with accumulation and utilised for storage (Korosec-Serfaty, 1984).

A number of other problems reported by participants during this study may be largely preventable though alternative design. The re-design of stair newel posts and sloped internal ceilings for example would reduce the risk of unintentional head injury. As data on unintentional injuries in the home are no longer collected within the UK, there is no way of ascertaining how many injuries may have been sustained due to descending newel posts or sloped internal ceilings within homes. Whilst there are cost implications associated with improved design to new dwellings, it may be beneficial to remove the hazard altogether thereby reducing the potential for injury. The initial cost
incurred during design may outweigh the subsequent cost of injury.

3.5.3 The interaction between design and occupier behaviour

Previous empirical research has identified the importance of an interaction between behaviour and dwelling design in relation to the use of stairs (Roys, 2001; Haslam et al., 2006). This study builds on this current knowledge and goes further to present information on how behaviour can interact with a number of other design features within the home and how this can lead to an increased risk of injury or ill-health. A number of examples of unsafe interactions were identified among the participants interviewed during this study. These are listed in Table 3.26.

Table 3.26. Design ~ Behaviour interactions

<table>
<thead>
<tr>
<th>Behavioural risk factor</th>
<th>Nature of risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupier modification of dwelling feature</td>
<td>Unsafe modifications</td>
</tr>
<tr>
<td>Interference with fire doors</td>
<td>Reduced fire protection</td>
</tr>
<tr>
<td>Drilling through plasterboard without considering location of services</td>
<td>Electric shock, damage to water pips</td>
</tr>
<tr>
<td>Unsafe loft access</td>
<td>Slips, trips and falls</td>
</tr>
<tr>
<td>Obstruction of wall air vent</td>
<td>Build up of noxious fumes within the home</td>
</tr>
<tr>
<td>Climbing to access features</td>
<td>Slips, trips and falls</td>
</tr>
<tr>
<td>Insufficient maintenance of smoke alarm</td>
<td>Burns and inhalation of smoke in event of fire</td>
</tr>
</tbody>
</table>

The provision of self-closing fire doors within new dwellings is a primary injury prevention strategy which is now controlled by legislation. The way in which occupiers interact with the doors by propping them open and removing the self-closing mechanism offers further support for Carson-Gielen and Sleet's (2003) suggestion that for virtually all primary modifications, a behavioural adaptation is also required. It is striking that in every property visited during the course of this study where fire doors were fitted the occupiers interfered with these doors in some way thereby reducing the fire protection afforded by the doors within those properties (Meacham, 1999).
If the results of this study are indicative of behaviours practised in other homes, as suggested by previous studies (Pickett, 2003; DCLG, 2007d), the provision of internal self-closing fire doors within dwellings may be largely ineffective as a safety measure. Pickett suggested that occupiers were likely to interfere with the self-closing mechanism due to the usability issues associated with fire doors, and this suggestion accords with the findings of this study. The fact that some participants recognised the benefits of having fire doors and understood the health and safety reasons behind their installation, yet still interfered with their doors indicates the significant practical problems users found with this safety measure. It also highlights the importance of addressing the interaction between behaviour and the environment in implementing engineering solutions to health and safety problems.

A number of the unsafe behaviours reported by participants during the course of this study arose as a result of their interaction with a feature or system within the dwelling. For example, accessing the loft without the use of installed ladders and drilling into plasterboard walls without considering the location of service cables. Until now, the majority of prevention initiatives aimed at reducing unintentional injury within the home have focused on either environmental changes (primary interventions) or ways of changing behaviour (secondary interventions). These approaches have often not considered the complex interactions which arise between occupiers and building features where each of these influences act together. This study has demonstrated that some risks are created or heightened by a complex interaction between behaviour and the built environment.

3.5.4 Sources of occupier knowledge

Whilst a number of sources of information were available for those occupying a new dwelling, the level of engagement with these varied across the sample. Some occupiers felt the information provided was sufficient for their needs, whilst others thought it was either too detailed or not sufficiently detailed. The level and type of information provided will obviously vary amongst the
developers with each providing some form of corporate information regarding their product. The importance of information about a property has been recognised through the development of the Home Information Packs which are now required for the sale of most existing homes (DCLG, 2006b). Despite the recognised importance of information for prospective occupiers there appears to be a lack of standardisation across the industry. In 22 of the properties visited, the occupier(s) reported that they did not know if they had an egress window fitted within their home. This is surprising, given the importance of this feature for occupant safety. In addition to this, occupiers in 8 dwellings were unaware that the smoke alarms within their home were linked to the electricity supply. Legislation now requires smoke alarms within dwellings to be linked to the mains power supply (ODPM, 2004a), a move which aimed to compensate for the behavioural responses reported in the literature (DiGuiseppi et al., 2002; BRE, 2003). However, such a move may led to occupants becoming overly reliant on a continued and uninterrupted power supply to the smoke alarm and apathetic towards the essential maintenance of the battery; in the event of a power cut, smoke alarm functioning remains reliant on an operational battery.

Some participants reported poor quality in relation to aspects of their home and in relation to consumer service. This is consistent with what has previously been reported in the literature (CABE, 2005,2007; Sommerville & McCosh, 2006). The policy to increase new build completions within the UK maybe ineffective if consumer satisfaction levels continue to be low; new homes need to be an attractive investment for prospective purchasers. Construction represents a rare industry in which consumers effectively do not have the right to return goods that they believe to be defective (Leishman et al., 2004). The levels of snagging identified in this study are consistent with previous reports (Sommerville & McCosh, 2006) and whilst this may be an accepted process in the purchase of new dwellings, continued problems and a lack of corporate response may contribute to and increase levels of consumer dissatisfaction.
3.5.5 Limitations of the study

Participants

The sample of participants was self-selecting and therefore those who responded to the invitation to participate in this study may have held particular views or experienced particular difficulties, motivating their participation. Participant recruitment was difficult; in total 774 unsolicited letters were delivered to properties resulting in 40 interviews, a response rate of 5%. There are a number of possible reasons for this; the study called for participation at a very busy time for individuals, subsequent to moving house and the interviews were held within the participants' home and therefore were intrusive at this busy time. In addition, no incentive was offered to participants for taking part in this study. These factors may have influenced response levels individually or in combination.

The study involved participants drawn from 40 properties, and wide generalisation is not appropriate with this sample size. However, systematic patterns of unsafe behaviours were reported in relation to specific design features within the sample of homes studied.

Study methodology

With regard to the study methodology, the findings reported in this chapter are based on self-report data gathered during retrospective interviews with occupiers. The retrospective nature of the study relied heavily on the participants' recollections of their experiences at a busy and sometimes stressful period and it is possible that information has been missed because of recall bias. This limitation has been addressed in subsequent studies presented in Chapters 4 and 5.

All of the interviews were conducted by the same researcher, trained in interview techniques. Whilst attempts were made to reduce the potential for bias within each interview, the open ended nature of the semi-structured interview meant that each interview undertaken was different.
semi-structured nature of this research also meant that new topics relevant to the research were sometimes introduced by the participants which had not previously been included within the interview schedule.

The initial questions within each interview were structured and were used to illicit information about the property itself and details of the occupiers. This allowed the researcher to establish a rapport with each of the participants at the outset of each encounter.

3.6 Summary and conclusions

The study described in this chapter sought to examine the different ways in which individuals use and interact with their home. Specifically the study aimed to identify how particular interactions could lead to an increased risk of injury or ill-health. Previous work has identified the importance of behaviour-environment interactions, but this has been limited to just one feature within dwellings, i.e. stairs (Roys, 1991; Haslam et al., 2006). From the interviews undertaken with occupiers of new dwellings it is evident that a wide range of influences interact as potential determinants for home-based injuries. Some dwelling design features installed to increase safety from one particular hazard were found to present additional hazards which may have been unforeseen. For example, internal self-closing fire doors prevent the rapid spread of fire, yet have the potential to cause finger-trapping injuries. Consequently occupiers disabled the doors thereby reducing the level of protection against fire (Meacham, 1999).

Unsafe behaviours practised by occupiers were also identified in relation to a number of other features within the dwellings. For example, some occupiers used various unsafe means of accessing their loft space, some reported climbing to access other features and one occupier intentionally blocked an air vent within the wall. The individual model of injury prevention understands a person and their injury risk in terms of individual behaviour, however these findings demonstrate that a number of external factors act as determinants of
In conclusion, this study has demonstrated varying influences which determine behaviour within the home. These influencing factors are not always considered in home injury prevention. The prevention of unintentional home injuries is a public health priority (Secretary of State for Health, 1999; Department of Health, 2003b) with calls for the UK to do more to reduce levels of domestic injury (Stone et al., 2001). New approaches which address the complex nature of behavioural, environmental and social factors as determinants of injury may be more effective.

This study presents self-report data from a sample of occupiers collected retrospectively and the limitations associated with this methodology have been discussed. Due to the self-selecting nature of this sample it is desirable to substantiate the initial findings reported here. The results from this study informed a further prospective study which aimed to investigate occupiers experiences within their new homes from a temporal perspective. The extent to which similar problems are reported by participants was intended to substantiate and inform the findings reported here.
Chapter 4

INVESTIGATING TEMPORAL PATTERNS OF ENGAGEMENT WITHIN THE HOME

4.1 Introduction

The focus of this thesis is on how occupier behaviour interacts with the design of new dwellings with regard to health and safety. Chapter 3 described examples of occupier interactions within the home from the perspective of the occupier(s). These perspectives were obtained during interviews which provided retrospective cross-sectional data. Whilst the interviews produced rich and informative data, a more complete view develops from understanding the relevant processes from a temporal perspective. It is important to understand if the experiences and interactions described in chapter 3 are stable over a period of time. The purpose of the research presented in this chapter therefore was two fold, firstly to gain information to substantiate the previous findings and secondly to seek rich temporal data from a smaller sample of participants.

4.2 Outline of research presented in this chapter

This chapter describes the findings from a diary based study which was undertaken with a sample of new-build occupiers. Audio diaries were used as a tool to obtain rich, in-depth information about the ways in which participants engaged with their home. Such an approach allowed the exploration of participant’s daily interactions within an authentic context.

4.2.1 Aims and objectives

The aim of this study was to capture temporal data reflecting individual experiences of inhabiting a brand new home. The objectives of the study were to collect data on:
• individual interactions within the home environment which may affect health and safety
• temporal patterns of engagement with specific features within the home
• the problems encountered by occupiers with specific features and systems within the home

4.3 Methods
A home-based diary study was designed to record participant's temporal patterns of engagement within the home. Solicited diaries have been widely used in social research and as a research tool they offer the opportunity to investigate social, psychological and physiological processes within everyday situations (Jones, 2000; Bolger, Davis & Rafaeli, 2003). They are useful as a research method to supplement interview data, providing a rich source of information on respondents' behaviour and experience on a daily basis (Corti, 1993). Diaries were therefore an appropriate research tool to use for this research to investigate unobtrusively how occupier behaviour can interact with design aspects within the private realm of the dwelling. Diaries also reduce the likelihood of retrospective bias, this being achieved by minimising the amount of time elapsed between an experience and the account of that experience (Bolger et al., 2003).

4.3.1 Equipment
Whilst pencil and paper diaries are the most common approach, electronic data collection methods are now feasible. The aim of this study needed to be balanced against the burden placed upon those participating. For example, a heavy commitment may have deterred participants from making entries, or the time constraint may have limited the level of detail entered during each entry. Audio diaries however have an advantage over written methods as they are less time consuming for participants as speaking is quicker than writing.
The audio equipment used in this study were battery operated Sanyo compact cassette recorders. These are light-weight and simple to use and all recordings are made directly onto a tape. In using a simple device the chance of human error on behalf of the participants was reduced. The data entries were recorded onto C60 cassette tapes, each tape providing one hour of recording time.

4.3.2 Sampling
Purposive sampling was used to recruit a sample of 10 participants. The inclusion criterion for this study was new build occupancy within the previous 6 months. Over a period of ten months, 232 letters detailing the objectives of the study and which invited interested participants to contact the researcher were delivered to all known recently completed and occupied properties on residential developments within a 20 mile radius of Loughborough University. The sample composition comprised all property types (detached house, town house, apartment etc) and also included private and social housing to take account of variations in occupancy status. Properties which had been selected during the previous study were excluded for this research.

In addition, 131 posters were distributed to the show homes on these developments. The posters contained information about the study and invited those who were interested to contact the researcher. The posters were left with sales staff within the show homes to hand to occupiers as they completed their purchase of the properties.

In total, 10 participants were recruited for participation. A further 5 participants contacted the researcher for further information but subsequently did not wish to participate in the study. During the initial briefing of one participant it became apparent that he had occupied his property for longer than 6 months. Due to difficulties with recruitment and because this participant was keen to take part he was included in the final sample.
4.3.3 Procedure

A one page sheet of instructions for participants was prepared before the research commenced. This sheet contained information about the equipment used during the study, the type of experiences the researcher was interested in hearing about, the frequency of the diary entries to be made and how to make a diary entry. The instructions also included a list of prompts to assist participants recall specific events. Participants were asked to make an entry initially on a daily basis and were advised that they could make more than one entry each day if they felt they would like to. Entries were to be made in an open format to record their activities and interactions in their own words. A copy of the participant instruction sheet is included in Appendix C.

Following recruitment, participants were visited in their home by the researcher. The aims of the study were fully explained to them and informed written consent was obtained. Participants were then introduced to the audio equipment and were shown how to record their entries onto the tape. This gave them the chance to ask any questions and provided an opportunity for the researcher to build a rapport with those participating. Before leaving the participant's home, the researcher ensured that the participants were able to operate the equipment and that they understood what was required of them. Spare batteries and extra tapes for the cassette recorders were also issued. Within the first week of commencing the study participants were re-visited by the researcher and the first diary entries were collected. Feedback on the recordings was then provided to participants.

Participants for this study were recruited shortly after moving into their new homes. The instructions therefore asked them to make an entry on a daily basis in the first instance as they were settling in. Following this initial 'busy period' it was expected that entries would be made on a less frequent basis, a 'falling off' effect (Oppenheim, 1992, p254). In order to reduce this effect, regular contact was maintained during the course of the diary research by the researcher, with contact being made approximately every two weeks.
This also helped to reassure participants and to motivate them thereby optimising their participation.

The diaries were allowed to run until the participants were reporting that they were making infrequent entries, or that they stated there was no further information they could add to the diaries. The tapes were collected from participants on a regular basis and fully transcribed by the researcher. A pilot study was conducted with two participants. The principle aim of the pilot study was to ascertain if participants could use the recording equipment easily and to determine the type of information that was likely to be recorded. The pilot study produced two completed diaries. Those participating reported that the equipment was easy to use and that they had no problems in understanding the instructions or in recording their experiences, despite feeling a little self-conscious at first. As these pilots resulted in full, usable diaries, they were included in the main data set.

4.3.4 Analysis
The recorded diaries were fully transcribed and the transcriptions were imported into the qualitative software tool, NVivo (Version 2). The qualitative analysis of the interview data was conducted following the three steps to qualitative data analysis developed by Miles and Huberman (1994); data reduction, data display and conclusion drawing/verification. Data reduction was achieved by reviewing the verbatim transcripts and applying descriptive codes to chunks of data. These descriptive codes were then organised into a number of themes in line with previous findings and the original objectives of this study. During the course of analysis, the codes were reviewed and revised as key categories emerged from the data. The pattern coding from the qualitative analysis provided the basis for the data summary tables from which the conclusions within this study have been drawn. The data summary tables are reproduced within this chapter.
4.4 Results

The results from this study support and validate a number of the previous findings reported in chapter 3. In addition, these results provide additional information regarding the temporal aspects of the interactions which occurred between the occupiers and their home. The results in this section are presented in the following format. Participant characteristics are detailed in section 4.4.1. In sections 4.4.2 to 4.4.5 those findings which substantiate earlier findings are summarised. In section 4.4.6, a temporal analysis of occupiers interactions is presented. In section 4.4.7 additional findings are presented which details the features within the home which were popular and on which participants commented in a positive way.

4.4.1 Participant information

Of the 10 participants who agreed to participate in this study, seven finished the study and returned completed diaries to the researcher. Two participants returned incomplete diaries and one participant returned insufficient information to be included in the study. There was considerable variation in the length of each individual diary and the type of entries made by participants. A breakdown of the number of days covered by each diary and the number of entries made for complete diaries is shown in Table 4.1. Similarly, a breakdown of the number of days covered and the number of entries made for incomplete diaries is shown in Table 4.2.
Table 4.1. Participant details (Complete diaries)

<table>
<thead>
<tr>
<th>Participant Identification</th>
<th>Age Range</th>
<th>Gender</th>
<th>Participant's Household Composition</th>
<th>Type of Property</th>
<th>Days resident in property before commencing diary</th>
<th>Duration of Diary and no. of entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1AL</td>
<td>26 – 35</td>
<td>Female</td>
<td>Husband</td>
<td>4 bed Detached House</td>
<td>21 days</td>
<td>103 days (55 entries)</td>
</tr>
<tr>
<td>D1SR</td>
<td>36 – 45</td>
<td>Female</td>
<td>16 year old son, 14 year old son and 10 year old daughter</td>
<td>4 bed detached house</td>
<td>Diary commenced on moving day 14 days</td>
<td>211 days (41 entries)</td>
</tr>
<tr>
<td>D2DC</td>
<td>36 – 45</td>
<td>Female</td>
<td>Husband and 2 teenage children</td>
<td>4 bed detached house</td>
<td>48 days (16 entries)</td>
<td></td>
</tr>
<tr>
<td>D3AM</td>
<td>26 – 35</td>
<td>Female</td>
<td>Husband and 10 year old son</td>
<td>4 bed detached house</td>
<td>52 days</td>
<td>43 days (17 entries)</td>
</tr>
<tr>
<td>D4GJ</td>
<td>46 – 55</td>
<td>Male</td>
<td>Wife and three daughters aged 17, 15 and 15</td>
<td>5 bed detached house</td>
<td>262 days</td>
<td>91 days (18 entries)</td>
</tr>
<tr>
<td>D5SH</td>
<td>26 – 39</td>
<td>Female</td>
<td>Partner</td>
<td>2 bed ground floor apartment</td>
<td>35 days</td>
<td>63 days (16 entries)</td>
</tr>
<tr>
<td>D6KH</td>
<td>26 – 35</td>
<td>Female</td>
<td>Partner</td>
<td>4 bed detached house</td>
<td>68 days</td>
<td>127 days (18 entries)</td>
</tr>
</tbody>
</table>
Table 4.2. Participant details (Complete diaries)

<table>
<thead>
<tr>
<th>Participant Identification</th>
<th>Age Range</th>
<th>Gender</th>
<th>Participant’s Household Composition</th>
<th>Type of Property</th>
<th>Days resident in property before commencing diary</th>
<th>Duration of Diary and no. of entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2HJ</td>
<td>36 – 45</td>
<td>Female</td>
<td>Husband, 12-year-old daughter and 10-year-old son</td>
<td>5 bed detached house</td>
<td>61 days</td>
<td>20 days (7 entries)</td>
</tr>
<tr>
<td>D7EW</td>
<td>26 – 35</td>
<td>Female</td>
<td>Partner</td>
<td>3 bed semi-detached Town house</td>
<td>15 days</td>
<td>9 days (2 entries)</td>
</tr>
</tbody>
</table>
4.4.2 Environment – behaviour interactions

Participants recorded information about a number of interactions undertaken within their dwellings. In some instances unsafe behaviour was practised by the occupants during these interactions. The findings are presented in data summary tables to allow comparisons with the findings from the retrospective interviews reported in chapter 3.

External area – insufficient light

In 3 of the diaries participants reported that there was insufficient external lighting outside of their properties. This had led to concerns about personal safety for two occupiers, with one of these participants expressing additional concerns regarding the safety of her children when they were left alone in the property. A summary of the findings are shown in Table 4.3.

Table 4.3. Summary of findings in relation to insufficient light

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlit external area</td>
<td>'Something else that we've noticed when we've been leaving a little later on is that it's quite dark. The house is situated on, it's not a grand private drive, but it's like a shared drive, you have to sort of turn off the road to go down to each of the houses, so there aren't any street lights because it's not a road [...] it doesn't bother me too much but it would be a little bit of a concern if I was leaving the children'</td>
</tr>
<tr>
<td>'It makes me worry about anybody who is lurking about that I might be attacked. It makes me worry that I can't see where I am stepping and I am going to fall over something, it's really bad'</td>
<td>Participant D1SR</td>
</tr>
<tr>
<td>'There's no street lights down this close whatsoever, the only lights they have are the ones you have outside of your own property. So, this obviously isn't ideal but I don't see that there is a lot I can do about that really'</td>
<td>Participant D3AM</td>
</tr>
</tbody>
</table>
External area – parking

In 2 cases, participants reported that the driveway attached to their property was too narrow to be able to park two vehicles with sufficient room for passengers to embark and alight from the vehicles. With the driveway being narrow this meant that participant D4GJ only had one parking space provided with her 5 bed-roomed home. In one instance, participant D1SR reported that difficulties arose due to a flowerbed which had been laid by the developers next to the driveway. This restricted the amount of room available for passengers on one side of the driveway. A summary of the findings are shown in Table 4.4.

Table 4.4. Summary of findings in relation to parking

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garage/Carport too small</td>
<td>'It’s a shared drive and whilst it is wide enough to house two cars side by side, it’s not wide enough to open the doors fully'</td>
</tr>
<tr>
<td>‘The garage is only eight foot wide, again they are substandard, they say an integral, but you drive a vehicle in there and try and get out the doors’</td>
<td>Participant D4GJ</td>
</tr>
<tr>
<td>'It’s a family house, but we’ve only got space for one parking space in front of the garage, now you would think that this house would have had at least a double garage and a double driveway because of the fact that it has got four double bedrooms and one single bedroom, but then you never can tell how these builders think'</td>
<td>Participant D4GJ</td>
</tr>
<tr>
<td>'The driveway is actually wide enough for two cars to park but they’ve actually planted, they’ve made a little bed on the left hand side and put some plants in and there’s a little grassed area as well, and it would have been much much more sensible if they had just tarmaced the lot to put something in so that you’ve just got that much more room for two cars and certainly room for passengers to be able to go in and out of both sides of both cars in a driveway'</td>
<td>Participant D1SR</td>
</tr>
</tbody>
</table>
Internal area - fire doors

Internal self-closing fire doors were fitted within three of the participant's homes. These were fitted in compliance with current building regulations (England & Wales). Participants from all three properties fitted with self-closing fire doors referred to these fire doors within their diaries. Participants D5SH and D6KH both made one reference to the internal fire doors within their diaries, with participant D6KH stating that fire doors were fitted on every single internal door within the property except the bathrooms but including the airing cupboard and the under stairs cupboard. Participant D4GJ made three references to the fire doors during the diary entries. Participants D4GJ and D5SH reported wedging open the fire doors to prevent them from closing. These findings are summarised in Table 4.5.

Table 4.5. Summary of findings in relation to fire doors

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of self-closing mechanism.</td>
<td>'I really hate the doors to be honest, I hate having fire doors, you have to have them closed all the time. So we have got them wedged open at the minute, I know you are not supposed to do that but it's just really dark with them all being closed'</td>
</tr>
<tr>
<td>Wedging open of fire doors</td>
<td>'We've taken three closers off and we've got two wedges, so we wedge open the other two'</td>
</tr>
</tbody>
</table>

Participant D5SH
One example of a fire door being propped open is shown in Figure 4.1.

![Figure 4.1. Internal fire door prevented from closing](image)

Internal area – excessive hot water temperatures
Of the 9 completed diaries, one participant, participant D1SR reported that the temperature of the hot water within her property was too high. This finding is discussed in more depth later in this chapter but a summary is shown in Table 4.6.

| Table 4.6. Summary of findings in relation to excessive hot water temperatures |
|---|---|
| **Interview Findings** | **Diary Findings** |
| Excessive hot water temperature | ‘My mother and myself have been really burnt by the water, we haven’t quite worked out how we can reduce the temperature of the hot water because it’s absolutely fiery hot’ |
| ‘I think it’s too hot still so I got them to come out and check it with their thermometer and they said it is right, it is very very hot water’ | Participant D1SR |

Internal area – services provision
A number of the issues concerning the provision of services within the home that were raised during the interview study were also raised by participants in their diaries. In relation to the loft space, two participants described asking...
the builder to fit electricity and a light within the loft (Participants P1AL and D1SR), and one participant described having to pay an electrician to do this after they have purchased the property (Participant D4GJ). In 2 of the diaries participants reported that there was no power supply to the loft and subsequently no light. Similar problems were reported in relation to the garage. Participant D1SR also reported that she had experienced difficulties with the location of the telephone point within her home. The findings are shown in Table 4.7.

Table 4.7. Summary of findings in relation to the provision of services

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>No provision of electricity in loft space.</td>
<td>'The loft, initially had no power, and as such we had to pay an electrician to put a light in for us'</td>
</tr>
<tr>
<td>Inadequate light within loft.</td>
<td>Participant D4GJ</td>
</tr>
<tr>
<td>'We were going to need a booster and we needed a power point up there'</td>
<td>'The loft, initially had no power, and as such we had to pay an electrician to put a light in for us'</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>No Television aerial</td>
<td>'We put the aerial up ourselves in the attic, the attic itself is situated to the left of the landing and the stairs [...] it is quite dangerous because at first he was having to stand on the banister which as you can imagine if he falls is quite dangerous'</td>
</tr>
<tr>
<td>'The points are there, and the cabling is in the attic, but there's no aerial'</td>
<td>Participant D7EW</td>
</tr>
<tr>
<td></td>
<td>'We put the aerial up ourselves in the attic, the attic itself is situated to the left of the landing and the stairs [...] it is quite dangerous because at first he was having to stand on the banister which as you can imagine if he falls is quite dangerous'</td>
</tr>
<tr>
<td></td>
<td>Participant D7EW</td>
</tr>
<tr>
<td>Inconvenient location of service points</td>
<td>'The only way that we can plug in the lawn mower is to push the plug through the open side window which we have to do'</td>
</tr>
<tr>
<td>'I think the phone sockets are in silly places'</td>
<td>Participant D1SR</td>
</tr>
<tr>
<td></td>
<td>'The only way that we can plug in the lawn mower is to push the plug through the open side window which we have to do'</td>
</tr>
<tr>
<td></td>
<td>Participant D1SR</td>
</tr>
</tbody>
</table>

171
No electricity in garage. Inadequate light within garage.

'No unfortunately that was another thing we were told it would have power and we were then told oh no it can't have power because you've got next doors house between yours. We've got a temporary light that runs off a portable battery'

'When the house was purchased there was no light or power in the garage and we had to pay separately for a light and sockets to be fitted in there'

Participant D4GJ

The telephone point referred to by participant D1SR is shown in Figure 4.2.

Figure 4.2. Location of telephone point in hallway

Internal area – sound insulation

Participant D5SH made one reference to the sound insulation within her home. She complained that a lot of noise travelled between the properties within her block of apartments. These findings are presented in Table 4.8.
Table 4.8. Summary of findings in relation to sound insulation

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient sound insulation</td>
<td>‘You can hear everything really clearly, I can hear the shower going on in the mornings, I can hear cupboard doors opening and closing, drawers opening and closing, door scraping, furniture scraping across the floor, it’s really bad’</td>
</tr>
</tbody>
</table>

**Internal area – layout**

In a similar vein to the previous study, a number of problems were reported in relation to the internal layout of the properties. These problems included a window which when opened was difficult to access in order to close and a glass door which had the potential to strike the worktop within the kitchen. These findings are shown in Table 4.9.

Table 4.9. Summary of findings in relation to the internal layout

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inaccessible window</td>
<td>‘[The] windows in the kitchen, you have to lean over the worktop to actually open them, once they are open, you can’t actually retrieve the handle to close them, so I find it difficult’</td>
</tr>
</tbody>
</table>

Participant P2HJ

Poorly coordinated Design | ‘The internal door between the hall and the kitchen has got panes of glass and if you pushed it back it ultimately would hit the corner of the worktop, which could be incredibly dangerous knowing what my children are particularly like’ |

Participant D1SR
The glass door referred to in the diary of participant D1SR is shown in Figure 4.3.

Figure 4.3. Glass door with potential to strike kitchen work top

**Internal area – sloped ceilings**

One feature which had previously been identified as presenting a risk for head injury was sloped internal ceilings and this topic was raised within the diary of 1 participant. The sloped ceiling was located in the en-suite bathroom and participant D6KH reported that her partner had bumped his head as a result of this feature. The findings are shown in Table 4.10.

**Table 4.10. Summary of findings in relation to internal sloped ceilings**

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sloped Internal Ceilings</td>
<td>‘The en-suite, has got the sloping ceilings, which I think [partner] has bumped his head on a couple of times, I have while I have been cleaning but we are kind of getting used to those’</td>
</tr>
<tr>
<td>‘You are actually too close to the cupboard under the stairs and you are forever clouting your head’</td>
<td>Participant D6KH</td>
</tr>
</tbody>
</table>
Internal area – loft

Of the nine properties, 8 were built with a loft (roof void accessible via a hatch), the exception being a ground floor apartment. A loft ladder permitting safe access to the loft space had not been provided by the builders within any of the properties. Access to the loft space was reported by 6 participants, two of which described this as difficult. The findings are summarised in Table 4.11.

Table 4.11. Summary of findings in relation to loft access

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ladders and step ladders to access the loft. Use of banisters as a step up.</td>
<td>'I have clambered up there using stools and using B [wife] to stand on, it's quite bad'</td>
</tr>
<tr>
<td></td>
<td>'It is quite dangerous because at first he was having to stand on the banister which as you can imagine if he falls is quite dangerous'</td>
</tr>
<tr>
<td></td>
<td>Participant D7EW</td>
</tr>
</tbody>
</table>

During one of her diary entries, participant D1SR described an incident whereby the portable ladder which was being used to access the loft fell:

‘Unfortunately, we had a little accident in the process, there isn’t a loft ladder so, which we will get one, but in the meantime just a straight forward ladder was used and unfortunately it fell down twice, sort of flat down. No injuries but unfortunately […] a little bit of the paint has come off the door’

One participant described how he installed a fixed loft ladder himself:
"Yesterday I fitted the loft ladder. The loft opening is situated in a very awkward place, right in front of our main bedroom and daughter’s bedroom doors. Because of the position, it was very difficult to work, particularly having to manoeuvre the step ladder around tight corners. I could not bring in an ordinary ladder as I was unable to bring it up the tight stair case. Once in the loft, the ladder could only go one way because of the rafters, this meant I had to fit a separate piece of wood to enable the loft ladder and it’s hinges to be supported correctly.”

Internal area – egress windows

Participant D1SR expressed concern about the emergency egress windows installed within her property. She reported that she was concerned that this feature presented a risk for falls in particular to young children. The findings are summarised in Table 4.12.

Table 4.12. Summary of findings in relation to egress windows

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concern regarding falls</td>
<td>'Both windows open quite fully, one of them you can’t lock because it’s a fire window, now if I had younger children I'd be a little bit concerned about that because they could easily climb out’</td>
</tr>
<tr>
<td>I'm just concerned obviously that they do open that wide and if, you know, kids are going to mess with things aren't they and that did concern me initially, because the top opens as well, it opens like that, so that concerns me in there’</td>
<td>Participant D1SR</td>
</tr>
</tbody>
</table>

4.4.3 Unsafe behaviour

In addition to unsafe behaviour reported previously in this chapter involving the internal fire doors and gaining access to the loft space, one further example of unsafe behaviour was reported by participant D1SR. This was in relation to the air vent which was located within the internal wall within the lounge of the property. Participant D1SR reported that the air ventilation brick produced a draught and therefore she had covered it, Table 4.13.
Table 4.13. Summary of findings in relation to unsafe behaviour

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruction of air flow</td>
<td>Obstruction of air flow</td>
</tr>
<tr>
<td></td>
<td>'The grill which is installed on the wall where the fireplace is [...] it's permanently open and it really was blowing a gale and it was so cold in there, so I've actually put some cardboard over it [...] because it was really uncomfortable'</td>
</tr>
<tr>
<td>Participant D1SR</td>
<td></td>
</tr>
</tbody>
</table>

4.4.4 Sources of occupier knowledge

Although not specifically requested in the participant's instructions, a number of references were made during the diaries in relation to after sales service. This is discussed further in section 4.4.6, but the findings are summarised here in the data summary table, Table 4.14.

Table 4.14. Summary of findings in relation to after sales service

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>After Sales Service</td>
<td>'The builders haven't taken a blind bit of notice of what I've been saying so it's been left to us to sort out the problem'</td>
</tr>
<tr>
<td>'And the customer service after you have moved in is very bad'</td>
<td>Participant P2HJ</td>
</tr>
<tr>
<td>'I've rang them so many times regarding different things, they have been pretty prompt at sending people out, and when I've had to leave messages with customer services they've always got back to me within a very reasonable amount of time'</td>
<td>Participant D1SR</td>
</tr>
</tbody>
</table>

4.4.5 Poor workmanship and quality of fittings

Once again, a number of participants spontaneously commented upon the standard of workmanship within their new homes. The comments extracted from the diaries in relation to this topic are shown in Table 4.15.
Table 4.15. Summary of findings in relation to poor workmanship and quality of fittings

<table>
<thead>
<tr>
<th>Interview Findings</th>
<th>Diary Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor standard of workmanship</td>
<td>'Where they have joined the boards they've used glue which has come through and instead of wiping it off they have left it there'</td>
</tr>
<tr>
<td>'There's a lot of bad workmanship in the house I think'</td>
<td>Participant P1AL</td>
</tr>
<tr>
<td></td>
<td>'One of the tiles that they've fixed now stands proud of the rest, why can't people be perfectionists. I find it hard to understand why when you look at it you can't see it in the way I can'</td>
</tr>
<tr>
<td></td>
<td>Participant D2DC</td>
</tr>
</tbody>
</table>

4.4.6 Temporal patterns of engagement

The analysis of the diary data also provided a temporal understanding of interactions within the home. A number of the problems experienced by occupiers were encountered repeatedly and the rich nature of the diary data permitted an exploration of how these interactions were viewed and addressed by participants over a period of time.

Diary extract 4.1 shows extracts from the diary of participant D1SR who reported engaging in unsafe behaviour by blocking up the air ventilation brick within her home. The problem was identified on day ten of her diary when she made the first reference to having noticed that there was a draught emitting from the air vent.
Day 10
'They've got a ventilation grill which seems to have a massive gale running through even though, I mean today it has been quite windy so it's the first day it's been noticeable, I felt it's been cool in the sitting room, it's something I am going to monitor because I hate being cold'

Day 11
'I might have said to you it's really really draughty in the sitting room with the vent they have got for the fire, it's started to bug me a little bit. There is a switch that you can switch on and off but I can't work out what that is for so I think I'll have a word with the site manager when he comes next week'

Day 22
'Something that has started to irritate, maybe now more than before because I've sat down in the sitting room is that, I think I might have mentioned before, the grill which is installed on the wall where the fireplace is, further along from the fireplace, a great safety feature obviously, I suppose because of possible fumes from the fire, I haven't got a fire at the moment installed, it isn't a grill you can open and shut, it's permanently open and it really was blowing a gale and it was so cold in there, so I've actually put some cardboard over it, it's not an issue actually, because we haven't got a fire in, although I will need to replace it with an open and shut, where I've got the choice of either open or shut grill, I think you can get something from one of the local DIY shops. So I've covered that because it was really uncomfortable sitting down, you can actually see the outside when you look through it, it really is a big hole. So, erm, given that the wind's started to get up, it becomes very uncomfortable'

Day 37
'I went to get an on/off vent for the sitting room but [the shop] were not very, they sell them but they said 'we don't recommend them, and you shouldn't really have one.' It seems strange that they sell them and it's been really really windy over the past few days and it's noticeable that with the piece of cardboard that I stuck in front of it, it is very very cold. I don't know quite how I can get round this one as quite clearly you do need to have the ventilation, according to the guy in [the shop] it isn't just for the gas fire, it's because you have a boiler, well it's several rooms away, I haven't got a gas fire at the moment, I've got the connection there but not the gas fire. So it is feeling a little bit draughty when the cardboard comes away from the blue tack on the wall'

Participant D1SR first reported that she had a problem with the air vent within her sitting room on day 10 of her diary. According to her diary this was the first time she had noticed this; 'it's the first day it's been noticeable'. The problem was raised again during her entry for the following day. She reported that she had taken action to rectify the problem 11 days later during her entry for day 22. The action taken involved covering the vent with cardboard and this can be seen in Figure 4.4. Her diary entries reveal that she recognised that the vent was a beneficial safety feature but due to her increased use of the sitting room post occupation of the property, the impact of the problem had
escalated. She also justified her action by claiming that she did not yet have a gas fire fitted and therefore there were no safety consequences as a result of her behaviour.

Figure 4.4. Photograph showing blocked wall vent

Participant D1SR was proactive in seeking a solution to the problem by attempting to purchase an alternative vent cover which she would be able to close. Although such an item was stocked by the shop, she was advised not to purchase one and therefore attempted to rectify the problem herself but was unable to source a suitable solution.

A further problem reported by this participant was that of excessive hot water temperatures. The extract from her diary is shown in Diary Extract 4.2.
Diary Extract 4.2. Taken from the diary of participant D1SR
(Extract commences on day 1 of her diary)

Day 1
'My mother and myself have been really burnt by the water, we haven’t quite worked out how we can reduce the temperature of the hot water because it’s absolutely fiery hot. I’ve just got to be careful in terms of safety issues with that'

Day 7
'The water is incredibly hot, that’s something I’ve noticed and I need to really sort out what to do about that'

Day 8
'The hot water is very very hot, erm, which I have noticed, I shall have a word, I think the site manager is coming up tomorrow just to sort that one out'

Day 10
'I didn’t mention yesterday, the hot water, when I mentioned it to the site manager he said that the thermostat on the boiler, I had set it too high but I’d set it at what I was told that I had to set it at maximum but in fact that’s what’s making the hot water so hot so I’ve re-adjusted that'

Day 23
'One thing that my brother-in-law said, he feels that the hot water is, you know, could scald someone, I need to really look into this because the way I had been told was that you have to turn down the thermostat on the boiler, and he says it normally would be on the tank so I need to have a look at that because it not obvious if there is a temperature gauge on the tank so I’ll have to have a look at that again because it could be an issue, I was conscious that it was hot but obviously if it is going to, you know, be a problem, and my concern is if you turn it down on the boiler, does that turn down the temperature in the radiators, obviously they are individually controlled radiators but the actual temperature of the water would vary, so I’m not a hundred percent sure on that one'

The above example shows extracts from the diary of participant D1SR and documents the problems she and her family experienced with the temperature of the hot water within their home. The problem was initially reported in her first diary entry, after both the participant and her mother had sustained scalds from the water. It was over a week later that this participant described how she was proactive in making a conscious effort to solve the problem by speaking to the site manager. Following advice from the site manager, the thermostat on the boiler was adjusted, but it would appear that this did not make any difference to the temperature of the hot water from the taps. The problem was reported again in a diary entry on day 23.

No objective measure of the hot water temperature within this home was obtained. A lack of information regarding the control of the water temperature contributed to the problems experienced by this particular participant. Even
after seeking expert advice from the site manager, she continued to experience the problem.

Poor understanding of and a lack of information regarding the features and systems within the home contributed to a number of the problems experienced by participants. Diary Extract 4.3 shows the diary entries made by participant D5SH who experienced difficulty in using her storage heaters.

Diary Extract 4.3. Taken from the diary of participant D5SH
(extracts commences on day 23 of her diary)

Day 23
'It's six o'clock and I want the heating on, it's freezing, it's so cold in here, but I can't put them on because they're storage heaters and I didn't switch them on last night. They are just stupid, they are supposed to be economical but we have to judge the temperature the day before, how much heat you are going to think you need the day after and set it up for storing the heat over night and the following day it gradually releases the heat, but at this time of year you don't, you just don't know what you are going to want, do you? So I didn't switch them on yesterday because it was baking hot, when the sun's in here you just don't need them on. I just want, I want to be able to put them on when I want them on, I want to switch them on when it's cold, but I can't. I've got to get used to the storage heating and plan for the day after which I don't think, which is daft, I just want them on a thermostat or something so I can stick them on and when the temperature gets cold they'll come on. I don't know, I think they are daft'

Day 32
'Today we are going to switch all the radiators on, we are going to brave it, so we should have a bit of a warmer house now. The instructions say we have got to put them on full blast because of them being new so they are probably going to stink a bit so for the two days you have to keep them on full. So we are going to try that over this weekend and then apparently you have to turn them all down and it'll set the temperature and then they'll just charge up every day apparently'

Day 34
'I've decided that I absolutely hate storage heaters and I never want them again. The next house I get I'm not having these things, I don't get them at all. We did the full blast thing for two days over the weekend and I assumed they had to charge up over night during the cheap hours on economy seven, but by the time we got back from the fireworks on Saturday night I could feel the heat coming off them, so are we getting ripped off and they are charging up during the day? I just don't get it, anyway and the instructions say that we have got to turn them down to zero and then turn them back up again until we hear a click and that apparently sets the temperature, well I have just done that and there's no click so do I carry on going right to the top, they are going to be on full blast, there's no click at all! The heater in the living room, it's absolutely freezing in here, there's no, there's no heat coming off it at all, it's weird. But I don't know if we have done it right, because the instructions we were given with our moving in pack aren't even the right instructions for this model'

Cont.
Day 38
'Just to let you know that [my partner] has been to the site office and the site manager is apparently coming round tomorrow to have a look at the radiators to see why they are not clicking and also he is going to try and find us a set of the proper instructions, so I believe that one when I see it, it took them three weeks to find my window keys so I can't see them jumping to come round here tomorrow'

Day 43
'Just to let you know that nobody turned up about the heaters which I am not surprised about, so [my partner] has phoned Creda direct instead, and the bloke there reckons it's impossible for them to charge up at any other time other than on Economy seven, so I will check the bill when it turns up if it's ridiculously high then, but there's nothing else we can do until then I suppose. He says that it probably heated up because it was the first time it was switched on, so it would start charging straight away, but nowhere does it tell you with Powergen what time the cheap rates are so, we will just have to go along with it for now I think. He is sending, he is going to send us an instruction pack in the post for the one in the living room, but apparently we have done it right anyway! And it just needed a few more days to heat up so that feels nice and warm now'

Day 55
'We have sorted the heating out, just update you on the heating. It's all running okay, it's not brilliant, it doesn't heat the house up great like my Mum's but it's something I will have to live with I suppose. I wouldn't have storage heating again in my next place though'

Having not encountered storage heaters previously participant D5SH expressed frustration at not being able to control the temperature of her home easily. No further action was reported until day 32 whereby having read the instructions for the heaters, she reported that she was going to turn on the heaters. Further frustration is evident in her diary entry for day 34 where it is reported that she had been provided with the wrong instructions for the heaters. During the following days she is active in seeking a solution and in her entry for day 55 it is reported that the heaters are working, but not to her satisfaction. She reported that this is a situation she will just have to accept!
Diary Extract 4.4 shows entries from the diary of participant D1SR which illustrates the process of organising the home post occupation.

Diary Extract 4.4. Taken from the diary of participant D1SR
(extract commences on day 4 of her diary)

Day 4
'The house is looking really untidy, there are bits everywhere, every time we go over to the house we bring another box load of things over for the kitchen'

Day 7
'It's a game of chess in a way, we can't move something until something else moves and I suppose it's always difficult at this stage knowing which piece gets moved first'

Day 8
'You do get used to seeing things and walking past things that you don't necessarily want to stay but you know, you move one thing and you have to move something else to make room for something else and this is why the garage is so chock a block, we haven't really got room to put some things anywhere else'

Day 10
'We are almost at the stage where I can see that there will be a lull for a little while until we get things organised, and you start getting used to seeing bits and pieces around'

Day 11
'My room as it's quite a big room is becoming a dumping ground, a spill over for lots of bits and pieces'

Day 12
'My room seems to be getting more and more cluttered and we are getting to the stage where we can't find things. I think the house at the moment looks a state, it almost looks worse than when we moved'

Day 19
'Really need to start sorting out a few more bits in the house because there are bits that are everywhere still, erm, it seems to have taken a step backwards, I feel it's worse now than it was earlier in the move, because you are starting to use things and not necessarily putting things back'

Day 20
'So I spent some of the days quickly trying to sort out the house yet again, it was looking a little bit neater and making sure that the sitting room and dining room in particular, the kitchen has always been fine, I've sorted that out, but less crowded and putting a few bits away and sort of shoving things into the garage'

Day 33
'So it's nice to catch up on householdy bits and tidy up a bit and hoover thoroughly'

During her initial diary entries participant D1SR reports untidiness within her home after moving in and goes onto describe how moving items becomes 'a game of chess' and how one room in the house becomes a 'dumping' ground for bits and pieces. She refers to clutter within the home which she feels is an
annoyance rather than a health and safety risk. It is not until day 33 of her diary that this participant recounts that the home is now tidy.

In the previous study (Chapter 3) a number of participants described using the garage as an additional storage area and this was also reported within some of the participant diaries. Diary extract 4.5 is from the diary of participant D1SR who describes how she utilised the garage as a useful storage area.

**Diary Extract 4.5. Taken from the diary of participant D1SR**

(extract commences on day 6 of her diary)

<table>
<thead>
<tr>
<th>Day 6</th>
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</thead>
<tbody>
<tr>
<td>'The garage is absolutely chock a block, furniture that's going to my husband's house actually wouldn't fit in, so the garage is chock a block'</td>
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</table>

<table>
<thead>
<tr>
<th>Day 7</th>
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</thead>
<tbody>
<tr>
<td>'I've started to take some bits out of the garage and some things have gone to the dump which has created a little bit of space, there's still a major amount in the garage, a major amount, you can't walk from, you can go from one end and go from the other, but you can't walk through it. But thank goodness for garages, that's all I can say'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 9</th>
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<tbody>
<tr>
<td>'Real fun and games trying to get the bikes in and out of the garage just because of the lack of space in the garage but we seem to have managed'</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Day 12</th>
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</thead>
<tbody>
<tr>
<td>'Still waiting to shift things around in the garage'</td>
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<thead>
<tr>
<th>Day 15</th>
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</thead>
<tbody>
<tr>
<td>'Our garage is a little bit clearer we can move around, the boys had a bit of a sort out so I can, you can't walk from front to back yet, hopefully that will happen quite soon'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 16</th>
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<tbody>
<tr>
<td>'I managed to organise for one of the charitable organisations locally to come and collect some furniture that is in the garage. They are actually coming today on Tuesday which will be great because that will free up some space to organise the garage better and move things around in the house, that are housed in very temporary accommodation, so I'm really pleased that I was able to get somebody to come so quickly'</td>
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<table>
<thead>
<tr>
<th>Day 17</th>
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<tbody>
<tr>
<td>'LOROS came and took some of the furniture in the garage, quite a big wardrobe and two settees which has created, in my mind a massive space, there's still a huge amount of stuff to be sorted out in the garage but you can walk to it back and front, it's much easier to be able to get things, I have been using the garage and it's like an extra room, it's great. And I've been able to access the fridge freezer, the second, I've got a fridge and a freezer in the kitchen but an actual fridge freezer combination, the spill over particularly at Christmas is really nice to have, I could access that and get the Hoover and brushes and things, but I wasn't able to walk through and particularly for the children over the Christmas holidays when they want their bikes and bits and pieces and for me to find things that I don't know where they are because they could still be in the garage, it's easier to do that now, so that was a big breakthrough'</td>
</tr>
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</table>

Cont...
This extract reveals how useful the garage has been to this participant as an additional storage area. She describes it initially as being ‘chock a block’ yet despite it’s usefulness, the fact that the garage holds so much unwanted material is of concern to her. Participant D1SR expresses her relief when at last on day 35 of her diary; she describes having ‘sorted out the garage.’ The timing of this coincides with her tidying inside the house. This therefore suggests a time scale to the process of organising the home post occupation.

Within the diaries, 2 participants recorded their experiences of occupying a new home on a new build site with construction continuing of further properties. This brought both advantages and disadvantages for participants and these are illustrated in Diary Extract 4.6.
Diary Extract 4.6. Taken from the diary of participant D6KH
(extract commences on day 1 of her diary)

Day 1
'Having the builders still on site is a bit of a mixed blessing really, it's great that they are there and any problems that we have had like the problem with the wall in the bathroom, and also the shower didn't work when we first moved in, they had put the pipes on the wrong way round but we were able to get somebody to come out and sort that out straight away. The downside is they do turn up at a quarter to seven in the morning and have loud conversations outside, but they are very friendly and very accommodating, they have let us put rubbish in their skips and things so that's quite nice and obviously they are going to be here for a couple of years yet I would think. Definite down side is that we do sometimes get people messing about on the building site and they try and get into the yard at night, you know, which is a little bit worrying, but as long as they keep their attention on bricks and not on our house, we should be okay.'

Day 5
'We did get kept awake for a bit last night. Our, the front of our house is directly opposite the gates to the builders yard and they are great big wooden gates with a chain that holds them shut and it makes a hell of a racket when it's windy. So that can be a bit annoying at times, constantly getting up to see if somebody is messing about with it as well.'

Day 9
'This morning a ginormous tractor/digger went past very loud and the house shook apparently.'

Day 10
'But we did get woken up at half past seven this morning by that digger thing that made the house shake on Friday.'

Day 12
'Apart from the fact that the builders left the gate to the yard open over the weekend so we had lots of stuff stolen from there, but that's not our fault.'

Day 15
[My partner] is on nights at the moment and the builders are keeping him awake a bit, but I suppose we have got to expect that a bit because we can't really moan too much.'

Day 22
'It's probably quite good still that the builders are here because we are probably getting things done quicker than we would if the road was adopted and we were relying on the council to do it! So, swings and roundabouts.'

Day 24
'We had a bit of a funny night last night, the joys of living near a building site. We were woken up at about three o'clock in the morning by somebody climbing over the security fences. By the sound he was quite drunk, he was talking to himself and I thinks he cut his hands to shreds whilst he was climbing the fence but, about twenty minutes later, he must have worked his way up to the Westbury homes site because they have got a motion detector thing which sets off an announcement that tells you that you that you are being watched and recorded on CCTV and it's quite loud so we could hear it from, from our house.'

The reported advantages of being one of the first to occupy a brand new home are that the builders are still on site to rectify any problems which arise with the home swiftly. The reported disadvantages include the accompanying
disruption as construction of additional properties takes place. In addition, participant D6KH describes a situation where the builder's material was stolen and another instance where an intruder was able to access the site. This highlights an additional concern for the safety of personal property under such circumstances.

Inconvenient aspects of design within the home were also recorded by participants within the diaries. One example was provided by participant D1SR who reported that the location of her tumble dryer prevented an extraction hose being fitted in the normal way. This situation was initially raised during the entry made for day 13 and was obviously given some thought by this participant, as reported in her final diary entry some months later. Her diary entries are shown in Diary Extract 4.7.

**Diary Extract 4.7. Taken from the diary of participant D1SR**

(Extract commences on day 13 of her diary)

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**Day 13**

'I'm a little bit concerned about the tumble dryer, where the tumble dryer is. I don't think there seems to be that much room to put a venting hose in. I shall, I forgot to mention it to [the handy man] today, I shall mention it to him when he comes back on Monday'

**Day 15**

'The utility, I'm concerned about the tumble dryer space because there's not very, I've got a non-condensing tumble dryer and it's perfectly adequate, it's about four years old and it's a really good tumble dryer, a condensing tumble dryer would solve the problem but I feel that something like a tumble dryer, unless you really need to get a new one you wouldn't change it. So I need to raise that because I don't know if they are going to put the vent in'

**Final Entry**

'I have had a big debate over the tumble dryer because there really isn't a convenient place to vent the tumble dryer, erm, again I think I probably noted this before but when people have, a couple of people have had a look at it, one of them being the handy man I have and also the guy who was the site manager came back, a while back. He, they said that really I would have to vent, go out through the wall between the utility and the garage and then go out through another wall of the garage, it's like two different movements, and I don't particularly want that because it will really tie up that corner of the garage and it just seems to be a great big faffle so I have actually made do, and I should really keep doing it with pulling the tumble dryer cut so that the, I have lost the connection would you believe it between, I have got the hose but the thing that keeps the hose in position within the tumble dryer is missing, so what I have been doing is just opening the door, sorry not opening the door, pulling the tumble dryer out, putting on the extractor fan, opening the garage door so there's enough air, which is not really satisfactory. So I may get a condenser dryer which would solve that problem. That's something perhaps I'll get in the summer or early autumn. There is actually nothing wrong with the tumble dryer but I think I can't go on with that situation because I don't think it's a good situation to be in really, so I shall have a look at that in the autumn'
Snagging, the identification of minor faults within a brand new home was an issue raised by participants during the previous interviews (Chapter 3). Participant P1AL mentioned a number of minor issues relating to faults and snags within her diary. These entries are reproduced in Diary Extract 4.8.

Diary Extract 4.8. Taken from the diary of participant P1AL

(Extract commences on day 1 of her diary)

<table>
<thead>
<tr>
<th>Day 1</th>
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<tr>
<td>We've got a problem at the moment because the oven isn't working, when we went to use it for the first time it was turning on sometimes, but other times it wasn't turning on at all and sometimes when it was on it would just turn itself off. [...] I noticed yesterday that when we turn the hot tap on in the main bathroom, water leaks from the sink, it's hard to explain but it's the plumbing or the wiring from the sink, it's not the actual tap or itself, it's the wiring underneath it, something's leaking onto the floor so we need to get in touch with the builder and ask them to come in and have a look at that.</td>
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<thead>
<tr>
<th>Day 5</th>
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<tbody>
<tr>
<td>'I spoke to the site foreman this morning[...] I've also told him about the problem in the main bathroom where the, every time you turn the hot tap on the water was leaking out the back of the basin and down the wall so hopefully he can get that sorted.</td>
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<tr>
<th>Day 20</th>
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<tr>
<td>'I've just noticed as well tonight in our en-suite bathroom, there's a massive, damp patch on the ceiling, and M has been up in the loft to have a look at it and it looks like a hole in the roof to let the air that the extractor fan extracts from the bathroom is actually letting in water, it's been raining really heavily the last few days and so it's obviously let in a lot of water and it's going down into our bathroom, so I'm feeling a bit fed up about that, I'm going to have to talk to them tomorrow and hope that they are going to be able to do something about it, I'm a bit fed up, it's quite a big stain and it's obviously all going brown round the edges cause the damp, so I'm a bit fed up about that. We've got a razor socket in the bathrooms and [My husband] brought a razor that would plug in directly to that seeing as we had a razor socket, but the one in the en-suite bathroom isn't working so when I get them in to do the ceiling I'll have to ask them to do that.</td>
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<tr>
<th>Day 21</th>
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<tr>
<td>'I spoke to the building manager this morning and he didn't seem that bothered or that concerned about the fact that our roof was leaking, he seemed to think it was just the extractor fan vent must be loose so he was going to send someone up a ladder to see if they could fix it. I know I shouldn't, but I feel a real nuisance when I ring in with these problems and I ended up not getting a chance to tell him about the sink leaking and the shaver section not working, just simply because I felt like I was being a pain and I know I'm not but it just that's the way it makes you feel. The other thing was that when I told him that the ceiling was all wet he didn't seem bothered about repairing that or anything, he just seemed to think he'd just fix the vent on the roof and that would be it, and the ceiling, although it's still wet now, when it's dried out it might be brown and horrible and I don't want that.</td>
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<tr>
<th>Day 22</th>
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<tbody>
<tr>
<td>'Still haven't been to the site office or to the builder about the problems in the en-suite, but the damp patch on the ceiling of the en-suite doesn't seem to be getting any better, it's still quite wet though because the weather's still being awful, at least it's not getting any worse.</td>
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Cont..
Day 24
'I've noticed that some of the doors are beginning to stick, the bathroom door and the back door seem to be getting a bit hard to, well not hard, but they are not opening and closing as easily so I guess we'll have to have someone in at some point to fix that.'

Day 25
'The en-suite bathroom ceiling seems to be drying out but it's got spots on it at the moment, it's not rained for a while so we don't know whether it's been fixed or not, they haven't told us whether or not they have fixed it, so, but it's looking okay at the moment. We just need to paint it when it's eventually dry. I suppose we could get them into do it but it seems like an awful hassle, it might be easier just to do it ourselves seeing as they have given us some paint. [...] I still do need to get the builders in to look at the shaver point in the en-suite and the leak in the sink but like I said earlier in the week, just really don't like doing it, I know I should but it's just a hassle to do it, but it's also, I just don't like doing it, it would be better I think if they had someone that was dedicated to sort these things out for you rather than a foreman who's just interested in building houses. When things go wrong I guess they are not really his priority, his priority is building more houses and not sorting out what has gone wrong so, it's difficult to go and talk to him, but I'm sure it's me rather than him but it seems like it's awkward and I don't like doing it.'

Day 28
'I still haven't been to or got in touch with the foreman about the electric, what is it, the shaver socket and leak in the bathroom. I know I really should but, I just can't be bothered. The leak in the bathroom ceiling seems to have dried out, it has rained quite a lot today and it doesn't seem to have got any wetter so hopefully they have fixed whatever was wrong, but it's still, it's not actually too bad, I thought there was going to be more of a stain on the ceiling but it's not really that noticeable so, I'll have to paint it but at least it's not too bad at the moment.'

Day 33
'I still need to talk to them about the drip in the en-suite bathroom and the shaver point and I did ask them for some glue and door paint and they haven't given me that so I need to chase it up but as I said already before it's, I really can't be bothered so I'll have to force myself to do that soon.'

Day 41
'I phoned [the builders] I've been moaning about it for ages and saying that I don't want to do it and that, he was really nice and he came round and he looked at the ceiling and he said that it was just damp because it hasn't dried out properly and to give it another couple of weeks and then he'd, to call him and he'd get the builders or whatever to come and re-seal the ceiling and then paint it, so that's good. He's also arranged for the electrician to come tomorrow to fix the shaver point and someone else to come and plane the bathroom door that's broken, that's swollen and not working properly. The sink in the en-suite that I thought was leaking seems to have stopped now so hopefully that's good, but if it starts again I'll just ring him and when I ring him about the ceiling I can mention that to him. So I was quite pleased about that all being sorted.'

Day 67
'I've made a list of all the bits and bobs that the builders need to come back and do, the bathroom, en-suite ceiling is still wet so I haven't rung them to get them back to re-seal it and paint it, but I might give them a ring sometime soon to sort that out.'

Day 76
'The builders have been in today, they've fixed the extractor fan, they've repainted that and sealed it and they've fixed the, all the stuff in the bathroom and the air vent in the third bedroom. They haven't, well for some reason or other they've planed the bottom of the third bedroom door so there is a massive gap now between the floor and where the door starts and they haven't fixed the actual door socket thing, so that's a bit disappointing but I guess I wasn't clear enough in my instructions. And they are coming back tomorrow to finish off the ceiling in the en-suite, so that's good.'
These entries provide a temporal view of this process. Initially, participant P1AL reported that she spoke to the site foreman about the issues and faults she had identified within her home. However, due to the number of times she had reported different matters and due to the perceived attitude of this representative of the company, she lacked motivation to report further snags; "I really can't be bothered so I'll have to force myself to do that soon." This resulted in participant P1AL living with defects within the home and contemplating organising remedial work herself. However, when she finally reported these issues to the same representative, a number of the snags were immediately dealt with.

Further diary entries from participant P1AL provide an insight into moving into a brand new home where only bare light fittings are provided by the builders. She describes the frustrations she experienced at not having any lamp shades or light fittings within the home. The extracts from her diary are reproduced in Diary Extract 4.9.
## Diary Extract 4.9. Taken from the diary of participant P1AL
(Extract commences on day 1 of her diary)

<table>
<thead>
<tr>
<th>Day</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>'We've not put any lamp shades or anything like that up yet, and in the living room we've fitted some ceiling lights and we've also fitted two wall lights.'</td>
</tr>
<tr>
<td>14</td>
<td>'I keep walking round the house and seeing all these bare lampshades, light bulbs and it's beginning to get on my nerves, I need to get that sorted but when you want nice light fittings, I've seen the one that I want for the dining room but it's not just a question of sticking up the lamp shade, it's an actual light fitting so I know that that's a lot of work and I can't be bothered with it, it seems that there's a lot to do still but it's, it will be worth it when it is all done, it's just taking time to do.'</td>
</tr>
<tr>
<td>19</td>
<td>'It's really beginning to get on my nerves now, light bulbs, I really need light fittings and lamp shades but I'm not sure we can afford, certainly the dining room, I'd like to get that all fitted but that one's eighty pounds so I think I need to wait to the end of the month to make sure I can afford that one before I buy it but they are beginning to get on my nerves. The other one that's really annoying me is on the landing, I want to get a lampshade for that or a light fitting so that's something I want to get done.'</td>
</tr>
<tr>
<td>35</td>
<td>'And we need lamp shades for the little bedroom that we are using for the office and the landing and the dining room. So I'd really like to get them done this weekend.'</td>
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<tr>
<td>45</td>
<td>'I did find a lamp shade that I liked for the landing but [my husband] said I couldn't have it because the light fitting in the lamp shade was too small for the light that we've got. We've got, apparently it's regulation that they have to put energy efficient light bulbs in the landing and the lounge in the house, so that's fine, it's all well and good but unfortunately there doesn't seem to be any lamp shades that fit them so it's a bit of a pain, so I'll keep looking for that. I think the only place we have seen them is Ikea, can't be bothered to go all the way to Ikea just for lamp shades, I'll have to keep looking elsewhere.'</td>
</tr>
<tr>
<td>67</td>
<td>'We also gave up looking for a lamp shade that would fit the light fitting on the landing so we've brought a new light fitting and a lamp shade, erm, but we haven't had a chance to put that up yet, but I can't wait to get a lamp shade on the landing, it looks horrible without it.'</td>
</tr>
<tr>
<td>73</td>
<td>'We've finally given up on trying to find a lamp shade that would fit the fancy energy efficient light or whatever it is that they've put on the landing and we brought a lampshade and a new light fitting. Fortunately, when [my husband] fitted it, he didn't have to take the actual thing that's stuck to the ceiling down, he left that up and just fitted the new light fitting to that and put the lamp shade on to it, so it looks much better, I'm happier with that, it seems a lot more homelier now with the lamp shade on it.'</td>
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Participant P1AL describes how energy efficient light bulbs were fitted within certain light sockets within the home. This is in line with current legislation. However, the installation of these light bulbs may create difficulties for
occupiers. This participant describes how she made a number of attempts to purchase a lamp shade which could accommodate an energy efficient light bulb. Despite these efforts she was unable to find an item that was compatible with such a bulb. She reports that because of this and the added frustration of not having a light cover she decided to replace the light fitting altogether with consequent exposure to health and safety hazards. This obviously counteracts the benefits of having low energy light bulbs installed within properties.

Participants from the previous study (Chapter 3) described cost as a barrier to the purchase of additional items over and above standard provisions within the home. A further example (shown in Diary Extract 4.10.) was provided in the diary of participant P1AL. She describes how the cost of a fitted burglar alarm was a barrier to it's installation by the builders:

Diary Extract 4.10. Taken from the diary of participant P1AL  
(Extract commences on day 1 of her diary)

Day 1
'There is wiring for a burglar alarm and all the wires at the moment are sticking out where the sensors would go, there're all sticking out in the rooms and there's the wires sticking out where the control panel would go, so we need to buy that. The house builders were going to charge us five hundred and eighty pounds but if we went to the electrician who would have done it on behalf of [the builders] they were going to charge us three hundred and fifty pounds but because we have got a cat we are probably going to end up paying a bit more because we want one that's got pet sensors, so we'll probably end up paying about five hundred quid anyway unless [my husband] or my Dad or someone can have a go at fitting it but I don't know how easy it would be'

Day 14
'And the other thing that we need to do which is getting on my nerves now is the burglar alarm because [the builders] have done all the wiring but they've just left great big bits of wire hanging out you know parts of the wall, I've got a big hole when you come into the house where the control panel would, you know, the control panel needs to be and then in all the downstairs rooms and landing there's wire sticking out the wall for the sensor, and then in the cupboard, you know where you hang your coats and that there's the control box thing, there's a huge pile of wires that needs to go there and it's not like you can not put the burglar alarm in, there's just a hole in the wall where the wire is so we do need to get that sorted. The people, the electricians who work for [the builders] want, I think I've already said this, want five hundred and fifty odd pounds to fit the burglar alarm with pet sensor sensors so that the cat can come and go as she pleases which is what we need really, but it seems awfully expensive when the wirings already there and all they have to do is put the control panel on and the sensors up so we are going to ring round on Friday, I'm going to ring round and see if I can get it cheaper anywhere, because I would like that done as well'

Cont.
Day 17

'We phoned round some electricians about the burglar alarm but unfortunately they were shut because it's a Saturday so we weren't able to do anything but [my husband] has decided that he is going to have a go at doing it himself so we need to find a burglar alarm that we can buy, but we don't want to buy one from B and Q because then anyone who knows anything about burglar alarms will know that we have just got a B and Q do-it-yourself one which perhaps might not be as secure as others, so we've found a specialist electricians we can ring next week and see if we can get an alarm from them. So we haven't really done very much, we went to Macro and found an extendable ladder that goes up to five and a half metres and seeing as [my husband] is going to have to fit the burglar alarm sign to the outside of the house we need a big ladder so we ended up buying that.'

Day 19

'[My husband] brought, managed to buy a burglar alarm today so he spent the evening or part of the evening fitting that. So far he has fitted the control panel by the door where you plug in your number and he's started to fit two sensors, we've got five all together that need to be fitted. They don't seem to be causing too much of a problem for him, the biggest problem that we've found so far is that we've brought pet sensors so that our cat can wander round the house when the alarm's on and one of the sensors is opposite the stairs so, and the pet sensors say don't put a pet sensor opposite the stairs because if the cat is or the animal is more than 1.5 metres high off the ground then it will set the alarm off so that's a bit of a pain, we either don't bother putting a sensor there or we don't bother putting pet sensors in anywhere. Haven't decided what we are going to do with that yet, and perhaps there is a way round it, but we need to look into it but it's a bit of a pain that the sensors pointing towards the stairs, it's also a bit odd because there is a sensor on the landing but there is no sensor pointing towards the front door which is a bit odd, you would think it would be more sensible to have a sensor pointing at the front door rather than the stairs but anyway that can't be helped, that's just the way the electricians put the wiring in the house when it was built. But that's good, we saved quite a lot of money on that, a quote we had for a pet sensor alarm from the electrician who was employed by Bloor to build the house was about £570 pounds, [My husband] has brought the alarm for £130 with pet sensors so we've saved quite a lot of money there, that will be good if we can get it fitted which it seems like we should be able to because it doesn't seem too difficult.'

Day 20

'[My husband] has managed to really fit the burglar alarm now, he's got all the sensors up I think, and the box outside the house, he's just got to do the control panel in the cupboard where it all links up whatever, so he's going to do that tomorrow night.'

Day 21

'[My husband] is doing really well with the burglar alarm, he's got everything fitted but for some reason it only works with the battery, the back up battery, not with the mains power, he's got it all fitted but it just, unless we connect the back up battery it doesn't work so he's having trouble working out that, so so far tonight we were without power for the first hour that we got in from five to six while he looked at it and then we stopped for tea and since about eight o'clock we haven't had any power.'

Day 24

'I left [my husband] working on the burglar alarm. He finally got it sorted this afternoon, one of the main reasons why it has taken so long it turns out was because one of the wires for it up in the loft, a great big chunk had been taken out of the wire so the electricity wasn't getting through to the sensor which was the big problem so he's managed to fix it. [...] And what we've decided to do with the sensor down in the, on the, in the hall that's in the wrong place for a pet sensor is put a sensor in there but just disable it on a day to day basis.'

Cont..
Day 25
'[My husband] brought some box thing whatever to cover the wire that he has fixed up in the loft so that the burglar alarm can work so that was good and we fitted that today with no problems, so that was good'

Day 45
'We've also got to put up the final burglar alarm sensor point'

Day 58
'I'd like to get the last sensor for the alarm fitted so I'm going to try and nag [my husband] to do that over the weekend. That's the one in the hallway that we couldn't put a proper sensor up because we wanted pet sensors and the way the wiring is it would, it would even if we put a pet sensor up it faces directly to the stairs as soon as the cat wanted to come down the stairs it would set the alarm off so what we are doing is buying just a normal, well we've brought just a normal one and then every time we turn the alarm on we'll just disable that one apart from when like we go away on holiday and the cats not in the house'

Day 68
'[My husband] fitted the final sensor for the burglar alarm tonight'

This diary entry reveal a long drawn out process associated with the installation of the burglar alarm with the entries covering a total of 68 days. One of the main drivers for the diary participant considering a DIY approach to installing the alarm was cost.

4.4.7 Positive Design Aspects

The qualitative analysis of the diary data also yielded information regarding some features within the home which participants had spontaneously commented on in their diaries in a positive manner. These are detailed below.

Participant D6KH explained that one of the reasons behind the decision to purchase a particular property was due to the size of the garden and the fact that the garden did not contain a slope:

'Going back to why we choose this house, erm, I'd say also about why we chose this plot, erm, as you could see when you came to see us the garden, while by no means huge, is significantly larger certainly than next doors plot and most of the other plots and also it's flat as well, and as the development, most of it's on a hill, I think we have probably got the best deal on the garden really'
Participant D6KH also commented on the fact that she liked the fact that the garden was secure and that there was no access to the garden from the front of the property:

'We like the fact that you can't get into the garden unless you come through the house or the garage, security for the dog and also we haven't got a gate that potentially an intruder could let themselves in through, so that was something that was quite good when we were looking at the plot as well'

This is incongruent to previous findings where some participants have described having a secure garden as being problematic. This would suggest that not all occupiers view design aspects in the same way. What some occupiers find suitable and pleasing, others may have difficulties with.

Two participants commented on the fact that a double garage was a feature that they were satisfied with:

'As you come towards the house on the right hand side there are large gates, you open the gates and you have a driveway before you have a double garage, a big enough driveway that you can park two cars behind the gates. I really like that because obviously, it's enclosed and it's a private so, and also for safety reasons and that kind of thing when you are on holiday that will be really cool'

Participant D2DC

'And really like the double garage because we never had a garage before where we were and this is very easy for us'

Participant D3AM

The fact that some participants felt that there was adequate storage within their homes was another issue which led to satisfaction. This was illustrated in the diary of participants D2DC and D3AM:
'All the three other bedrooms have built in wardrobes and they are done in a very inoffensive way and that's really good because wardrobes are very ungainly often and take up a lot of space. Our bedroom has two wardrobes in it so that's also good'
Participant D2DC

'That was a good point actually, we all like the fitted wardrobes, it saves a lot of space, you know, storage is pretty good. There is lots of storage, there is a nice cupboard in the kitchen which we can put all our stuff in. We've got a big cupboard in the hall that's got, you know, suitable for coats and then upstairs three of the four bedrooms have got fitted bedrooms, so you know, there is space for storage everywhere'
Participant D3AM

Participant D4GJ mentioned additional storage above the garage being a benefit:

'The garage does have valuable storage area above in the roof space'
Participant D4GJ

Sufficient natural light within the home was another aspect which led to satisfaction among occupiers. This was mentioned by participant D3AM:

'I really love the light in the house, it's a really light house'
Participant D3AM
4.5 Discussion

This section provides details of the key findings arising from this study. These findings are discussed in terms of their relevance to the over-riding research aims and also in relation to their congruence with previous findings. Also detailed in this section are the limitation associated with this study.

4.5.1 Summary of key findings

The aim of this study was to collect rich and detailed information about how occupier’s interact with a brand new home with respect to health and safety. Furthermore, this diary method explored the temporal patterns of engagement within the home through the description of nine participants. The results support many of the findings from the previous study, reported in chapter 3, and in addition provide insights into how specific patterns of behaviour practised by participants are influenced over time. The key findings from this study are summarised below:

Participants independently reported concerns about a number of features within their dwelling which they thought were a hazard and which presented a risk of injury. These features included insufficient lighting outside the properties, self-closing fire doors, excessive hot water temperatures, sloped internal ceilings, the loft access hatch and egress windows.

A number of problems were described in the diaries in relation to specific design features in the home. These features included internal fire doors, the internal layout of the property and parking provision.

Participants were proactive in seeking a solution to a number of the problems reported in the diaries. Where a solution was not found over a period of time, this led to various behavioural responses including unsafe behaviour and acceptance of the situation. Unsafe behaviours were reported by participants in relation to a number of features within the home including internal fire doors, loft access hatches and air ventilation grills.
4.5.2 Environmental influences on home safety

The participants in this study independently described a number of features within their dwellings which they considered as hazardous. These features included internal fire doors, sloped ceilings and egress windows. In addition, the diary entries revealed a number of problems experienced with specific features within the home. Amongst the problems encountered, occupiers experienced difficulty with internal fire doors, the internal layout of the home and insufficient light within external areas. The results support many of the findings reported in Chapter 3.

In three of the properties internal self-closing fire doors were fitted in accordance with current legislation. All three occupiers made some reference to these fire doors within their diaries with two occupiers reporting that they wedged the doors open in some way. The third occupier described the doors as an ‘issue’. It is striking that given the level of inconvenience associated with the fire doors reported in the previous study, that participants from this study made very few references to them within the diaries. However, it may be due to the fact that by propping open the doors the diary users created a more convenient and acceptable environment for themselves. However, the actions reported by participants within dwellings where fire doors were fitted highlight the importance of human behaviour in fire safety engineering; it is evident from this and the previous study that the protection afforded by fire doors within some dwellings is negligible.

Excessive hot water temperatures, sufficiently hot to cause scalds, were reported by one participant in this study. The home is the principle environment in which burns and scalds occur (Runyan et al., 2005) and the need to control hot water temperatures to prevent injuries has been recognised for some time (Rennie & Ford, 1995; RoSPA, 2002). Such injuries are preventable, for example adjustments can be made to the thermostat (if fitted) on the water heater or an anti-scald device may be installed at the point of delivery (Stone et al., 2000). Barriers to hot tap water safety have been reported by Jaye, Simpson and Langley (2001) whereby the balance needs to be met between controlling for Legionella and allowing safe limits of water.
temperature. This further illustrates the interactions that are evident in shaping some elements of home safety which extend beyond primary and secondary based initiatives. Safe limits on the delivery of hot water within dwellings are not currently contained within Building Regulations in the United Kingdom, however, a recent move to bring thermostatically controlled mixing valves within the scope of building control has been announced (ODPM, 2004c).

There is no legal requirement for house builders to provide a loft access ladder which permits safe entry to the roof void within new properties in the UK. In this study, none of the properties were constructed or supplied with a fixed loft ladder. This replicates the previous findings in relation to this feature which were reported in Chapter 3. One participant installed a fitted loft ladder himself yet reportedly encountered difficulties due to both the positioning of the loft access hatch and the roof joists themselves. Clearly, there had been no thought regarding the future installation of a loft ladder at the time of construction. Cultural influences underpin certain aspects of behaviour in the home, including the interactions with the loft space (Korosec-Serfaty, 1984) and despite changes in construction methods which do not support using the loft for storage, the findings illustrate that some occupiers continue to behave in this way.

Additional hazards were described within the participant’s diaries whereby sloped internal ceilings and fire egress windows were a concern. Fire egress windows are not only a hazard to young children resident within properties but also for young children who visit. This was illustrated in one diary entry:

‘Both windows open quite fully, one of them you can't lock because it's a fire window, now if I had younger children I'd be a little bit concerned about that because they could easily climb out. Now it won't happen with mine but I've got nieces and nephews coming over Christmas and I shall have to remember that’
Once again competing factors are associated with this feature. There is a legislative requirement to provide a safe egress in new homes (ODPM, 2004a) yet falls from windows have been highlighted as priority concern for children (Spiegel & Lindaman, 1977). An on-line query of the most recent HASS data shows that in 2002, 1,230 children under the age of 14 were involved in a fall involving a window or balcony within the home (http://www.hassandlass.org.uk/query). Prevention efforts therefore need to consider a multitude of interacting factors; current primary efforts to provide adequate escape appear to focus solely on this need and fail to recognise the additional hazard presented by the installation of windows that cannot be locked. Some of the egress windows fitted within properties were fitted with a restricting device which could be over ridden in the event of an emergency. This type of device can reduce the risk for falls and consideration should be given to incorporating the requirement for restrictors on all egress windows within new dwellings.

The difficulties reported by participants due to a lack of external lighting reflect the concerns raised by participants in the previous study. No street lighting had been installed on any of these developments and whilst motion triggered lighting was attached to the front of properties, this was not at a sufficient level for residents to feel safe. ‘Secured by Design’ is an initiative supported by the Association of Chief Police Officers (ACPO), the government and industry partners which provides a minimum standard of design for safety and security within the built environment (Association of Chief Police Officers [ACPO], 2007a). The initiative aims to achieve a good overall standard of security for buildings and includes recommendations for new residential environments. Amongst such recommendations (which are discussed in further depth in Chapter 7) is the requirement for adequate lighting in communal areas on new build developments (ACPO, 2007b). It would therefore appear that a lack of lighting on residential developments has been recognised as an important factor in promoting safe communities. Given the difficulties faced by participants from this and the previous study, street lighting is an obvious social factor which can influence home safety. An ecological approach to the
promotion of home safety would permit consideration of this and other social factors when addressing injury prevention.

A further social influence concerns the level of parking provision provided with new homes. This is a matter which has previously been discussed in chapter 3 whereby the influence of planning regulation of the provision of parking was recognised. It would appear that car parking on new developments is a contentious yet continuing issue (CABE, 2005, 2007) whereby the need for needs of the residents need to be balanced against the restrictions on density. Car ownership within Great Britain is forecast to increase by an average of 46 per cent by the year 2031 with more households moving from 'single' car ownership to 'multi' car ownership (Department of the Environment, Transport and the Regions [DETR], 2005). This increase, combined with tighter density requirements is likely to lead to increased problems in relation to parking on new developments in the future. Government policy aimed at reducing the levels of car ownership are unlikely to be successful or popular (CABE, 2005) and therefore alternative measures which balance the needs of the residents within a sustainable development framework need to be developed.

The design of internal features within dwellings is also an area which warrants attention. In this, and the previous study, examples of poorly co-ordinated design aspects were identified. The location of essential services within dwellings should be an important consideration during design yet examples of poor practice remain evident in current new homes. For example, participant D1SR highlighted the inconvenient location of the telephone point within the dwelling and also drew attention to a glass door which when fully opened was obstructed by a kitchen work surface. Examples such as these can lead to occupier modification, and thereby can introduce further risks for DIY injuries.

### 4.5.3 The interaction between design and occupier behaviour

This research has demonstrated that some aspects of dwelling design can exert an influence on behaviour and patterns of behaviour have been identified which can change the nature of the home environment. For example, as described in the results section, the level of fire protection
afforded in some homes can be reduced as a result of a behavioural response to fire doors and blocking an air vent can lead to the build up of noxious gases. These interactions are important components for home safety which are not currently addressed in injury prevention.

Participants reporting unsafe behaviours were often aware that their actions had safety implications for those others occupying the home, yet they continued to engage in unsafe acts. The fact that they interfered with the fire doors accords with the suggestion that environmental modifications often require a behavioural adaptation too (Carlson-Gielen and Sleet, 2003). Such behaviours also suggest that strategies to reduce unintentional injuries and ill-health within the home which are aimed at education alone may be ineffective in preventing unsafe behaviour. A combined approach of education and environmental redesign maybe more effective.

4.5.4 Temporal patterns of engagement

The temporal analysis of diary data provided information regarding how some occupier interactions with the home develop and unfold over a period of time. Where problems arose within the dwellings, participants were initially proactive in seeking solutions. The fact that participants reported proactive attempts in seeking solutions to problems by seeking advice and information on alternative products indicates that they value their health and safety within the home. Indeed, an awareness of the importance of certain safety aspects was acknowledged. Unsafe behavioural responses therefore appear sometimes to be a secondary response after proactive attempts are unsuccessful.

Proactive attempts to solve difficulties were not always successful because of the lack of information provided to participants, and this led to frustration for some participants. Examples have been illustrated whereby participants were provided with poor or inaccurate advice together with incomplete instructions for some of the systems operating within the home. These findings would suggest that one way to improving occupier safety would be to encourage
developers to provide detailed information in a usable format to all new build occupiers.

The diaries also provide a flavour of the time period taken to organise the dwelling. For some, this process takes longer then for others. With clutter located in and around the house there is an increased risk of slips, trips and falls, this risk is heightened as occupiers become increasingly tired. It is interesting that participant D1SR described the clutter within the home as an annoyance factor rather than as a health and safety issue; clutter is a recognised risk factor for falls (Haslam et al., 2006).

The utilisation of the garage for additional storage is a recognised behaviour amongst home occupiers (Forrest & Murie, 1993; Leishman et al., 2004; CABE, 2005) and as available storage space within new dwellings decreases it is likely that garages will be utilised further as storage space. As with the home itself, the garage is organised over a period of time, and is viewed as valuable additional space, not only for infrequently used items but for general day to day articles such as a freezer and vacuum. Viewed by occupiers as an additional space, it is possible that the garage will be used less and less in the future for vehicles. This will have an impact on the planning of parking provision on new build developments and is an issue which designers and planners need to take into consideration.

As discussed in the literature (Chapter 2, section 2.2.5), unintentional injuries are more prevalent in dwellings where there is noise at night (WHO, 2004). Those who are among the first to occupy a new dwelling on any given development may be exposed to additional noise as a result of the ongoing building work. On large developments, this may be over a prolonged period of time. Examples have been presented where residents were disturbed at night due to activities associated with the development. The presence of the builders can be viewed in a positive way as there is immediate access to a site representative, and although some occupiers reported that over time the noise at night was ‘annoying’, this annoyance appears to be off-set by the accessibility of site representatives. Developers need to be made aware of
this issue and take steps to reduce the potential for noise on any development.

Some of the problems experienced by occupiers are not apparent until they have been resident in the property for some time. This is particularly the case for ‘snags’, whereby minor corrections are required to some aspect of the dwelling. It would appear that whilst some occupiers are happy to report initial snags, after a period of time, this becomes an uncomfortable process for them and can result in occupiers living with defects within their home or undertaking the corrections themselves. This introduces the obvious risks associated with DIY activities.

4.5.5 Limitations of the study
The audio diaries used in this study provided an appropriate method of data collection. The participants embraced the opportunity to use the recorders to record their experiences, and although the length and detail provided within each diary varied between participants, the audio entries were sufficiently detailed to provide a strong sense of individual experience. Some of the entries made by participants were extremely comprehensive and hence provided a greater depth of data than would be expected within a written diary.

The diaries however varied in duration, the longest diary covering a period of 211 days, (Participant D1SR), and the shortest diary covering a period of only 9 days (Participant D7EW). Although participant D1SR sustained her diary over a considerable length of time, this is atypical of the sample. In most cases, the diary entries were made over the period of a few months covering no more than one seasonal time of the year. Temporal variations that exist between the seasons for each individual participant may therefore have been missed.

The participants recruited for this study formed a very small sample group and wide generalisation of the findings is not possible. However, despite the small sample size, systematic patterns of behaviour were reported which were in
line with previous findings (Chapter 3). Participants were recruited for this study by way of unsolicited letter inviting participation. Those agreeing to participate may have held strong views or encountered particular experiences which motivated or influenced their participation.

There were limitations in the use of the audio diaries. The use of diaries as a research method is prone to errors arising from incomplete recording of information, under reporting, inadequate recall and sample selection bias (Corti, 1993). Some participants forgot to make a daily entry or delayed making an entry until it was convenient for them to do so. Some entries were also combined by participants so that they made one entry which covered two days. This made the temporal analysis of the data more challenging. The retrospective nature of the recordings relied heavily on the participant’s accurate recollection and reporting of their experiences and it is possible that some information has been missed due to recall bias. However the likelihood of recall bias was reduced by encouraging participants to make a diary entry on a daily basis where possible, thereby minimising the amount of time elapsed between an experience and the account of this experience. The actual experience of keeping a diary for research purposes may have influenced participant’s personal interactions within the home environment, leading them to be more consciously aware of their behaviour than they otherwise would have been. This would have led to a higher level of reporting than would have been expected. However, utilising an unobtrusive method of data collection permitted the reporting of all interactions, including latent interactions which may have been otherwise missed by participants.

4.6 Summary and Conclusions
The importance of an interaction between occupier behaviour and dwelling design has not been well recognised in the development of home safety initiatives within the United Kingdom. This may be due to the lack of information available regarding such factors. In Chapter 3, it was suggested that complex environmental, behavioural and social factors underpin the interactions that take place within the dwelling and an exploration of these
provided fresh insights into a number of interactions which can influence health and safety within the home.

This study aimed to explore such interactions from a temporal perspective and has provided further evidence of the complex influences which shape the experiences within a brand new home. A number of the interactions reported by participants and described in Chapter 3 have been independently documented within a separate sample of participants.

The temporal data illustrate that occupiers are often aware of the benefits provided by specific safety devices and that they can be proactive in seeking solutions to difficulties experienced with various features within the home. This offers encouraging support for the value of education with respect to home safety.

A clear and comprehensive pattern of engagement within the home has been identified from the previous two studies (reported here and in chapter 3). Some of the influences which underpin and shape these behaviours have also been identified. Despite these two studies yielding similar findings, the results are confined to a small sample of participants from one geographical region within the United Kingdom. It is therefore desirable to build upon this knowledge to ascertain if the behaviours and problems are indicative of those encountered by a wider sample of individuals inhabiting a brand new home.
Chapter 5

A QUESTIONNAIRE SURVEY OF NEW DWELLINGS

5.1 Introduction

The previous two studies described in chapters 3 and 4 have identified various interactions that take place within the dwelling which can influence occupier health and safety. A number of these interactions can result in unsafe behaviour on behalf of occupiers. In addition, a number of problems have been described with certain design features present in new homes. The findings from the previous two studies have identified behavioural, environmental and social dimensions which can affect the risk of unintentional home injury or ill-health and have clear implications in relation to current home injury prevention strategies. The extent to which these interactions are indicative of the experiences of those occupying new homes remains unknown. This study therefore aimed to achieve quantification of these issues from a larger sample of participants.

5.2 Outline of research presented in this chapter

The purpose of the research presented within this chapter was to build upon the findings of the previous two studies to establish the prevalence of reported behaviours amongst a wider population. The previous qualitative studies were confined to a small geographical area and a wider study incorporating other areas within the UK would demonstrate whether earlier findings were existent outside of the original sample group. Frequency data gathered from a large scale survey would also provide a quantitative view of the scale of the previous findings, and a postal questionnaire was an appropriate research tool to use. This allowed the collection of data from a large number of participants from a wide geographical area.
5.3 Methods

A questionnaire was developed made up of 4 sections. Section 1 requested personal data from respondents such as age, gender and the household composition. Section 2 requested information about the type of property, tenure and their length of occupation. Section 3 contained questions relating to the design of the property and the questions were informed by the previous findings reported in this thesis. Questions were included which covered aspects of dwelling design and occupant behaviour.

Sections 1 to 3 used closed questions. At the end of each set of questions within section 3, respondents were given the opportunity to add any comment or to provide further information. In the final section of the questionnaire, respondents were asked to provide information about any additional concerns or problems they had in relation to any aspect within their home.

Explanatory notes were attached to the questionnaire which detailed the reasons for the study and provided the contact details for the researcher. Participants were assured that any responses given would be confidential and that all information would be used solely for research purposes and reported anonymously. In addition, participants were informed that their views were important and valuable to the research.

Before commencing the study, 8 volunteers completed a draft version of the questionnaire. They were asked to feedback their comments on the layout and wording of the questions and also to make comments about any difficulties they had in understanding or answering any of the questions. These comments informed the subsequent development of the final questionnaire which can be found in Appendix D.

A house builder from the Midlands area agreed to assist with this research. All individuals that had completed the purchase of a new property built by this company in the previous 12 months were asked to participate in a
postal questionnaire. In total, 794 questionnaires were sent by post to these addresses. A self-addressed freepost envelope was included to facilitate the return of the questionnaires. Included with the questionnaires and information sheet was a letter from the construction company, on company headed paper, introducing the research topic and encouraging occupiers to complete the questionnaire. Reminders were not sent to non-responding households for two reasons; the budgetary limitations of the sponsoring organisation and also due to data protection issues; the names and addresses of the construction company's customers were not supplied to the researcher. Participants responded anonymously to the questionnaire and therefore it was not possible for either the researcher or the construction company to identify which address each completed questionnaire was returned from.

5.3.1 Analysis
The data from the completed and returned questionnaires was coded by the researcher. Frequencies were calculated using the software Statistical Package for the Social Sciences (SPSS) version 14.

5.4 Results
A total of 142 completed questionnaires were returned to the researcher, a response rate of 17.8%.

5.4.1 Participant details
Of those who responded to the survey, 40.1% were male and 59.2% were female (0.7%, missing data). A wide range of age groups were represented in the sample, (18-25 (18.3%); 26-35 (44.4%); 36-45 (18.3%); 46-55 (7.0%); 56-65 (7.7%) and over 65 (2.9%), missing data (1.4%). A range of house types were also represented, terraced (12%), semi-detached (59.2%), detached (26.1% and other (2.8%). Of those responding, 22.5% lived alone, 6.3% were single parents living with children, 26.8% lived with their spouse/partner with children and 44.4% lived with their spouse/partner with no children. The value of the properties described varied between
£50,000-£199,000. The most frequently reported length of occupation of the properties was between 6 and 9 months. Of the 142 responses, 137 were owner occupiers and 2 were private tenants (2.1% missing data).

5.4.2 Environment – behaviour interactions

External area - sloped access

Sloped access, permitting easy non-ambulant access to the property, was provided in 33.8% of the properties, and participants from 72.9% of these properties stated that this path became slippery in wet and icy conditions (Missing data, 1.4%).

<table>
<thead>
<tr>
<th>Table 5.1 Summary of results - Sloped access to property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there sloped paths giving access to your home?</td>
</tr>
<tr>
<td>YES</td>
</tr>
<tr>
<td>33.8%</td>
</tr>
<tr>
<td>Does the sloped path become slippery in wet conditions?</td>
</tr>
<tr>
<td>YES</td>
</tr>
<tr>
<td>72.9%</td>
</tr>
</tbody>
</table>

'I have complained about this on so very many occasions as slipped holding my little boy'

External area – parking provision

Participants described insufficient parking facilities for their needs. A private driveway was attached to 88.0% of the properties (missing data 0.7%) and communal parking facilities were provided with 21.8% of the new homes. Of those with a private driveway, 64.1% reported that this was sufficient for their needs.
Table 5.2. Summary of results - Parking provision

<table>
<thead>
<tr>
<th>Question</th>
<th>YES (%)</th>
<th>NO (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have a driveway attached to your home?</td>
<td>88.0</td>
<td>11.3</td>
</tr>
<tr>
<td>Do you have sufficient parking on your driveway for your needs?</td>
<td>68.4</td>
<td>31.6</td>
</tr>
<tr>
<td>Is your allocated parking area within a communal parking area?</td>
<td>21.8</td>
<td>78.2</td>
</tr>
</tbody>
</table>

'Fallen out with next door as drive isn’t wide enough. Have to stand on their front garden when getting out of car'

Where communal parking areas were provided, (21.8% of the properties), inconvenience or difficulties arising though the use of this area were reported by 48.4% of that sample. Concerns were also expressed due to this area being unlit during the hours of darkness. Of those with a communal parking area 70% reported that this area was not lit and 71.4% of this sample reported that this caused them concerns. One female participant reported:

'Living alone with a baby I don’t park at night as feel very unsafe'

In addition, difficulties unloading vehicles due to car parking arrangements were reported by 24 participants. One occupier of a terraced property wrote:

'Unloading can be difficult at times as the parking area is located at the rear of the property which means coming through the garden and back patio doors'
External area – garage
A private garage formed part of 72.5% of the properties. Within this sample, 68.9% of the private garages were attached to the property itself. Only 37.3% of participants with a private garage reported using it for a vehicle and 84.5% of participants with a private garage reported using the garage for additional storage of household items. An electrical light was fitted in 70.6% of the properties built with a garage. Where there was no light fitted inside of the garage (29.4%) this led to difficulties for 90% of participants within that sample. An electricity supply was installed within 70.6% of the private garages, and where no electrical supply was fitted (29.4%) this led to reported difficulties for 83.3% of that sample.

Table 5.3 Summary of results - Garage

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have your own private garage?</td>
<td>72.5%</td>
<td>26.8%</td>
</tr>
<tr>
<td>Is your garage attached to your property?</td>
<td>68.9%</td>
<td>31.1%</td>
</tr>
<tr>
<td>Is your garage fitted with an electric light?</td>
<td>70.6%</td>
<td>29.4%</td>
</tr>
<tr>
<td>If there is no light, does this cause you any problems?</td>
<td>90%</td>
<td>10%</td>
</tr>
</tbody>
</table>

‘I put the electricity in myself as the builders refused to’

A light had been fitted in 70.0% of the private garages (n=72), but this was not always in a sensible position within the garage. One participant whose garage was attached to the property said:
‘The light is in a stupid place – not in easy reach if entering from house [...] so in complete darkness till light switch reached’

Internal area – fire doors
Self-closing internal fire doors were fitted in 35.9% of the homes. No fire doors were fitted in a further 59% of homes. In 3.5% of homes, the occupiers did not know if the internal doors were fire doors (missing data, 1.4%). Of the homes with fire doors, information regarding this safety feature had been given to only 33.9% of occupiers. In 70.6% of properties with fire doors occupiers reported propping these open in some way, preventing the self-closing mechanism from working. In 19.6%, occupiers reported having removed the self-closing mechanism from the fire door. In 23.5%, participants reported that some member of the household had experienced a finger trapping injury due to the fire doors. Where internal fire doors had been interfered with, or the self-closing mechanisms removed a number of reasons were listed by participants for such action. A full list of these reasons provided by participants is shown in Table 5.4.

Table 5.4 Reported reasons for interference with internal fire doors

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconvenience</td>
<td>21.1</td>
</tr>
<tr>
<td>Inadequate light</td>
<td>18.4</td>
</tr>
<tr>
<td>Concern for pets</td>
<td>15.8</td>
</tr>
<tr>
<td>Concern for children</td>
<td>13.2</td>
</tr>
<tr>
<td>Noise</td>
<td>5.3</td>
</tr>
<tr>
<td>Prevent injuries</td>
<td>5.3</td>
</tr>
<tr>
<td>Not specified / No reason provided</td>
<td>21.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
One participant with a small child described why the fire doors were propped open in the home:

‘Because we have a child under 2 years old and need to be able to see and hear him at all times. With one small child we find them very dangerous’

Another participant described a similar situation:

‘Frightened that children visiting the property will trap fingers, also very noisy when slamming shut. Very unsafe where children are concerned’

In addition to the associated safety concerns, participants described the inconvenience caused as a result of the fire doors:

‘The closers slam the door shut and make moving around difficult. For convenience we prop them open’

‘Having doors closed all the time does not create a nice atmosphere in the home and limits light. Also creates greater difficulty moving between rooms’

**Internal area – excessive hot water temperatures**

In 11.3% of properties, occupiers reported that the hot water temperature was too hot and in 37.5% of these properties participants reported that a member of the household had been scalded because of high hot water temperatures.
Table 5.5 Summary of results - Excessive hot water temperatures

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the temperature of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the hot water too hot?</td>
<td>11.3%</td>
<td>88.0%</td>
</tr>
<tr>
<td>Has any person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>scalded themselves</td>
<td>37.5%</td>
<td>62.5%</td>
</tr>
<tr>
<td>because the water is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>too hot?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

‘One of the children scalded their hand before the water temperature was turned down’

A hot water thermostat, allowing occupiers to control the temperature of the hot water was fitted in 78.9% of the homes. An additional 4.2% of participants reported that they did not know if the temperature of the hot water within their home was controlled by a thermostat. Mixer taps, allowing hot and cold water to be mixed at source were fitted in 64.1% of properties. However, 10.9% of these participants reported that although mixer taps were fitted within their home, these did not actually mix the hot and cold water to prevent scalding.

**Internal area – electricity cables/water pipes**

Of the 142 properties surveyed, a services map detailing the location of the electricity cable or water pipes was remembered as having been issued to 18.3% of these. A services map was not provided by the house builder for 79.6% of the properties, (missing data = 2.1%). Other information (written or verbal) was provided in 25.4% of the cases but for the remaining 71.8% of participants, no information was provided, (missing data= 2.8%).

When erecting pictures within their homes, 28.2% of participants reported that they used a services detector tool to locate the position of pipes and wires before drilling into the walls, and 84.5% stated that they did consider where the service cabling and water pipes might be located. A total of 16.9% stated that they had drilled into the walls with no consideration about where the water pipes or electricity service cables might be located. In 4
cases, this had resulted in the participant drilling through a water pipe or an electricity cable.

Some participants reported that although they used a services detection tool to locate the position of services within the wall, this would not detect the location of modern water pipes because they were made from plastic. One participant commented:

‘Water pipes are plastic, so detecting tool wouldn’t work’

Another made a similar statement:

‘Plastic coated pipes means we cannot use a detection tool – just have to guess’

For one participant this had prevented them from erecting any pictures within their home:

‘The water pipes are plastic (I was told) and run up the wall from the middle of radiator. I have therefore not put up any pictures’

One participant reported on the technique used to locate the pipes within their home:

‘Due to plastic pipes we have had to put the central heating on before putting pictures up. Pipes ’loop’ in the wall rather than following straight line’

Another participant explained that they had drilled into a water pipe whilst undertaking a DIY task:

‘Drilled into water pipe whilst putting up outside light’

Within the questionnaire, 7 participants made a written comment concerning what they deemed to be a lack of information provided to them about the
location of service cabling and water pipes within the home. These comments suggest that the provision of such information would be of benefit to new home owners:

'To be informed where they are would be beneficial'

And

'Could do with more information'

Internal area — allocation of space
Participants from 58.5% of properties stated that at the time they purchased their property there was insufficient storage provision for their needs within their homes, and 55.6% of participants stated that since moving in they had created extra storage for themselves.

Amongst the problems reported by participants, the lack of facilities to store common essential items such as an ironing board or vacuum cleaner was a common theme. One participant described the situation:

'Ridiculous — not one cupboard in whole house. Ironing board & ironing basket squeezed in airing cupboard, hoover, mops and buckets in garage, all homes need a cupboard'

And another commented:

'3 bed roomed home — not one fitted cupboard — downstairs or upstairs. Where do people put ironing board/hoover?'

In addition to these, a number of other written comments were made regarding the storage facilities within the kitchen. The following are examples of the participants' comments written on the questionnaires:
'Kitchen storage totally unacceptable for a family home [...] No storage for hoovers, coats, no downstairs storage at all'

'This is a 4 bedroom family home, we find there is not enough storage space, especially in the kitchen'

'Not enough storage space in the kitchen, poorly designed'

Some participants had created extra storage space themselves:

'We added extra shelving to the kitchen cupboards as there was a lot of wasted space'

'I have put shelving into the airing cupboard'

Whilst for others, the addition of extra storage was planned:

'Storage facilities very poor, we will add storage in the future, badly designed, very disappointed'

Internal area – internal layout
Sloped internal ceilings were reported in 33.8% of the properties. In 33.3% of these homes, participants reported that some member of the household had hit their head on the sloped ceilings. One participant described this occurring within the lounge:

'Sloped ceiling part of underside of staircase [...] people do hit their head on it as our settee fits under'

In 20% of the properties participants reported that the sloped ceilings had led to other problems. For example, when erecting curtain poles or moving furniture. One participant commented:

'[I] can't fit a curtain pole'
Newel posts are located at the top and bottom of a stair case and positioned at stair turns for structural support. These were reported as a feature in 26.1% of the properties from this study. Participants from 16.2% of these properties reported that some member of the household had hit their head on this feature. In one property the occupants had removed part of the newel post.

**Internal area – loft space**

All but 4 of the properties were built with a loft (accessible roof void) and in 103 of these properties participants had accessed this space since moving into their property. In 4 cases a ladder was not required to access the loft due to its location within the property, but in the remaining properties a fitted access ladder, providing safe access to the loft had been fitted by the construction company in only 1 case. A fitted loft ladder had been installed by a further 9 participants subsequent to their occupation of the property. In 89 of the properties, participants described gaining access to the loft in a variety of ways; by using a portable ladder \((n = 79)\), by using furniture to stand on \((n = 25)\), with the assistance of another person \((N = 39)\).

In 5 of the properties with a loft space, an electricity supply to that area was installed by the house builder. In an additional 7 homes, the occupants had installed electricity to the loft subsequent to moving in. In addition to a power supply, a light had been installed in the loft in 5 properties by the house builder, and in the other 98 homes with a loft, no light was provided. In 5 of these properties, the occupants had installed a light within that area themselves.

A number of occupants, \((5.6\%)\), reported that they had been advised not to place boarding on the floor within their loft or to use their loft for storage, one such participant wrote:

‘*Told not to store anything in it, everyone needs loft space – stupid idea*’
Participants also made various comments concerning the fact that a loft ladder, power supply and light were not fitted as standard by the house builders:

'I would have expected a ladder, light and boarding in the loft'

'No ladder, no light, difficult to access'

'A loft light is a must, power supply and socket would also be useful, and [it] does need a loft ladder'

**Internal area – egress windows**

A fire egress window, enabling escape in the event of an emergency, was fitted in 38.7% of properties, no such window was fitted in 50.7% of properties and 7.0% of the occupiers reported that they did not know if an escape window was fitted within their home, (missing data 3.5%). Information concerning a fire escape window was reported as being provided to only 31 of the 142 properties.

In 38.2% of those properties with a fire escape window, this window was not lockable in any way. A restrictor, preventing the fire escape window from being opened fully, which could be overridden in emergencies, was fitted to 49.1% of the windows in the properties. A total of 7 participants reported that they felt the fire escape window in their homes presented a hazard for falls. One participant explained:

'I am concerned because you can press a button and your child could fall out – upstairs windows have no locks'

**Internal area – unsafe behaviour**

Air ventilation bricks, installed to prevent the build up of carbon dioxide and other noxious gases, were fitted in 43.0% of the properties. In 17 cases, participants reported that these ventilation bricks caused a draught within
the property and 3 participants stated that they had intentionally blocked these with furniture or by some other means. One participant commented:

'Noisy if wind is blowing'

**External area – garden**

All 142 properties involved in this study were provided with a private garden. A total of 80.3% of participants reported that the garden met their expectations. A small number of participants (9.9%) reported that their garden was smaller than expected and 18.3% reported that their garden was larger than expected. A larger number of participants (57.7%) reported that their garden was on a slope. Where it was reported that the garden was sloped, 51.2% of this sample reported difficulties associated with the slope within their garden.

One of the main difficulties reported which arose due to the garden containing a slope was that of excess water pooling in one area. One participant living in a detached house said:

'It's very uneven and floods a lot. Slopes at the back causing water to pool when it rains'

Another participant from a semi-detached dwelling commented:

'The slope causes water logging at the bottom of the garden'

A further problem reported was connected to the maintenance and planning of the garden itself by the occupiers. One participant living in a semi-detached dwelling commented:

'Non level nature of the garden makes maintenance difficult'

Another participant described how the slope had caused them difficulties:
'The slope has caused problems when thinking about having a conservatory built'

A further participant described a problem erecting a shed:

'The main problem is the slope, as constructing a shed on this was ridiculous'

Three participants reported that they did not have adequate access to their gardens. In two cases, access could only be gained through the house or the garage and in one case, the occupiers could only access their garden through the garage:

'It would be good if we had a gate into the garden, instead of walking through the house'

'The only access to the garden is through the garage'

'No access from garden to front of property except through garage or house'

5.4.3 Sources of occupier knowledge
A home information pack, containing information about the materials used and the appliances within a new home, is provided to new occupiers as a standard procedure by the majority of house builders within the UK. Of the sample responding to this questionnaire, 59.2% of occupiers reported that they had read the whole information pack provided by the house builder, 33.8% reported having read some of this pack. A total of 76.1% of participants reported that they found this pack to be informative. A number of written comments were made by participants regarding their perception of the level of information provided within this pack:

'Rubbish, not relevant'

'Seems to give info to cover the builder! Not for the home owners benefit'
'Some information was missing, some not relevant (e.g. for the wrong house). Most was common sense'

However, this was not the only view explicitly expressed; one participant made a very positive comment in relation to the information they had received:

'We have found the information pack the most informative one we have come across'

5.4.4 Poor workmanship and quality of fittings

A number of the additional problems recorded by participants on the questionnaire were associated with the standard and quality of the internal finish for their home. Poor workmanship was commented on by a number of participants (7%). For example, one participant described having to employ a professional painter to complete the work on the property:

'We have been in our house 6 months and are still waiting for correctional work, also when glossing internal doors, could make sure run marks are cleared up, again, this has cost us extra money to pay a professional painter to correct shabby work'

A further two participants made a written comment about the standard of workmanship within their homes:

'Most of the teething problems would not have occurred if tradesmen had paid more attention and professional pride in their own particular jobs'

'The quality of work done on the house is of a poor standard which the builders have been unable to rectify so I have had to pay for properly qualified workmen to repair and make it more liveable'

The location of the electricity fuse box within the home caused concern for one participant who wrote:
'Electricity fuse box is located in the smaller front bedroom in the middle of the wall. At night the big red button is very appealing to young children, this is to be our child's bedroom in the future, what a stupid place to site a fuse box.'

5.4.5 Additional problems reported by occupiers

Whilst a number of participants had stated that there was no access to the rear garden other than through the house or garage, one participant commented that there was no access to get out of the property to the rear, and expressed his concerns:

'There is no access to get out of back of property and my brothers house nearly caught fire. I think this is dangerous and should be investigated'

A number of other problems were reported by participants. These generally related to internal design features which led to inconvenience for occupiers:

'The front door opens the wrong way to gain entrance to the kitchen; you have to close the main door every time you fetch something in'

'Positioning of light switches, especially in the kitchen, they are not beside any doors but tucked away in the corner. This does not make sense in the dark'

Another problem reported by participants was a lack of external street lighting. One participant described their problem:

'On-street lighting, we have none! We live in a cul-de-sac with 3 houses; [the house builders] informed us that we didn't warrant a street light. The area beyond the houses is thick woodland; hence we must walk in darkness to get to our respective houses'

The internal soundproofing of the properties was another area which participants made comment upon. For example one participant wrote:
'Noise insulation is appalling. You can hear everything going on in our neighbour's house'

Not all participants responded with negative comments regarding their home. Despite the fact that a number of comments were provided by participants which highlighted particular problems that they had encountered with specific features, a number of positive comments were also made by participants regarding their homes. For example, one participant was very pleased with their home and wrote:

'Very pleased with [house builder]. Would buy again'

And a further participant commented:

'I find the house comfortable and convenient and any changes are likely to be purely cosmetic. Compared to other accommodation in the area within my price range, it represents good value for money'

For one participant who was pleased with the design of their new home, the only negative comment made was in relation to after sales service:

'Beautiful home, love the layout and have settled in really well. Just a shame about poor customer service, who at times come across as unhelpful and uncaring'

5.5 Discussion
The aim of this current study was to build upon the findings reported in chapters 3 and 4 and to ascertain if these findings were prevalent amongst a wider population outside of the original sample area. There is a large degree of congruence between the results from this study and the previous qualitative studies (Chapters 3 and 4) but this may be due to the fact that the questions were based on the findings from the previous two studies.
5.5.1 Summary of main findings

The key findings from this quantitative survey are summarised below:

Participants reported experiencing difficulties with specific features and systems within their homes. These features included sloped access paths which became slippery in wet and icy conditions; insufficient parking provision leading to difficulties with vehicles; hot water provision whereby water temperatures were reportedly high and a sloped garden which led to difficulties with maintenance.

Participants reported unsafe behaviours in relation to some architectural features within their homes. For example when accessing the loft space the majority of participants reported they did not have a fitted loft ladder but used other means to gain access, including the use of unfixed ladders and furniture to stand on. In addition, in many of the homes where internal fire doors were reportedly fitted, participants reported interfering with the self-closing mechanism in some way.

Participants described a number of features within their home which they felt introduced an additional hazard for injury. These features included the internal fire doors which presented a risk of finger trapping, egress windows which caused concern for falls and descending newel posts which presented an additional risk of head injury.

5.5.2 Environmental influences on home safety

The findings described in this chapter illustrate that the environmental influences affecting individual risk of injury or ill-health within the home which were reported in chapters 3 and 4 exist within a wider sample of dwellings across the UK.

A high proportion of occupiers (72.9%) reported that the sloped access to their properties became slippery in wet and icy conditions. Fall incidence is subject to seasonal variation and sloped driveways which become slippery in wet conditions are a risk factor for falls (Bentley & Haslam, 1998, 2001).
Since the introduction of new measures to allow safe and easy access to dwellings for those with mobility difficulties, the majority of new homes are built with a sloped threshold. The findings reported here and in the previous chapters suggest that as the numbers of completed dwellings rise in line with government targets, this will increase the prevalence of risk for slips and falls among residents and visitors. One method of reducing the such a risk would be to encourage developers to use slip resistant materials for the surface of dwelling thresholds. Such an approach however would also need to consider the safe manoeuvrability of those in wheelchairs.

The problems experienced in relation to parking have been discussed previously within this thesis (Chapter 3, section 3.5.2). Communal parking areas are a design response to higher density guidelines yet there is a possibility that they will be under utilised by residents if they are unlit or introduce other difficulties for occupiers. It is recognised that parking provisions on new developments need to balance both economic and environmental needs, yet the effects of inadequate parking are sizable. Residents may utilise their front gardens and there may be increased pavement and on street parking. This will introduce further difficulties for residents in negotiating the community environment. There have been calls for residents' views and perceptions to be incorporated into the dwelling design process (CABE, 2005) and the difficulties encountered by occupiers which have been reported in this thesis need to be addressed. Serious consideration to the provision of adequate and suitable parking for both residents and visitors has previously been highlighted as a priority (CABE, 2005) and the findings reported in this and previous studies support this claim. A multi-disciplinary approach to planning where environmental, behavioural and social influences are jointly attended to may lead to improved community safety and increased health and well-being amongst new build occupiers.

Communal parking areas are provided for properties which do not have a garage. The behaviour of occupiers in utilising their garages for storage can lead to more vehicles being parked in communal areas where these are provided. With the projected increase of car ownership (DETR, 2005) the
difficulties identified as a result of this research are likely to increase. A number of the garages provided have been described as too small to accommodate a family vehicle. The size of domestic garages is likely to be influenced by the density guidelines for new developments yet the consequences of this for occupiers may not be recognised by those directing current policy.

The provision of mixer taps might appear a favourable solution to prevent burns and scalds from excessive hot water temperatures, yet the design of these safety measures needs to ensure that the hot and cold water is mixed at source. Mixer taps were reportedly fitted within 64.1% of the properties in this study but amongst this sample 10.9% of the participants reported that these did not actually mix the water to a sufficient degree to prevent scalding.

The majority of participants in this study reported accessing their loft space. These findings accord with reported behaviours from the first two studies (Chapters 3 and 4). The behaviours were reported despite some participants being advised not to board out or store items in the loft. Previous discussions in chapter 4 have suggested that occupiers are proactive in seeking and following advice, but the behaviours reported in this study indicate that certain circumstances may arise where professional advice is not followed. It is possible that the low levels of storage provided in new homes results in the loft space being viewed by occupiers as essential additional space. As mentioned previously within this thesis, a low cost solution to the problem of unsafe access to the loft space would be a legislative requirement for the provision of loft access ladders in all new dwellings. The location of the loft access hatch itself also warrants consideration, through addressing the design specifications of this feature and positioning it away from the stairs, this would remove the potential risk for serious injury in the event of a fall.

A large number of participants (n=82) reported that their garden was built on a slope. This caused difficulties in relation to maintenance of the garden.
and it was reported that this made plans to add a conservatory complicated. Furthermore, during wet conditions, the slope prevented the adequate drainage of water resulting in water pooling at the bottom of the slope. Whilst the previous studies had identified this as a problem for some occupants (see Chapter 3), the findings reported here indicate the extent of the problem; over half of those occupiers living with a slope reporting encountering difficulties in relation to this.

5.5.3 The interaction between design and occupier behaviour
The interference with internal fire doors by occupiers has been a consistent finding throughout the work undertaken within this thesis and is in line with previous published work (Pickett, 2003; DGLC, 2007c). Previous work undertaken by the DGLC met with difficulties whereby individuals did not wish to participate in the research due to the potential for comeback. This concern became a barrier to the provision of detailed information (DCLG, 2007d). It is possible that for the same reasons some participants in this study failed to accurately report their behaviours in relation to the self-closing fire doors. The extent to which this may be true cannot be determined. Even if this behaviour has been under-reported in this study, the combined results from this and the previous two studies provide a clear and comprehensive view of the householder interactions with self-closing fire doors.

A number of participants reported that they were unaware whether the internal doors within their properties were fire doors. A lack of knowledge and understanding was also expressed by some in relation to fire egress windows. There is obviously scope to improve the level of information provided to new home owners. A lack of knowledge amongst occupiers may explain why a small number of participants reported intentionally blocking the wall vents within their property. These vents are installed within new homes to prevent the build up of carbon dioxide and other noxious gases. In 17 homes surveyed during this research, it was reported that these vents caused a draught and in 3 of these homes the vents had been intentionally blocked by the occupier. Although this behaviour is not
reported to the same extent as that associated with self-closing fire doors, it is another consistent finding throughout this research.

Unsafe behaviours also arose in relation to electrical cables and water pipes within these new dwellings whereby occupiers reportedly drilled into the walls without considering the location of these services. In total, 16.9% of those completing a questionnaire reported that they had acted in this way and amongst these, 4 participants had accidentally drilled through a cable or pipe as a result. A services map, detailing the location of service routes, was provided for some participants but not others. This is surprising given that the entire sample were occupiers of a new home built by the same developer. A lack of information regarding the location of services within the home can potentially cause difficulties for residents and ultimately present health and safety risks as a result of occupier modifications.

5.5.4 Limitations of this study
The response rate obtained during the course of this research was low (17.8%). However, the house types represented amongst the returned questionnaires reflect current trends amongst dwelling stock within England as a whole (DCLG, 2007e). The study was asking for participants' cooperation at a busy and stressful time for occupiers, subsequent to moving home, and this may have had an effect on the levels of response to this study. It may also be argued that the data set is biased towards occupiers who had experienced a particular problem with their dwelling and whom used the study as an opportunity to express their frustration. However, in utilising any self-selecting sample within research, this issue of response bias cannot be completely controlled for.

Although the responses to this questionnaire were obtained from a sample within the UK, the participants were all consumers of one particular volume house builder. In utilising standard house types, any design elements are likely to be repeated within a number of different developments throughout the company's area. This may explain why certain problems or behaviours are more common than others.
There were a number of questions which were left unanswered by some participants. Where participants had completed the entire questionnaire and omitted just one question, this could be accepted as participant error. For some of sections, the participants may have felt that a particular question was not relevant to their circumstances. Other examples of missing data were also observed, for example, a small number of missing data points were observed for two questions relating to features where a high number of participants indicated that they did not know whether such a feature was present within their home. The features referred to in the questionnaire were wall ventilation bricks and egress windows. This may be due to one of two reasons, questionnaire design (in particular the descriptions of the features) or the fact that participants genuinely did not know enough information about the feature to respond.

5.6 Summary and Conclusions
The aim of this chapter was to build upon the findings of the previous two studies to establish the prevalence of reported interactions amongst a wider population. The chapter presented the analysis of 142 questionnaires completed by individuals occupying a brand new home. The findings show that the difficulties and behaviours reported by participants are not limited to a small geographical area or to those resident in one particular house type. Indeed, it would appear from these research studies that similar problems are faced by new occupiers in different types of dwellings within a number of different areas.

Standard house types are used by many of the developers operating within the UK and many of the dwelling designs are replicated again and again on different developments. Thus there is the potential for many of the problems identified during this research to be repeated in new dwellings in the future.

As a result of this research a number of social, environmental and behavioural influences which can affect the health and safety of occupiers within the home have been identified. Building codes and regulations aim to
ensure the health and safety of individuals within the built environment, but as this work has demonstrated, a number of current regulations introduce additional hazards. The issues faced by participants have been captured in this and previous chapters (chapters 3 and 4). As a fourth stage it would be appropriate to investigate these issues from the perspective of those responsible for dwelling design to ascertain the considerations given to the health and safety of occupants during the dwelling design process.
INVESTIGATING THE INFLUENCES ON CURRENT DWELLING DESIGN

6.1 Introduction
The previous three chapters documented the experiences of a sample of individuals occupying a brand new dwelling. The studies undertaken examined the interactions experienced within the home from the occupier’s perspective and identified a range of interacting factors which influence occu-plier behaviour within the home with regard to health and safety. As reported in chapter 2, the interactions that can arise between occupier behaviour and dwelling design have not been recognised to an adequate extent by home safety programmes; prevention strategies have tended to focus on environmental modification or behaviour change, ignoring the interaction between the two.

The findings presented in the previous three chapters highlight the important role dwelling design can play in shaping occupier behaviour, an influence that ought to be apparent to those involved in the design process.

6.1.2 The design process
The development of a new dwelling is a complex process with many factors influencing the shape and form of new housing. The planning system within the UK exerts a significant influence on what can be built, when and where, through the application of design standards. Whilst responsibility for planning policy and building regulations rests with Central Government within the Department for Communities and Local Government (DCLG), planning applications are dealt with by Local Authorities where they are required to meet the Regional Spatial Strategy and Local Development Frameworks. These policies direct the number of new homes and amenities which are required within an area in line with targets set by central government.
The private housing developer in the UK is responsible for all stages of the house building process, from land acquisition to estate and dwelling design. The process is speculative whereby houses are built in anticipation of demand (Whyte, Bouchlaghem, Thorpe & McCaffer, 1999). The actual design of the dwellings themselves is the responsibility of architects. A number of engineers and surveyors are also employed by major developers as part of an 'in-house' team of designers. The design of all new homes must meet planning requirements and building regulations. In the case of new developments, additional considerations are given to maintaining sustainable local amenities which will support the growing community.

The study reported in this chapter focused on the design of new dwellings within the UK from the perspective of a sample of architects and designers. Dwelling design has been shown to be an important influence in the safety of occupiers within new homes and therefore it is important to understand how the complex nature of the planning system and local authority control influences how architects and designers develop their designs.

6.1.3 Outline of research presented in this chapter
This chapter describes the findings from semi-structured interviews conducted with design professionals with experience of dwelling design*. In total, 14 interviews were conducted with architects and designers to examine what these professionals believe influence and guide their designs.

6.1.4 Aims and objectives

The aim of this study was to examine the considerations given by architects and designers to reducing unintentional injury within the home through careful design. The specific objectives of this study were to:

- gain an understanding of the main objectives considered by architects and designers during the design of dwellings within the UK
- examine the influences restricting and controlling the design of modern day dwellings
- examine the extent to which house designers believe their design meets user needs and requirements in relation to usability and maintenance
- determine the extent of congruence between the opinions of occupiers obtained in the previous three studies with the views of those professionals involved in the design process

6.2 Methods

Semi-structured interviews were conducted with 14 architects and designers involved in the dwelling design process within the UK. An interview schedule was prepared before the commencement of the study which covered the general themes of maintenance, modification and user-focused design in modern dwelling construction. An additional section of the interview schedule covered specific design elements within dwellings which had been identified by occupiers as hazardous or problematic within the previous three studies. This interview schedule was piloted before producing the final version and is reproduced in Table 6.1.
Table 6.1. Interview schedule for architects and designers

<table>
<thead>
<tr>
<th>Topic</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Details</td>
<td>• Name, Position (type of job), Organisation, Contact details \</td>
</tr>
<tr>
<td></td>
<td>• What are the main objectives in dwelling design today? (Prompts: maximise density, comply with legislation, consumer focus, developer needs) \</td>
</tr>
<tr>
<td></td>
<td>• What are the main constraints upon your design? (Prompts: consumer demand, government directives, other?) \</td>
</tr>
<tr>
<td></td>
<td>• Which of these influences has the greatest impact on design? \</td>
</tr>
<tr>
<td></td>
<td>• Why do you think that is? (Prompts: ask for examples) \</td>
</tr>
<tr>
<td></td>
<td>• In what way do any constraints affect your design? \</td>
</tr>
<tr>
<td>General House Design</td>
<td>• Would you describe your dwelling designs as meeting user needs? \</td>
</tr>
<tr>
<td></td>
<td>• Why do you think this way? \</td>
</tr>
<tr>
<td></td>
<td>• If yes, how is this achieved during the design stage? \</td>
</tr>
<tr>
<td></td>
<td>• What aspects do you think are important in user-focused dwelling design? \</td>
</tr>
<tr>
<td></td>
<td>• In what way are you informed about consumer preferences/requirements? (Prompts: market research, consumer polls) \</td>
</tr>
<tr>
<td>Consumer Focus</td>
<td>• In what way are you informed about unpopular features within modern design? \</td>
</tr>
<tr>
<td>Maintenance</td>
<td>• In what ways do you address the long term maintenance of the properties during the design stage? (Prompts: cleaning windows, durability of materials, cleaning soffits and facia boards, guttering?) \</td>
</tr>
<tr>
<td></td>
<td>• How are these considerations incorporated into your design? (Prompt for examples) \</td>
</tr>
<tr>
<td>Modification</td>
<td>• To what extent do you consider the possible need for future modifications in your design? (Prompts: lifetime homes, ageing society)</td>
</tr>
<tr>
<td></td>
<td>• How is this incorporated into your design? \</td>
</tr>
<tr>
<td>Occupier Safety</td>
<td>• Do you consider how your design can reduce the potential for accidental injury? \</td>
</tr>
<tr>
<td></td>
<td>• Are there any barriers that prevent you from considering this issue? \</td>
</tr>
<tr>
<td></td>
<td>• If yes, please can you tell me about them? \</td>
</tr>
<tr>
<td></td>
<td>• What about other health and safety aspects within the home? (Prompts: changes in floor level, lighting, security) \</td>
</tr>
<tr>
<td>Expert opinion on interview data</td>
<td>• Sloped access, parking provisions, garage, fire doors, service cables and pipes, newel posts, sloped ceilings, loft space, egress windows, wall air vents, garden</td>
</tr>
</tbody>
</table>
6.2.1 Recruitment
Participants were selected on a convenience basis from a list of practices within a Leicestershire business register. Initial contact was made with all practices listed within the register and where individuals expressed an interest in the study they were invited to participate by letter, e-mail or via the telephone.

6.2.2 Procedure
Having agreed to take part in the study, participants were visited at their place of work at a time that was convenient for them. They were briefed verbally by the researcher about the nature of the research and supplied with written information (Appendix E). Written, informed consent was obtained from all participants. The interviews were tape recorded with the knowledge and consent of participants and each interview lasted for approximately one and a half hours. All interviews were conducted by the same researcher trained in interview techniques.

6.2.3 Analysis
The recorded interviews were fully transcribed and the transcriptions were imported into the qualitative software tool NVivo (Version 2.0). The qualitative analysis of the interview data was conducted following the three steps developed by Miles and Huberman (1994). This procedure is fully described in Chapter 3. Validation of the coding was achieved by an independent review of a sample of the data and subsequent interpretation by another experienced researcher unconnected to the study. The identified coding patterns and themes provided the basis for the conclusions of this study. These are shown in the data display tables below.

6.3 Results
6.3.1 Participant Information
Of the 14 participants interviewed, 8 were architects employed within an architectural practice, 3 were architect assistants, 2 were sole practitioners and 1 surveyor worked for a major developer within the UK. The mean
length of experience of dwelling design amongst those interviewed was 20.8 years ranging from 1 year to 49 years. At the time of the interviews 5 participants were involved in dwelling design on behalf of external developers, 3 were involved in bespoke design (one off projects for private clients) and 6 were involved with both bespoke projects and large projects undertaken by external developers. In total, 11 males and 3 females were interviewed. A full breakdown of participant details is shown in Table 6.2.
<table>
<thead>
<tr>
<th>Participant Number</th>
<th>Status</th>
<th>Number of years of experience</th>
<th>Type of dwelling design experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Employee (Architect)</td>
<td>43 years</td>
<td>Commercial developments</td>
</tr>
<tr>
<td>P2</td>
<td>Employee (Architect)</td>
<td>43 years</td>
<td>Commercial developments</td>
</tr>
<tr>
<td>P3</td>
<td>Employee (Architect)</td>
<td>3 years</td>
<td>Bespoke design</td>
</tr>
<tr>
<td>P4</td>
<td>Employee (Surveyor)</td>
<td>16 years</td>
<td>Commercial developments</td>
</tr>
<tr>
<td>P5</td>
<td>Employee (Architect)</td>
<td>20 years</td>
<td>Bespoke design/Commercial developments</td>
</tr>
<tr>
<td>P6</td>
<td>Sole practitioner (Architect)</td>
<td>35 years</td>
<td>Bespoke design/Commercial developments</td>
</tr>
<tr>
<td>P7</td>
<td>Employee (Architect)</td>
<td>10 years</td>
<td>Commercial developments</td>
</tr>
<tr>
<td>P8</td>
<td>Director (Architect)</td>
<td>11 years</td>
<td>Bespoke design/Commercial developments</td>
</tr>
<tr>
<td>P9</td>
<td>Employee (Architect)</td>
<td>31 years</td>
<td>Bespoke design/Commercial developments</td>
</tr>
<tr>
<td>P10</td>
<td>Employee (Architect's Assistant)</td>
<td>1 year</td>
<td>Bespoke design/Commercial developments</td>
</tr>
<tr>
<td>P11</td>
<td>Employee (Architect's Assistant)</td>
<td>1 year</td>
<td>Bespoke design/Commercial developments</td>
</tr>
<tr>
<td>P12</td>
<td>Sole Practitioner (Architect)</td>
<td>49 years</td>
<td>Bespoke design</td>
</tr>
<tr>
<td>P13</td>
<td>Employee (Architect's Assistant)</td>
<td>2 years</td>
<td>Bespoke design</td>
</tr>
<tr>
<td>P14</td>
<td>Director (Architect)</td>
<td>27 years</td>
<td>Commercial developments</td>
</tr>
</tbody>
</table>
6.3.2 Design Objectives

Table 6.3. NVivo codes derived from data

<table>
<thead>
<tr>
<th>Thematic Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients Requirements (7)</td>
</tr>
<tr>
<td>Developers needs (1)</td>
</tr>
<tr>
<td>Local Authority planning requirements (3)</td>
</tr>
<tr>
<td>Building regulations (3)</td>
</tr>
<tr>
<td>Building in context (2)</td>
</tr>
<tr>
<td>Best Use of Land (1)</td>
</tr>
<tr>
<td>Current Trends (2)</td>
</tr>
<tr>
<td>Space and architecture (2)</td>
</tr>
</tbody>
</table>

(Figures in brackets indicate the number of practitioners who referred to this theme during interview)

Participants were asked to describe their main objectives when designing a dwelling and a number of objectives were reported by the interviewees. In most cases (n = 11) participants reported more than one objective when considering their design, a number of which were identified as competing, whereby it was impossible for the architect to meet the requirements of both. Where rival objectives were in operation, planning and regulatory requirements were given priority.

Meeting client’s needs
Of those interviewed, 7 mentioned that a main objective was to meet the clients’ needs. Of these 7 participants, 1 was involved in designing properties on behalf of major developers, 2 were designing only bespoke properties and 4 designed both bespoke properties and also homes for major developers. Where the client was the developer, the client’s needs were the developer’s needs. During the interviews only 2 participants mentioned the end users’ needs.
One architect with 3 years experience of designing bespoke properties stated:

'\textit{We are guided by the client and our main objective is to achieve what they want}'

Another participant, an architect's assistance with 1 years experience said:

'\textit{It's just the client's brief really, which rooms they want and which spaces they want}'

One practitioner with 10 years experience of designing bespoke properties and properties on behalf of a major developer stated:

'\textit{Well the objective is to be, you know, well to be acceptable by the end user [...] I mean the three bedroomed house or the two bedroomed house it will obviously be occupied by a family of, you know, one or two children so the main objective is to make it as comfortable as we can have it for the family, to meet all their needs, and that will be the inner space and the outer space}'

An architect with 3 years experience stated that initially he considered the end user in terms of usability and comfort but this was limited by the regulations:

'\textit{Usability, comfort, obviously all of the main things that are considered when you are buying the house, short of the regulations}'

Yet another participant with 31 years experience of designing bespoke properties and dwellings for major developers stated his objective was to meet developer's needs:
‘It might seem a fairly mercenary thing to say but erm, the developers are usually interested in getting the maximum of number of properties on the site, erm, amount of floor space and obviously they want, they want houses that they can sell for a decent profit’

Local Authority planning requirements
Amongst the architects and designers interviewed 3 mentioned that one of their main objectives was to meet Local Authority planning requirements. One participant with 11 years experience of both types of design (bespoke and on behalf of a major developer) stated:

‘We obviously want to produce a scheme that the local planning authority will be happy to give permission for’

Another with 10 years experience said:

‘In the planning requirement we have to meet some of their provisions which is open air or external views, landscape, balconies and all of that, the eternal features of the land on which we are designing the projects in’

Where developer needs are at variance with planning requirements, these two objectives have to be balanced by the architect. One architect with 43 years experience explained:

‘The government have required us to increase the density whilst still providing what a lot of people want’

One employee within an architectural practice with 16 years experience explained how these competing objectives are addressed:
'Sometimes we are under pressure, [...] we've got an instance where we've got to do a lot of flats but the client is pushing, trying to get more on the site than the planners will allow, partly because of parking restrictions. [My employer] has to go back to them and say I don't think we can, we are going to put in for planning, we perhaps will make two planning applications, one which we think will get through and one which we think doesn't stand a chance.'

Building Regulations
All three architects' assistants interviewed stated that their main objective in designing a property was to meet building regulations. One assistant with a years experience explained:

'We are governed by a set of regulations called building regulations, where doors have got to be off stairs and how big the steps have got to be, they try and make it health and safety conscious'

Another architects' assistant with 2 years experience stated

'I think mostly it's the space requirements [...] I mean, apart from complying with building regs and regulations'

Building in context
A further objective mentioned by 2 of the participants was to consider how a building sat in context with the site upon which it was located. One architect with 16 years experience explained:

'To provide you know, a building that sits within it's context, that utilizes the natural features of the site whether the site's sloping, natural light, views, integrating local details into it'

And a further participant with 20 years experience stated:
'I suppose there are two sides to that, there's obviously there's the context of the house, it might be a field miles from anywhere but it might be in the context of other houses or some other planning constraints, so obviously from the external point of view you obviously want to build a house that is going to fit in that context'

Current trends
Meeting current trends within dwelling design was mentioned by two architects interviewed and this objective was linked to meeting developer needs. For example, one architect with 43 years experience of designing properties for a major developer stated:

'To provide basically the current trends [...] Normally there is a criteria which a three bed house, depends on what market it was aimed at, if it's a starter home then it would be as small and as cheap as possible with the best fittings, you get to the other end of the range then you'll want a utility, kitchen diner or diner, at least one en-suite, they'll probably want three reasonable bedrooms with fitted wardrobes'

Another participant with 27 years experience added that in meeting the needs of the developer his design would need to consider what was marketable for the developer:

'They [the developer] would have a view about what is marketable out there, whether it's, you know, whether open planned for instance is marketable'

Space and architecture
Space and architecture were objectives identified by 2 participants, but there were considered after other objectives had been met. For example one participant, an architect's assistant with 2 years experience stated that after considering planning and regulations, space requirements were an objective she considered:
'And all that's in the background and then we'll go for space requirements, space and architecture, how does it look?'

A further participant with 27 years experience explained that creating a sense of space was a main objective within dwelling design:

'From our perspective, the main objective is about really creating two things, a sense of place within the actual scheme, so try to address it, urban design has moved on enormously, even in the last five years, the concentration of quality of design in terms of layout is quite important'

Make best use of the land
Making best use of the land was an objective mentioned by 1 participant. An architect with 43 years experience reported that he had to give consideration to acreage and this required him to maximise the potential of the land:

'And to make the best use of the land. That's the other thing we have to consider, we've obviously got to create an acreage'

6.3.3 Constraints upon design
Participants highlighted a number of constraints that affected their design, including Local Authority controls, building regulations and density guidelines. Of those interviewed, 12 participants reported more than one factor which they felt acted as a constraint upon their design. The data display table detailing the thematic analysis is shown in Table 6.4.
Table 6.4. NVivo codes derived from data

<table>
<thead>
<tr>
<th>Thematic Code</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local authority planning controls (11)</td>
<td></td>
</tr>
<tr>
<td>Building regulations (6)</td>
<td></td>
</tr>
<tr>
<td>Density guidelines (5)</td>
<td></td>
</tr>
<tr>
<td>Developers needs (2)</td>
<td></td>
</tr>
<tr>
<td>Site constraints (2)</td>
<td></td>
</tr>
<tr>
<td>Financial constraints (1)</td>
<td></td>
</tr>
<tr>
<td>Social housing (1)</td>
<td></td>
</tr>
</tbody>
</table>

(Figures in brackets indicate the number of practitioners who referred to this theme during interview)

**Local authority planning requirements**

Local government planning requirements were identified by participants as a constraint upon dwelling design. The Local Plan details provisions for new housing, employment and community facilities. A sole practitioner with 35 years experience explained how he felt the Local Plan affected his design:

"The concept of the house is determined in that way [through planning regulation]"

Once again, conflict between these requirements and other factors was also reported. One architect described how he was able to meet the planning requirements whilst also achieving the density required:

'So possibly the greatest constraint then is the space around dwellings which most authorities have still got their own standards, and they are looking for those standards but we cannot achieve the density, so you have to compromise and usually the front of the dwellings will face each other, more or less from the back edge of the footpath so that you reduce the usual twenty one metre distance to ten, twelve or something like that'
Another participant with 35 years experience of dwelling design described how planning considerations were a constraint and also a source of conflict with client needs:

'The constraints of planning regulations, but you do it for the client, but these are major constraints that you need to satisfy before, in order to get what the client wants'

An architect with 27 years experience reported that meeting Local Authority planning requirements was a juggling act:

'Well planning is always an issue that erm, you know, it's a juggling act, it's developing a design, it's developing designs for the site, you know, it's negotiation really with the planning department, the planning department might have a view on the densities on the site. But you are more concerned about the actual houses themselves'

Building Regulations
A number of participants (n=5), referred to building regulations as being a constraint upon their design. It was reported that the constraints arose as a result of a lack of flexibility on the part of building regulations. One participant with 49 years experience of designing bespoke properties stated:

'With the Building Regulations, architecture used to be an art form, now you have so many regulations to comply with, it governs the size of windows, certain elevations, the size of windows, close to boundaries, close to roads, and all sorts of things so it's all virtually designed for you, how it's got to be formed'

A further participant with 20 years experience of designing properties again commented on the lack of flexibility of building regulations:
'I mean building regs put on huge constraints, I mean in terms of the amount of glass, you know, we come up with what we think are lovely designs and we can't do it because of building regulations and that's a shame. You know, things like I mean even things like stairs, you know, on a boat you go up a blimming ladder, erm, they insist they have certain, I can understand it in some ways but if you can only have a little bit more flexibility you could make designs so much more exciting and good.'

Another participant with 10 years experience of designing properties for a major developer explained how building regulations were restrictive:

'Health and safety as well, well, for instance building regulations requirement, I know it's there for safety issues we have to consider but it's, the design we sometimes consider like there's a, the handrail round the stair case and all of that, we have to have a handrail which is safety issues which we have to comply with, and er, the design of it we have to have a gap of a minimum we have to have a hundred millimetre gap if it is a railing on the handrail, so we have to achieve that. Sometimes you want to go some further on your design and have some ideas, nice ideas, some contemporary, some plans but it's just restricting on that one'

Density guidelines
The density guidelines which were in operation at the time of the study, known as Planning Policy Guidance, Note 3 (ODPM, 2000), were reported as being a constraint upon design because they controlled a number of aspects of dwelling design including parking provision around developments and the size and layout of the dwellings themselves. One architect with 43 years experience of designing dwellings on behalf of a developer explained:
‘[We have] a range of house that are specifically designed, developed for PPG3 clearance, now come the next stage, PPG3 revision, when it comes out, we will have to get say thirty-five, forty to the hectare, then we will be struggling with the house types we’ve got. […] because [the developer], they’ve got sites where they’ve got to get fifty to the hectare and I’ve got a problem. [They] would like to provide one car space and a garage per dwelling they are selling, which is another constraint. But that’s created another social element I think in that we are now going back in some ways to distance parking, of course people have got used to having a car, in the past not everybody had a car, but now we have an average of at least one per house and perhaps more on average two now. And of course the designs that [we] have to come up it means they don’t have a single drive and a single garage or a double garage on each plot, there is some remote parking. Remote parking is bad news in my eyes’

Another participant with 3 years experience described the impact of PPG3 guidelines on his work:

‘Obviously the amount of, the knock on effect that that has is phenomenal because you have still got to get garages, driveways, houses that will sell, density and all the other considerations into the same site that you would have done ten years ago before PPG3’

He went on to describe the consequences of these guidelines:

‘The biggest change you are getting is, you are getting three story houses, you are getting houses that are much closer to the footpath, you are getting garages that are in communal blocks with yards out the back, just basically so that everything is grouped together and therefore takes less space up than if it was individually sited’

A further participant with 11 years experience described the consequences of the guidelines for the layout of dwellings:
'PPG3, but it's partly led by the government and partly led by the house builders because land prices are now so high that the only way they can be competitive is by, I hate to use the word, cramming them on, but that is in essence what they are trying to do. We are looking at ever increasingly at going beyond the typical two story dwellings to an arbitrary three story. But what we are trying to do still, because if you are giving somebody a smaller garden than they would have had before you are packing them in so they are closer to the next door neighbour's house, you've got to try and create a better feel around the actual environment and the site itself and the builders are spending more money on creating that impression.'

**Developer requirements**

Amongst the architects interviewed that were involved in designing dwellings on behalf of major developers, 2 mentioned that the developer dictated what type of designs they provided and that this was reported as constraining their design. One participant with 43 years experience stated:

'And we are limited to the house types that our client wants, we can't dictate to them that we should have this unit, talking about town houses, this one is the one, they prefer this one now with no garage, it's expensive to provide an integral garage.'

And a further participant with 27 years experience described how the developers' concern with what properties were marketable influenced the types of dwellings designed:

'They would have a view about what is marketable out there, whether it's, you know, whether open planned for instance is marketable.'

**Site constraints**

Site constraints were another factor participants mentioned during interview. One architect with 11 years experience of dwelling design described some site constraints which influenced his design:
'There can be any number of site constraints, and that's from irregular boundaries, existing landscape features, terrain in terms of topography, service constraints, sewerage pipes and things like that running across the site.'

In addition to the site itself, he went on to describe how constraints of the immediate area dictated what could be built:

'Highways are a big site constraint because it depends on the capacity of existing roads around the area, it may mean that you are coming off a suburban street and you can only build ten houses on a site that could take thirty because that's all the road category allows or suggests it should take. So there is all sorts of issues like that'

The control that highways placed upon designs was also commented upon by another participant with 43 years experience:

'The highways are usually very tight constraints, they have a book, their bible which you can do anything you want, as long as it looks like that'

Financial constraints
Financial constraints were mentioned by one interviewee. This participant had 20 years experience of designing dwellings on behalf of major developers, but he was also involved with designing bespoke properties for private clients. He described how financial constraints affected his design:

'They say they have got fifty thousand pounds or a hundred thousand pounds whatever and what often happens is we say fine and we take that on board and we do a design and then before we've gone to tender they'll say oh, how about putting this on or that on or that on, and we'll say this might cost more, you know, and they don't seem to hear that. Then the price comes in and it's oh but you said we could do all this for so many thousand pounds'
Social housing

Dwellings intended for rent or shared ownership are referred to as affordable homes or social housing. The directives controlling the design and provision of these particular homes was reported by one participant with 11 years experience as being a constraint due to the fact that they are built differently from dwellings intended for private ownership:

‘Again, socially, they are designed with simplicity, they don’t spend a lot on any features because they don’t provide a lot or very little and very often the occupants, because they tend not to respect the properties, because they don’t own them, that has an effect on the residents’

Another participant with 43 years experience did not explicitly state that social housing was a constraint but he explained how affordable housing was built differently:

‘Affordable housing often, is built better than private housing, only marginally but again this is government driven in many respects but because they, where the private house builders listen to their sales and marketing team, the affordable house providers listen to their maintenance team. And there are certain things that they will not put in’

One participant with 43 years experience described how the concept of affordable housing was a source of conflict between planning officials and developers:

‘And social housing as well, there’s more and more sites, I think it used to be up to twenty-five, up to twenty five would not warrant the provision of social housing. Now, it does and usually the social housing is twenty five per cent, and the planners want that to be sometimes for rent and sometimes for shared ownership, they like it pepper potted if you like, sprinkled all over the site, but developers don’t want that, they say, if that’s rented we’ll keep that out the way, there is a them and us’
6.3.4 Consumer Needs

During the interviews participants were asked to describe how their dwelling design met consumer needs. A variety of responses were forthcoming from participants, some of which suggested that the consumer is a secondary consideration to what type of property is marketable. One participant with 11 years experience reported how he thought consumer needs were a secondary consideration:

'The consumers are almost a secondary consideration in some respects, erm, certainly every big developer has a sales and marketing team, they are charged with speaking to the local agents and establishing housing square foot in terms of what you are going to sell the places for and local demand so it maybe that you’ve got in the vicinity a really good demand for two or three bedded accommodation, it maybe that you are in an area where you’ve got a high demand for big properties or it maybe town houses or it may be flats and generally all developers will take the advice of an agent, they become extremely important to you early on, I mean some of them won’t do a thing without the estate agent saying, yes that’s what you should be doing'

He went on to describe how designers make assumptions about the end user when designing dwellings:

'In terms of direct consideration [of consumer’s needs], not at all. Quite simply, what we are doing is making assumptions about the end user and we are making assumptions about the type of person who is likely to buy the property we are working on, the two bed-roomed flat conversion in a factory or whether it be a three bed-roomed house on an estate we are assuming certain things about the type of person that’s going to buy it. Sometimes we get it right, sometimes we get it wrong. Generally, as an average you are somewhere in the middle and about right. You make assumptions'
One surveyor with 3 years experience of working for a major developer explained how feedback from the consumer was fed back to the architectural team:

'Most house builders send out pretty comprehensive questionnaires to every customer and of course every employee of the house building company lives in a house so when you have got so many people who have access to the drawings, access to the actual finished product, then you have an awful lot of feedback about what works and what doesn't work'

However, another participant, an architect's assistant with 1 years experience explained that although such information may be mentioned as a comment, generally no feedback was received from the end user:

'Even with a developer, it's like a one-to-one client because the developer is a person and maybe a group of ten, who wanted a certain design, so whilst we come up with a planning drawings, they agree with that, they like it, but if the person who buys the flat does not like it then we have no contact with him. If he doesn't like it, he has a choice to buy or not to buy the flat. It could come up as a comment to us but it's not usual that we should hear from them'

One architect's assistant explained how he felt that the use of the term 'meeting user needs' was purely a commercial term and meant little in practice:

'I think its just erm, a commercial advert just to sell houses, I don't think these housing developments now meet any criteria at all. They don't even meet the criteria in materials, they are just fake, cheap, cheap, fake or there isn't any insulation, proper insulation, it seems weird because there, although the regulations, the standard is going higher but the developments that are being built at the moment, they have low standards'
Amongst those interviewed, few participants reported anticipating the requirements of those occupying their properties. For example, only two of the participants reported that they included the provision of a fixed loft ladder in their design drawings. One of these participants, an architect's assistant had experience of designing bespoke properties but both reported that they were involved in designing dwellings for major developers. With 16 years experience, one reported:

'As a matter of course I put in a loft ladder'.

The architect's assistant, with only one years experience expressed an awareness of the hazard presented by the location of the loft hatch:

'I never put a loft ladder at the top of the stairs, I always put it away from the stairs'

Although it was reported that dwelling designs are based upon assumptions about the future occupants (as detailed above), it was also reported that cost prevented the provision of more storage within new homes: One participant with 43 years experience stated:

'If you design a square foot to provide a store, it's quite [expensive]'

However, this finding was restricted to those properties intended for private ownership. The provision of storage within properties designed for housing associations was reported as an important consideration. One architect with 35 years experience explained:

'A lot of housing associations influence that [the provision of storage] and they have their standard, every house or every flat has to have a certain percentage of storage so it depends on where you are going, which developer'
The provision of other fittings within the home such as telephone points and other services was described as being 'developer led' whereby each developer would have a standard for each particular house type. One architect with 10 years experience described:

'Phone points are generally developer led, so you will always have one somewhere in the hall, [...] you'll have a phone point in the lounge or study and you'll have a phone point in the main bedroom. Beyond that really is down to developer choice'

Where utilities and services were not required by regulation, it was reported that developers were unlikely to include them within their homes. This was highlighted by one architect with 31 years experience when he was asked about the provision of electricity within a garage:

Well it's not in the regs. If the developers and house builder's don't have to purchase them, they don't have to. It's just a balance isn't it at the end of the day? Because you can always get an extension leads from your house to the garage'

6.3.5 Maintenance
The consideration of long-term maintenance issues for private dwellings was reported as being primarily concerned with external maintenance. One architect with 31 years experience stated:

'We tend to avoid materials that need a lot of maintenance, there is no painted wood or anything like that'

Another participant described the consideration of maintenance as a priority within design and explained how this information was handed over to the end user. When designing residential properties, this information was placed inside the new home owner's pack:
'Long term maintenance is always put into what we call a health and safety manual or the, or a manual of operation or a maintenance manual, which will be handed over to the client and that will give them a good, that will be a very thick manual, which will give them all the operation manual for every single part of the building like the fire alarms, the emergency lights and the burglar alarm and all of that. It gives them any details of any equipment that we fit or the services that the engineer will fit and it gives them a clear picture of how to operate it to start with safety and in case of emergency who to contact and all of that. And usually, cover as build drawings for all the services that they've got'

Other participants described long-term maintenance as a consideration during the design stage, but also reported additional drivers behind these considerations. One driver identified was for the developer to avoid potential future problems as a result of maintenance, an architect with 43 years experience stated:

'I think, as a team, the developer isn't going to want to build something that is going to give them technical problems or physical problems and there are guarantees on the building to the customer when they buy them. So, it is a consideration, it may be that it is a consideration to keep to a fairy simple construction in order to avoid problems and difficult things that perhaps they haven't been proved or are always a big problem with maintenance'

A further participant with 11 years experience stated something similar:
'It is considered yeah, it depends, there is two reasons as well, with this, I mean most developers, particularly the house builders operate an NHBC warranties on houses, that gives you ten years guarantee against essentially defective manufacture and design, in essence, so if you were living there, three or four years went by and the ceiling fell in for some reason, the chances are you would be covered under the warranty. Properties are, and it does vary in terms of quality and it does depend how much you spend on building in the first place but I don't think nowadays we are looking at houses that are going to last more than fifty years without substantial maintenance'

He went on to describe that developers do not expect occupiers to live in one house forever, and therefore the long-term aspects of maintenance were not fully attended to:

'House builders have two lines of thought, firstly people do not buy their house types to live in them forever, very few houses are houses that are lived in for more than ten to fifteen years because they are sold, especially the smaller properties are sold to young couples and couples with young children that are actually moving through the chain. You don't generally sell Barrett houses to retired couples, it's just the way it works, and they don't design them as such. I suppose on the other side of it, there are a few that think, 'oh well, once it's sold, what do we care?'

He added that his own professional opinion was to leave the occupier to sort out the long-term maintenance problems themselves:

'Some people will do it themselves, but erm, ultimately other than making people aware of the risks erm, you have to leave them to their own devices'

An architect's assistant with one years experience also expressed the view that long-term maintenance issues were not a concern for architects. He went on to describe that as a designer, he was not required to consider these issues within his design:
'The maintenance of the properties is up to the householder, or the person who brought it. [...] It's not up to us, generally on residential it's not really thought about because you don't need to'

It is evident that the issue of long-term maintenance is an important consideration during the design and construction of affordable homes. These were described as being 'built better' than homes for private ownership. The responsibility for the maintenance of affordable or social housing remains with the housing association and therefore it is not surprising that this responsibility ensures consideration of these issues during design. One participant with 11 years experience within the social sector highlighted this:

'They wouldn't dream about having render on a property, they wouldn't dream of having timber cladding of any description on a property because they know somewhere down the line it may be twenty years away but one of their maintenance guys will be swearing because he has got to get it repainted, reclad, whatever'

6.3.6 Modification of properties

When asked about whether their properties were designed flexibly to allow for future modifications, a varied response was obtained from participants. Those architects who designed properties on behalf of major developers for private ownership reported that they did not consider this at all. For example, one participant with 43 years experience of such design stated:

'Well, one would hope that the properties that we design are sufficient for their immediate needs and if they want to extend...they can employ a professional to give them advice'

Another participant with 49 years experience of designing bespoke properties stated that his dwelling design focused on the needs of the intended occupier and he did not consider future occupiers' needs:
'You do everything for the person who buys the house but then an idiot moves in and everything you have thought about in design is erm, goes out the window basically. There is no way you can cope with the number of people, I mean how many people have lived in this house since seventeen fifty six or whatever it is?'

One architect with 16 years experience reported that there was little room for flexibility within his dwelling designs:

'I suppose the problem partly that the houses tend to be fairly small some houses are very small, erm, you have to have a bathroom and they want two bedrooms, really there is not much room for flexibility other than, we do do houses where you can knock one of the walls out, you know, without any sort of structural implications, and then the larger houses, you know, the great big houses, it's hardly relevant really, they are so big you could build a house in one of the rooms'

Flexibility and long-term modification of dwellings was however reported as a priority for those designing social and affordable housing. This was highlighted by one participant who had 11 years experience of designing such properties:

'Certainly on the affordable housing side, erm, we have, we have full wheelchair properties we call them, now generally they are built for identified end users [...] The other thing with developing affordable housing is what we call a lifetime home, the theory of that is somebody can come into that property with say having a disability which means they can still climb stairs or whatever but the knowledge is there that in the future, say maybe motor neuron disease or something like that there may be a possibility that in five, ten, fifteen years they will be in a wheelchair, that house shouldn't have to be vacated'
However, he went on to add that such properties are only built to demand:

'**We only build those according to demand, according to what the social housing provider instructs us to do**'

### 6.3.7 Occupier safety

The architects interviewed during this study reported that they did not have access to any data on home accident statistics, and such information had never been filtered through to any of the practices participating in this research. One architect, a sole practitioner with 35 years experience stated:

'If you asked me what the greatest, what the causes or what the greatest or the most, the most common accident in the home I couldn’t tell you'

Another participant with 3 years experience stated:

'Certainly from the house building point of view the erm, the regulations are put into place to iron out as many of the problems and accidents, risks and so on that erm, we would come across'

The responsibility for providing safe and efficient housing was identified clearly by some as resting with building control. By meeting building regulations a number of the architects interviewed felt that they had achieved the required levels of health and safety within the home. One architect with 16 years experience stated:

'I suppose the Building Regs are so sort of safety conscious that you know that if you've met building regs, you know, unless someone wants to commit suicide, you know, even then they would have a job'

An architect's assistant with 1 years experience added:
'We get given the building regulations which minimize accidents in the house.'

Safety in the home was also identified as a competing factor with other important aspects of modern dwelling design. For example, within the loft space of dwellings, the joists are obscured with current levels of insulation. One participant highlighted the incongruence of this aspect of energy conservation with domestic safety:

'Well that's a thing I don't particularly like because we've now, we now put insulation which goes across the lines of the joists which means you can't see them and I think from the point of safety I think it's a detrimental step, but of course we are saving the occupants so much money per year in heating bills, you have got to balance the two out.'

And a further participant highlighted the incongruence between safety and security:

'This is where legislation can sometimes become a bit of a fool in that we've had the police giving advice on to how to design houses from the point of view of safety and access, criminal activities, so we start putting locks on all the windows, then the next legislations says you must be able to escape from this window and how can you escape when in the panic you have to find a tiny little aluminium key?'

Responsibility for the health and safety of occupiers within the dwellings was placed with the occupier's themselves. This included the provision of basic safety items. An architects' assistant with 1 years experience stated:

'It's again down to the adult, if you want a ladder and lets say if my grandma wanted to get up into the loft then I would say get a ladder, but not everybody needs a ladder and most people have got a step ladder in their garage and they only have to take them upstairs.'
An architect with 11 years experience of dwelling design attributed most home accidents to occupier behaviour:

'I mean the reasons for why accidents happen and the reasons for all things occurring in the home is down purely to the person you know, yes okay, sometimes it can be mitigated but you can walk through a door and bang your head on the frame but it's not because the frame is in the wrong place, it's because you are stupid enough to walk into it. And that would happen in ninety percent of all cases I would guess'

6.3.8 Expert Opinion

In terms of preventing unintentional injury arising through the interaction between behaviour and design, architects reported that they were limited in what they could do. Examples of unsafe behaviours and reported problems identified during the previous studies were presented to these participants. The behaviours and reported problems are shown in Table 6.5 together with examples of the responses given by architects and designers.
**Table 6.5. Architects’ responses to hazardous features and behaviour identified during previous studies**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Reported problems and associated behaviour</th>
<th>Expert View</th>
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<tbody>
<tr>
<td><strong>External area</strong></td>
<td></td>
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<tr>
<td>Sloped threshold to property</td>
<td>Slippery during wet and icy weather</td>
<td>'Sloped yeah, very dangerous with the ice last week'</td>
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<td>'They could have one little problem with arthritis or one little accident where they have to shuffle their feet and they would be appreciative of it'</td>
<td>'I think the sloped access is supposed to have that sort of material where it's textured material, graded material, slip resistant material'</td>
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<td>Difficulties carrying items from vehicle, difficulties during maintenance</td>
<td>'It is a big issue, I didn't realise how much of a big issue until we moved in, carrying the groceries for instance, I mean that's, and you can't get the car anywhere near to clean it'</td>
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<td>'Again, it's a density thing, if you lump a load of people together in one block of garages it's a lot, you are saving on space doing that'</td>
<td>'Remote parking is bad news in my eyes'</td>
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<td></td>
<td>Difficulty negotiating external areas, concern for personal safety</td>
<td>'You see the car parks aren't lit, if they did they would have to go on a meter, someone would have to pay for it and how do you allocate it?'</td>
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<td>'Big problem that, shall I tell you why, that's because if you are on shared driveway, the councils won't adopt them and they therefore don't have public lighting'</td>
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<td>Feature</td>
<td>Reported problems and associated behaviour</td>
<td>Expert view</td>
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<tr>
<td>External area</td>
<td>Difficulty parking vehicle, difficulty exiting vehicle. No electricity within garage</td>
<td>'The garage is only eight foot wide, again they are substandard, they say an integral, but you drive a vehicle in there and try and get out the doors'</td>
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<td>Garage</td>
<td>'There is a minimum size you can get away with'</td>
<td>'That again is cheapness, really, I suppose the major difference between your private sector and, you know, your big builders are just doing it absentmly, for ourselves and a private client you'd have a power point in the garage unless they specifically said no'</td>
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<td></td>
<td>'If the developers and house builder's don't have to purchase them, they don't have to. It's just another, it's just a balance isn't it at the end of the day? Because you can always get an extension leads from your house to the garage'</td>
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<td></td>
<td>Removal of self closers. Wedging open of fire doors</td>
<td>'We picked up on why there were chains on all the doors... so we moved in and took them all off [the closers]'</td>
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<td></td>
<td>'That's their priority really, if they want to take it off then they are just asking for trouble, if there was a fire, then they're buggered'</td>
<td>'Until you've lived in a house with fire doors you realise what a pain they are, and it just doesn't suit the domestic lifestyle, opening this door all the while'</td>
</tr>
<tr>
<td>Internal area</td>
<td>'We've taken three closers off and we've got two wedges, so we wedge open the other two'</td>
<td>'Unfortunately, there is very little that the developer or the architect or anybody can do about that'</td>
</tr>
<tr>
<td>Fire doors</td>
<td>'Until you've lived in a house with fire doors you realise what a pain they are, and it just doesn't suit the domestic lifestyle, opening this door all the while'</td>
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<tr>
<td>Feature</td>
<td>Reported problems and associated behaviour</td>
<td>Expert view</td>
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<tr>
<td><strong>Internal area</strong>&lt;br&gt;Electricity cables and water pipes</td>
<td>Drilling through walls without considering the location of pipes or cables&lt;br&gt;&quot;I've knocked a nail into the wall and crossed fingers nothing's happened&quot;</td>
<td>'A lot of it is common sense or if they are worried to get one of these erm, things which detect where they are'</td>
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<tr>
<td><strong>Internal area</strong>&lt;br&gt;Provision of services within the home</td>
<td>Inconvenient placement of service points&lt;br&gt;'I think the phone sockets are in silly places'&lt;br&gt;'The TV socket is behind there, you've got no option, it was the worst possible place because the sun comes in and you can't see it for about three hours a day'</td>
<td>'We do put where exactly we want the sockets to be, but unless somebody has not read the drawings properly [...] the electrician has put it in the wrong place'</td>
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<tr>
<td><strong>Internal area</strong>&lt;br&gt;Allocation of space within the home</td>
<td>Poor allocation of space leading to insufficient storage&lt;br&gt;'Storage is the biggest thing that was a concern for me, just to be able to fit everything in here'</td>
<td>'We don't provide storage in houses'</td>
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<td><strong>Internal area</strong>&lt;br&gt;Sound insulation</td>
<td>Poor sound insulation leading to a lack of privacy&lt;br&gt;'Some sounds travel through the house, like if you are in the kitchen stirring a cup of coffee you can hear it on the third floor'</td>
<td>'I mean it's so much more expensive to do extensions because you have got to meet the regulations of sound and insulation and we go to a new development and you knock on the walls and you can hear people next door, it's a travesty really because you know, developers have got the money and they are just trying to cut corners'</td>
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<tr>
<td>Feature</td>
<td>Reported problems and associated behaviour</td>
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<tr>
<td>Internal area</td>
<td></td>
<td>'They use different materials, they use materials that have been, that are being experimented on and that are being tested and have got a lower value, because they could be sustainable or better environmentally friendly'</td>
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<tr>
<td>Sound insulation</td>
<td></td>
<td>'Uncoordinated design leading to the obstruction of service points and other items. Inaccessible features.'</td>
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<td>(continued)</td>
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<td>'Because the shower door opens about that much and then bangs into the sink'</td>
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<td>Internal area</td>
<td>'It could be the architect having drawn the light fitting at the wrong place, it could be the builder who put it in the wrong place'</td>
<td>'I always site my erm, my fittings away from the head of the stairs so the people do not fall down when they are climbing up ladders so to speak, if a door hits a light fitting it's obviously badly placed'</td>
</tr>
<tr>
<td>Layout</td>
<td>'Because the shower door opens about that much and then bangs into the sink'</td>
<td>'I always site my erm, my fittings away from the head of the stairs so the people do not fall down when they are climbing up ladders so to speak, if a door hits a light fitting it's obviously badly placed'</td>
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<tr>
<td>Stair newel post descends</td>
<td>'Unfortunately they are structural, so, they should be designed in such a way that you don't bang your head on them and they shouldn't be on centre, but there is no accounting for the way people try and walk upstairs or mess around on stairs I have to say'</td>
<td>'That is the sort of thing that isn't identified until you have competed the house, it is very difficult to map out exactly how big your newel or where your newel are going to fall in relation to whether it invades your personal body space'</td>
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<td>into living space</td>
<td>'If you lean underneath to get to the phone and you forget it's there you come back and nearly knock yourself out. My dad nearly did knock himself out, he was on the floor. That's really well dangerous, really dangerous, we said to them and they said ‘well that's how it comes'</td>
<td>'That is the sort of thing that isn't identified until you have competed the house, it is very difficult to map out exactly how big your newel or where your newels are going to fall in relation to whether it invades your personal body space'</td>
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<tr>
<td>Feature</td>
<td>Reported problems and associated behaviour</td>
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<tr>
<td>Internal area</td>
<td>Sloped internals ceilings providing insufficient head clearance</td>
<td>'There is regulation for head room when it comes to things like'</td>
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<tr>
<td>Sloped internal ceilings</td>
<td>'It is more of an annoyance to me, the roof above the stairs it’s not low, you wouldn't have a problem, but I've banged my head on it twice'</td>
<td>'There is regulation for head room when it comes to things like'</td>
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<tr>
<td>Internal area</td>
<td>Use of inadequate ladders and step ladders to access the loft. Use of furniture and banister rail to gain entry. Position of loft access hatch</td>
<td>'Well they deserve to be injured then'</td>
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<tr>
<td>Loft space</td>
<td>'I have clambered up there using stools and using [his wife] to stand on, it's quite bad'</td>
<td>'The hatch is there, you are going to use the loft. I think that regulations ought to be altered so that the occupier can continue to use the loft in the manner that they always have by allowing a central area in the loft to be boarded. Therefore we can put a loft ladder in place'</td>
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<td></td>
<td>'If you weren't too steady and were worried about it and you fell off you would probably fall to the ground floor'</td>
<td>'The loft access is there to basically gain access to maintain the services and people will always put stuff up there, but it's not meant to be for that with the current regulations about insulation and so on. So I believe that the regulations are put in place without any forethought as to the end user'</td>
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<tr>
<td>Internal area</td>
<td>Restricted egress from property. Concern regarding falls</td>
<td>'Well people need to teach their children not to climb out of the windows'</td>
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<tr>
<td>Egress windows</td>
<td>'I'm just concerned obviously that they do open that wide and if, you know, kids are going to mess with things aren't they and that did concern me initially, because the top opens and the bottom opens as well, it opens like that, so that concerns me in there'</td>
<td>'If your house has complied with all the regulations again it's up to the family to respond to that'</td>
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<tr>
<td>Feature</td>
<td>Reported problems and associated behaviour</td>
<td>Expert View</td>
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<tr>
<td>Internal area</td>
<td></td>
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<tr>
<td>Lighting</td>
<td>Insufficient internal lighting</td>
<td>‘It wasn’t light enough and wherever I stood in the kitchen, I was working in my own shadow and it drove me to distraction’.</td>
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<td></td>
<td></td>
<td>‘So what I tend to do in a lot of cases, er, because I do find with ceilings getting lower due to cost that if you’ve got one point one you’ve got very little window space left on the first floor to give you the light in, in a bedroom so I tend to put a transom across’.</td>
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<td>Walled air vents</td>
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<td>‘The grill which is installed on the wall where the fireplace is, [...] it’s permanently open and it really was blowing a gale and it was so cold in there, so I’ve actually put some cardboard over it’.</td>
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<td></td>
<td></td>
<td>‘But there is not a lot we can do about it’.</td>
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<td></td>
<td></td>
<td>‘Yes, now I’ve had that. I have been called in by housing associations to sort them out, but not a lot I can do, I can put it back again but they’ve got bits of carpet turned up in front of them and stuffed with newspapers or bits of card pasted on the front. But they are still alive, none of them have died, so they got away with it’.</td>
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<tr>
<td>Occupier knowledge</td>
<td>Insufficient information for occupiers</td>
<td>‘I wasn’t too interested in the detail, because they told us most of it as well’.</td>
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<td></td>
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<td>‘Yes it was informative, there was a booklet, I think’.</td>
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<td>‘Give them information. I think it’s just giving them clear information. The Government are very strong on that at the moment, in giving the occupant an occupier’s pack, because at the moment that’s essentially telling them things like how technically the house works, where your stop taps are, all your controlling points, your heating, and it also gives them product information of where you can replace certain things. I mean, we’ve got to add to that, if we don’t already do it, telling them that the doors are a safety feature and shouldn’t be closed’.</td>
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</table>
Participants' reported that one of the main considerations regarding the provision of some safety features was cost. This was a barrier, particularly in relation to storage provision and the provision of other home safety items. An example was given by an architect who had 27 years experience of residential design on behalf of a major developer. In describing the provision of a loft access ladder within properties as a preventative measure against falls, which is currently not a legislative requirement, the cost of this prevented their installation within new homes:

'Again, you don't need to do it, you know, it's all done on cost isn't it?'

Those architects working in private practice however were more sympathetic to the provision of this item, and those involved in the design of bespoke properties tended to include a loft ladder as a standard feature.

The provision of alternative fire protection to self-closing fire doors as an attempt to reduce injury and increase convenience was also viewed as costly. One participant with 3 years experience stated:

'I think it could be feasible, but again it's cost as well. It's just cheaper to have maybe door closers'

6.4 Discussion
6.4.1 Summary of main findings
This study has provided an insight into the complicated and interrelated nature of some of the factors influencing current dwelling design within the UK. The key findings from the research are summarised below:

Participants identified a number of primary considerations which are addressed during the initial stages of dwelling design. Most participants reported multiple considerations, some of which are at variance with each other. For example, some participants reported that it was difficult to meet the requirements of planning regulations whilst still providing what the
developer required. A number of controlling factors were identified which constrain the scope of some dwelling designs. These factors include Local Authority planning requirements and building regulations.

The majority of participants tended to view the design process as a routine, technical activity with little thought as to why they were doing it. Many expressed an unsympathetic view to the needs and requirements of the end user. A more consumer-oriented approach to dwelling design however is demanded by housing associations. A high reliance on building regulations to ensure the health, safety and wellbeing of individuals within the home was reported. The responsibility for safety within the dwelling once completed was reportedly placed with the occupiers themselves. Cost was identified as a barrier to innovative design and to the provision of additional safety equipment, such as a fixed loft ladder. This was essentially reported amongst those participants working with major housing developers.

When presented with details of a number of problems encountered by occupiers within their homes, the architects interviewed during this study felt that they were limited in what they could do. Occupier behaviour and legislative requirements were identified as the main determinants of the difficulties. There is a lack of feedback to architects in relation to their designs. There is also a lack of information provided to them on the contribution of environmental design to home safety.

6.4.2 Drivers for dwelling design
The findings from this study suggest that the main factors influencing current dwelling design within the UK arise from various overarching sources of control and legislation and include Government guidelines (housing policy and building regulations), Local Authority control (local planning guidance) and market trends. These influences originate from different sources within housing policy.

Different divisions within central and local government are responsible for the development of housing policy and it is therefore unsurprising that the
intended aims of some policies are at times conflicting. This study has demonstrated how conflicting guidelines can sometimes lead to the architect or designer acting as an arbitrator between two sources of recommendations. The recent popularity of the town house exemplifies the influence of different recommendations whereby the addition of an extra storey on some new dwellings is a response by developers to ensure compliance with increased density guidelines whilst still being able to produce marketable properties which meet consumer demand (David Wilson Homes, 2004). The additional storey subsequently requires the home to be protected by additional fire safety measures, with current practice being the provision of self-closing fire doors. These features may meet legislative requirements for fire safety but as reported elsewhere in this thesis they are problematic for occupiers.

The findings demonstrate how societal processes such as housing policy and planning requirements can shape the form of the house. The need to comply with such legislation, where the aims of some policies are at times conflicting, can result in designers paying little regard to consumer needs.

Building regulations exert a major influence on the design of dwellings in determining amongst many things the materials used in construction and provisions for the safety of occupants in and around buildings. As discussed in the literature review, the careful design of dwellings can help minimise the risk of unintentional injury and with this in mind, a number of environmental modifications aimed at reducing domestic injuries have been incorporated into building regulations. It is evident that the architects interviewed during this study were unsympathetic to the needs of occupiers especially with regard to their health and safety and were reliant on building regulations to ensure the provision of safe housing. Heimplaetzer and Goossens (1991) suggested that a reliance on building regulations to provide a standard of health and safety leaves little motivation for the designer or architect to provide additional safety measures within their designs. Unless specific legislation demands the inclusion of an explicit feature there appears to be little motivation or indeed, incentive to consider
this during the design phase of the dwelling. The majority of participants from this study did not report providing additional safety measures over and above those required by building regulations. The situation might improve in line with the requirements of the Construction (Design and Management) Regulations 2007 (HSC, 2007).

It is evident from those studies presented in the previous chapters that some primary measures required by building regulations are based on partial or incomplete modelling (Heimplaetzer & Goossens, 1991) whereby their provision introduces additional risks for some occupiers. In addition, many of the primary solutions required by legislation ignore the fact that occupiers are active within their environment and that a behavioural adaptation is required for some measures to remain effective (Carlson-Gielen & Sleet, 2003).

Heimplaetzer and Goossens (1991) also suggested that a reliance on building regulations to provide a standard of health and safety leaves little motivation for the designer or architect to provide additional safety measures within their designs. Unless specific legislation demands the inclusion of an explicit feature there appears to be little motivation or indeed, incentive to consider this during the design phase of the dwelling. The majority of participants from this study did not report providing additional safety measures over and above those required by building regulations. The situation might improve in line with the requirements of the Construction (Design and Management) Regulations 2007 (HSC, 2007).

It is possible that the practice of not providing additional safety features for new dwellings is a developer-led custom as opposed to a design based decision whereby developers aim to maximise profits within housing developments. The emergence of standard house types means that house builders will often build to the minimum specification to comply with building regulations and to sell the house (Moran, 2004; CABE, 2007). Indeed, previous studies reported in this thesis identified the practice of developers charging for features not provided within the standard house type. With
attention currently focused on increasing privately owned dwelling stock within the UK, this presents an ideal time to address the standards and practice evident within the industry.

The influence of building regulations in determining the quality of housing was recognised over 40 years ago, together with a suggestion for those involved in code reform to take a larger view of the system within which they work (Schodek, 1976). Architects and designers appear to have little influence in shaping the regulations within the UK, accepting their implementation without question. It is possible that a 'systems' approach, first suggested by Schodek (1976), can be incorporated into an ecological approach to injury prevention within the UK whereby societal policies are developed which reflect an understanding of their affects on the built environment as a whole and the health and safety of the occupants.

6.4.3 Social housing
It is evident from this study that whilst user needs may not be a priority consideration for those designing for major developers they are considered to a greater extent by those architects designing for social landlords. It was reported that housing associations require such properties to be designed to include a basic level of storage and that the materials used in their construction require the minimum of maintenance.

The increased attention to user needs in the design of subsidised housing is client driven rather than designer driven, whereby design quality standards have to be met by developers in order to qualify for funding (Housing Corporation, 2003). An element of affordable housing is now provided on most major full market developments (DCLG, 2007a). This provides an opportunity for those involved in designing such developments to incorporate some of the design considerations previously afforded to subsidized housing to all new homes. Such considerations would benefit all occupiers within new dwellings; additional storage would reduce the potential for clutter and subsequent trips and falls and low maintenance materials would reduce the potential for injuries sustained during DIY.
6.4.4 User needs

As reported in the above section, the findings from this study suggest that user needs are not a priority consideration for those involved in designing new dwellings on behalf of major developers. Indeed, new dwellings are shaped by market influences, planning restrictions and building regulations. Consumer needs cannot be the only determinant of dwelling design but before good quality housing can occur, the needs of human beings have to be properly understood (Heywood, 2004b).

The research undertaken and presented in the previous three chapters indicates that whilst consumer preferences are not homogenous, their needs in terms of safety are comparable. Design professionals may not be able to accurately assess levels of home injury risk, as demonstrated by Wells and Evans (1996), yet if user needs are not considered and subsequently met, there remains the potential for them to make their own adaptations with possible exposure to health and safety hazards. Consumer preferences are addressed by developers in terms of offering them a choice of internal fittings, yet their needs in terms of storage, for example, appear to be weighted against other influences.

The lack of feedback to architects demonstrated in these findings means that they are unaware of the effectiveness of their designs. This can result in poor designs being repeated particularly within standard house types, whereby approved designs are replicated again and again. It has been demonstrated previously that architects and the public sometimes have contrasting views in terms of what types of buildings are appealing (Devlin and Nasar, 1989) and with a lack of feedback, architects remain unaware of popular and unpopular features. There is therefore a need for developers to incorporate feedback on user needs in addition to user preferences to all designers. This communication should also be filtered to the those responsible for the construction and fitting of internal features.

Luten (2006) argued that whilst usability and user involvement have become an established part of the consumer product design process, such methods
are not common within architectural design. This may be due to the fact that underlying almost every post-occupancy housing evaluation study is the implicit critique that more of the user needs could have been met if more information was available during the design process (Vischer, 1985). Much can be learnt from the user centred approach taken within other industries and consumer product design whereby designers should consider and address the potential for misuse of their product. Such an approach has led to the manufacture of designs which guide and support the correct use of many products (Hale, Kirwan and Kjellén, 2007).

6.4.5 Limitations of Study

Participants
The sample of architects and designers interviewed during this study were self selecting. Those agreeing to participate may have held particular views on current dwelling design or design practices which motivated their participation. The results therefore reflect the views of a small group of professionals and may not be representative of those within the industry as a whole. Despite this potential limitation, similar responses to a number of questions were elicited from those participants working on behalf of a major developer and those undertaking bespoke designs only.

The participants were predominantly male (11 men, 3 women) but this sex ratio accords with the sex ratio within the architectural profession itself (ONS, 2006).

Study methodology
The interviews were undertaken during normal working hours and were held in the offices of those agreeing to participate. The interviews were held at a time that was convenient for the participant when they had no other engagements or appointments which could distract them from the interview. All interviews were conducted by the same researcher, trained in interview techniques. A good rapport was established between the interviewer and all participants to encourage the communication of information. These factors
together with the standardised approach to analysis minimised the potential effects of interview subjectivity.

### 6.5 Summary and Conclusions

This chapter has described the findings from 14 interviews conducted with professionals involved in dwelling design within the UK. The findings have demonstrated that social factors such as planning regulations and building control exert a strong influence in shaping the design of new homes. A number of the objectives outlined within Central Government and Local Authority housing policy are often at variance with each other indicating that a more unified approach to housing policy is required.

Architects and designers rely heavily on building regulations to ensure the health and safety of those occupying dwellings, and this may be due to there being a lack of information available concerning the nature and extent of home injuries in the UK. Participants in this study were unsympathetic to the problems experienced by occupants with some features within new homes suggesting that there is a need for clearer lines of communication from research findings to those in commercial practice whereby injury data may be used to sensitise designers to particular injury risks within dwellings.
Chapter 7

DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

7.1 Introduction

This thesis is concerned with occupier behaviour within new homes and how this behaviour interacts with design features to affect health and safety. Through a series of studies adopting a multi-methodological approach, the research aimed to extend existing knowledge on behaviour within the home environment and to gain a thorough understanding of occupier experiences and interactions with the features present within new homes.

Chapters 3, 4 and 5 presented studies which investigated the issues from the occupiers' perspective, including an examination of temporal patterns of engagement within the home (Chapter 4). In Chapter 6, the issues have been explored further from the perspective of a sample of those responsible for current dwelling design within the UK.

With the Government's ambition to reach 240,000 net additions to existing housing stock per annum by the year 2016 (DCLG, 2007a), the research presented in this thesis offers an opportunity to inform the design of new dwellings. The work has also highlighted the importance of additional influences on health and safety within the home which have not been fully acknowledged by previous prevention strategies. It is argued that an ecological approach to the reduction of unintentional home injuries offers a novel perspective for injury prevention, incorporating the additional influences on injury risk identified by this research.

7.2 Overview of research findings

A summary of the findings from each of the studies described in this thesis follows.
7.2.1 Home interviews with new build occupiers

A qualitative approach was utilised involving householder interviews and a home inspection to gain an understanding of how people interact with the building features and systems within their homes. The findings from this study revealed various unsafe behaviours practiced by occupiers within new homes. Such behaviours arise as a direct result of the occupant's interaction with a dwelling feature or system. These behaviours included the interference with internal self-closing fire doors and unsafe means of accessing the loft space. Unsafe actions such as these were a behavioural response to particular design elements within the dwelling where the design of the feature did not accord with user needs and requirements. For example, self-closing fire doors were described as an inconvenience in that they inhibited free movement between rooms within the home and were difficult to negotiate whilst carrying articles. When closed, the fire doors obstructed natural light and the self-closing mechanisms resulted in the doors slamming thereby creating additional noise and a risk of finger trapping injuries. As a response to the inconvenience introduced by the doors, occupiers described interfering with the self-closing mechanism on these doors and in some instances occupiers reported removing the self-closing mechanism altogether.

Occupiers also reported concerns in relation to a number of architectural dwelling features which they felt presented a risk of injury, for example, fire egress windows were considered a risk for falls and descending newel posts and low internal ceilings were described as introducing a risk of head injury. Whilst a number of sources of information are available to those occupying a brand new home, the level of engagement with these sources varied amongst households.

The findings from this study provided further evidence of how behaviour can interact with features within the domestic environment and how this can lead to an increased risk of injury or ill-health. These findings build upon the previous work of Roys (1991) and Haslam et al., (2006) and go further by
identifying the physical, behavioural and social influences which shape individual experiences within the home. The physical design of some aspects within the dwelling has been shown to induce a behavioural response by occupiers. Both the design of the dwelling and the behavioural reactions to design have been demonstrated to be underpinned by social and cultural factors such as government housing policy. By identifying the important influence of these issues, this study has highlighted where improvements can be made in current home injury prevention practices.

7.2.2 Investigating temporal patterns of engagement
Having identified systematic occupier-dwelling interactions within new homes, resulting in unsafe behaviour or increased risk of injury or ill-health, the aims of this next study were twofold. Firstly, the study sought to substantiate the previous findings through the use of a prospective analysis of occupier activities within the home subsequent to occupation. Secondly, the study aimed to explore occupier-dwelling interactions from a temporal perspective, to seek information about how occupier engagement within the dwelling changed over time. Unsafe behaviours and concerns regarding potentially hazardous features within the home were identified similar to those from the initial interview study. A temporal analysis of occupier engagement revealed that in many situations occupiers initially maintain a pro-active approach to seeking solutions to difficulties encountered within the home, for example by seeking alternative products or further information. However, such an approach is not sustained over time. This has clear implications for behavioural based injury prevention initiatives within the home in that it identifies the need for future approaches to consider the long term maintenance of safe behaviours.

7.2.3 A questionnaire based survey of new dwellings
Having identified and substantiated a variety of occupier interactions and activities within new homes, it was appropriate to establish the prevalence amongst a wider population occupying new dwellings across the UK. A questionnaire was developed and distributed through a volume house
builder to a sample of new build occupiers. The findings from this survey indicated that unsafe behaviours are commonly practiced by those occupying new homes. Reoccurring difficulties were also reported by occupiers in relation to architectural features within the home. This is unsurprising given the level of use of standard house types by the majority of volume house builders which would result in the replication of problems. It also suggests that there is a possibility that the interactions and difficulties identified during the course of this research may be common within new homes across the UK.

7.2.4 Investigating the influences on current dwelling design
Having identified the importance of the environment in influencing behaviour within the home, a further study was undertaken to explore the processes involved in dwelling design to identify the influencing factors which give rise to particular design elements. Through a series of interviews with architects and designers the issues guiding their designs were explored. In addition to this, the consideration given by architects and designers to reducing unintentional injury within the home through design was assessed.

The results provided an insight into the complicated and interrelated nature of the factors affecting the development of dwellings, with a number of the design objectives and policy requirements being at variance with each other. This is an important finding in view of the current drive to extend the provision of new housing within the UK. A heavy reliance on building regulations to ensure the health and safety of occupiers was apparent among the design professionals with the majority expressing little motivation to provide anything over and above what was required by this legislation. Such an approach accords with a recent finding reported by CABE (2007), whereby developers were found to comply with only the minimum requirements of the planning system. A lack of inducement to promote the innovative design of new homes and neighbourhoods may be a cause of this. One aspect of this could be addressed through additional professional training for architects, planners and surveyors (CABE, 2007). To date,
surprisingly little attention has been paid to the needs and preferences of residents in the provision of new housing (Leishman et al., 2004; Luten, 2006) yet many of the unsafe behaviours and difficulties identified as a result of the research presented in earlier chapters of this thesis could be avoided through alternative design.

7.3 The interaction between dwelling design and occupier behaviour

As discussed in chapter 2, injury prevention strategies have paid little attention to how occupier behaviour interacts with the home environment and how this can affect health and safety. The studies reported in this thesis have demonstrated that there are a number of complex interactions which arise within new homes which can lead to an increased risk of injury or ill-health. The physical design of the domestic environment will impact on how individuals interact with the features within their homes. These interactions will also be influenced by individual factors (attitudes and beliefs) and social aspects such as cultural expectations and societal norms.

One main approach used for injury prevention is the modification of the home environment to reduce the presence of physical hazards. Primary measures have included the provision of safety equipment and alterations to the physical design of dwellings, yet such an approach does not consider the potential influence of behaviour. This is now regarded by some commentators as a weakness (Carlson-Gielen & Sleet, 2003) and further evidence in support of this is offered through the work presented here.

This work has highlighted the important influence of developers of new housing, designers and the end user in shaping health and safety within new homes. The problems encountered by occupiers identified during the course of this research are the result of a combination of factors and will require a unified approach involving much wider cooperation amongst developers and those from within government and local authority housing.
divisions.

A number of the problems identified by participants in the course of this research could be avoided through alternative design, for example the inclusion of slip resistant surfaces on sloped thresholds of new homes would reduce the potential for slips and falls in wet or icy weather. The findings from the interviews conducted with architects and designers however suggest that unless such design changes are made a mandatory requirement for all new dwellings, there is little impetus for change. Some examples of good practice were evident amongst those architects interviewed, for example, consideration was given to the placement of the loft access hatch away from the stairs, in one case. This however, was the exception rather than the norm.

The Construction Task Force, established following the Latham Report in 1994 (Latham, 1994), aimed to improve the efficiency and quality of new housing, however a number of subsequent reports have identified failings in this (Barker, 2004; CABE, 2005; Sommerville & McCosh, 2006). There are currently a number of approaches which have the potential to improve aspects of dwelling design and construction within the UK, for example the Secured by Design initiative (ACPO, 2007a, 2007b), the Construction (Design and Management) Regulations 2007 (HSC, 2007) and the Planning Policy Statement 3 (DCLG, 2006a). Each of these present encouraging mandates yet are unlikely to be successful without the committed approach of all those involved in the development of new dwellings. It has already been demonstrated in this thesis (Chapter 4) that some important aspects of the Secure by Design initiative are not followed by all designers and developers.

The Secure by Design initiative is a minimum design standard for safety and security (ACPO, 2007b) whereby compliance with the provisions set out in the Code for Sustainable Homes enables a development to be described as 'Secured by Design'. The code is not a mandatory requirement but instead
offers a minimum standard for environmental design and physical security. The work presented in this thesis supports previous findings whereby it has been established that there is little motivation amongst some designers and developers to consider aspects of design which are over and above that required by law (Heimplaetzer & Goossens, 1991; CABE 2007). This suggests that schemes such as the Secured by Design initiative maybe limited in scope. However, the house building industry is competitive in nature and with large-scale developments being promised for the future, voluntary schemes which promote high standards of design and construction may offer developers a competitive advantage through participation. In other areas such as vehicle safety, increased attention to safety has led to this being a marketable aspect of vehicle design.

The safety of consumer products depends on the design of such products and product liability legislation places an emphasis on safety whereby industrial designers need to consider how their product will be used by consumers. Such consideration needs to include ‘foreseeable misuse’. One aim of the Construction (Design and Management) Regulations 2007 (HSC, 2007) is to direct designers responsible for the development of new dwellings to consider how the dwelling will be used by potential occupiers. This presents scope for consumer participation in dwelling design. A number of the difficulties faced by occupiers are not apparent until they have lived within a dwelling and therefore may not be fully considered during design.

Housing policy and planning controls exert a strong influence on the design of new homes and the developments on which they are built. The provision of social housing within the UK is regulated through legislation (Kintrea, 2005) with design standards detailing essential and recommended items for inclusion within a scheme’s design (Housing Corporation, 2003). A greater consideration is given to consumer needs in the design of new properties intended for rent or shared ownership whereby attention is paid to the storage needs of occupants together with the long-term maintenance of
external features. Such an approach would also benefit those occupying new full market dwellings.

7.4 Implications for Intervention measures

This thesis has demonstrated the important influence that environment-behaviour interactions can exert on the health and safety of those occupying new homes. Complex interactions arise between behaviour and the physical environment and these interactions are influenced by wider social factors such as government policy and community practices. The relationship between these factors is shown in figure 7.1.

The individual model of injury understands injury risk in terms of individual behaviour (Allegrante et al., 2006) and as such, prevention initiatives have focused on encouraging safe practices within the home. Environmental interventions have also been encouraged to reduce the prevalence of physical hazards within dwellings. From the model (figure 7.1), it is clear that safe and unsafe behaviours within new homes arise due to various interactions between the individual and the home environment. These interactions themselves are directed by individual factors (psychological and biological) and by the design of the environment itself. Furthermore, social factors such as government policy, community and societal practices shape both individual factors and the design of the built environment. This situation can be thought of as an ecological system whereby there are multiple levels of influence on behaviour (this notion is further expanded in section 7.4.1). It is possible that these factors can be addressed consecutively through prevention initiatives which are directed at different levels within a community's ecological system. For example, intervention initiatives aimed at changing an individual's behaviour may be supported by changes within the home environment together with complimentary policy initiatives and action on behalf of developers.
Figure 7.1. Influences on home safety practices
The competing nature of some of the influences will require a strong commitment from different agencies to form a partnership in sourcing workable solutions.

Not all injuries however can be prevented through design, yet there remains the scope to encourage safe practices through a supportive home environment. One key finding to emerge from this study was that architects and designers have limited insight into the sources of risk presented within homes. This may be due to an over-reliance on building regulations in providing a level of safety or because of a lack of available information on the nature and scope of unintentional home injuries. The latter may be difficult to address on a national level as home injury statistics are no longer collated within the UK. However, there remains scope for this area to be addressed through the training and education of architects and designers. In addition, an ecological approach to home injury prevention would recognise the important role played by those responsible for the design of dwellings and could incorporate strategies to communicate the risks posed by certain architectural features within new homes at an organisational, community and societal level. If occupier safety and injury prevention was a leading priority in the design of built environments, there would be obvious health benefits for occupiers (Stevenson, 2006).

With a commitment from the current government to increase house building within the UK there also remains scope to incorporate changes in dwelling design to reduce the number of physical hazards present in new dwellings. This will require a commitment from the government agencies responsible for housing policy here in the UK and from the developers themselves. Developers have previously been criticised for only providing the minimum required by planning control (CABE, 2007) and the provision of additional safety items as standard practice will require a consensus across the industry. If such an approach is adopted voluntarily by the developers, this may reduce the need to legislate for such a change (Farquhar, 1998).
This research has also demonstrated shortcomings in relation to some primary measures which form part of building regulations, for example the current requirement for fire doors in some dwellings. In homes where self-closing fire doors were fitted a large majority of occupiers reported unsafe behaviour in relation to these doors. There has since been a proposal from the government to remove the requirement for self-closing fire doors within dwellings from building regulations:

'The ODPM is minded to remove the need for self-closing devices within dwellings. This is because they can present a hazard to children; they can interfere with the day-to-day convenience of the occupants and many of our stakeholders tell us they are often disabled soon after occupation. The fire safety benefits of closing doors, particularly at night, remain and it is proposed to reinforce this message through national and local Community Fire Safety programmes (see www.firekills.gov.uk) and other fire safety Initiatives'. (ODPM, 2005, P46).

This proposed approach to maintaining fire safety within dwellings incorporates environmental (i.e. doors) and behavioural (i.e. educational) initiatives simultaneously. In Chapter 3 however, it was demonstrated that few occupiers reported that they had made a fire escape plan despite an educational campaign to encourage them to do so (ODPM, 2002b). Reasonable expectations of what it might be possible to achieve, along with alternative ways of reinforcing the importance of fire safety within the home are therefore required to compliment any changes in engineering approaches.

7.4.1 An ecological framework for the prevention of home injuries

The aim of this research was to identify ways in which behaviour can interact with the design of new homes to influence occupier health and safety. Home injury prevention initiatives within the UK have recognised the contribution of both behaviour and the environment to unintentional injuries, with engineering approaches (primary approaches) and behaviour
modification programmes (secondary approaches) being implemented in the past.

It has been demonstrated that some behavioural based programmes which target risk taking behaviours can be effective in reducing childhood home injuries (Clamp & Kendrick, 1998; King et al., 2005). This success may be due to the increased motivation of parents (Lund & Aaro, 2004) as opposed to long-term maintenance of protective behaviours among children. Combined approaches, incorporating primary and secondary measures have also met with some, yet limited success. Primary approaches are often being referred to as passive approaches, intimating that no human action is required for their effectiveness however Carlson-Gielen and Sleet (2003) argue that for virtually all environmental changes a behavioural adaptation is also required. This has been demonstrated with respect to a number of primary strategies aimed at preventing unintentional injury within the home, for example, smoke alarm maintenance (Shults et al., 1998; Runyan et al., 2005c).

The importance of social factors in determining health have been recognised for some time (Fuller-Thomson et al., 2000; Hartig & Lawrence, 2003) and more recently the contribution of social influences in the aetiology of unintentional injury has been acknowledged (Newcombe et al., 2005; Allegrante et al., 2006). Despite this, there is little evidence of social influences having been incorporated into injury prevention initiatives. The medical model of injury prevention understands a person and their injury risk in terms of the presence of external agents or individual behaviour, however, Hanson et al., (2002) suggest that environmental and social determinants impose significant constraints upon individual behaviour and therefore injury should be understood as an environmental and social phenomenon.

The findings from the studies presented in the previous chapters have highlighted how environmental, behavioural and social influences shape the
experiences of inhabiting a new home and influence occupiers' health and safety. Some environmental features within the home have been recognised as presenting a hazard to inhabitants and unsafe behaviours practised by occupiers have been identified. Social factors have also been identified which influence both the design of the home environment and the interactions that arise within it.

It is therefore argued that unintentional home injuries can arise as a result of individual, environmental or social factors or as a result of a combination of these issues. An ecological approach to reducing the incidence and severity of unintentional home injuries would allow consideration to be given to the complex factors involved in injury causation within multifaceted prevention initiatives. In this way, environmental, behavioural and social influences can be attended to, in addition to the interactions that arise between them. In terms of new dwelling design, it has been demonstrated that social process such as government policy aims and planning control can influence the shape and form of new homes (chapter 6), indicating that the characteristics of behaviour on an individual level is embedded within a much larger system. Any attempt to change behaviour should therefore recognise the impact of controlling factors from within a wider context. Likewise, any environmental modification, such as the provision of self-closing fire doors within dwellings should address the behavioural and social responses required for such a modification to be effective.

The interactions which take place between an individual and the home environment involve a combination of behavioural factors and environmental factors (Intrapersonal level and Interpersonal level) and these interactions are shaped by aspects from other levels within the ecological system (Organisational, Community and Societal levels). For home injury prevention strategies to be successful they will need to address behavioural, environmental and social influences simultaneously. Examples of the types of approaches which may be incorporated into an ecological prevention strategy are illustrated in figure 7.2.
Figure 7.2: Ecological model of injury prevention focusing on the design of the dwelling.
7.5 Methodological considerations

This research adopted a mixed methods approach to data collection whereby data were obtained using a variety of qualitative and quantitative methods. Such an approach enables the researcher to draw on the strengths associated with each methodology and minimise any weaknesses which may arise where a single approach is utilised (Johnson & Onwuegbuzie, 2004). Mixed-methods can be used interchangeably within a single empirical investigation or as a process by which different data sets are brought together (Moran-Ellis et al., 2006) and is a useful approach for generating new knowledge through a synthesis of findings (Foss & Ellefsen 2002).

The application of qualitative and quantitative methods to the same project is criticised by some researchers (e.g. Lincoln & Guba, 1985) because of the paradigmatic differences between positivist and interpretivist accounts of social phenomenon. Advocates of mixed methods research however argue that multiple methods based on different philosophical assumptions can be used whereby each method examines a particular aspect of the same phenomena (Sale et al., 2002). The approach reported in this thesis utilised qualitative methods to gain information about the experience of occupying a new home and a quantitative approach to measure this experience, thereby negating any possible paradigm conflict.

The triangulated approach used during the studies presented in chapters 3, 4 and 5 utilised qualitative and quantitative methods to explore the interactions that occur between occupier behaviour and new dwelling design. In each of these studies the sample of participants were self-selecting and it is possible that this methodological limitation may have biased the study findings through participants being those with particular views and having points they wish to express. The data provided by participants within each of these studies was based on self-report and thereby disposed to response bias. Random sampling with high levels of compliance would be necessary to examine the possible extent of this
The use of a mixed methods approach was also useful in counteracting the potential for error introduced by retrospective data collection; this being where recollection of detail by participants relied on their memory for an event. The data collected retrospectively and reported in chapter 3 was subsequently built upon and validated in later chapters. The retrospective nature of the data obtained in chapter 6 does need to be considered when interpreting the results as these particular findings were not validated through subsequent work. Despite this limitation, the study provided an informative data set which contributes to our understanding of how some societal policies influence the creative aspects of dwelling design.

The questionnaire survey with new home owners was limited in size and focused on properties built by just one developer. The use of standard house types by that developer would have led to certain design elements being present within many of the homes surveyed. The findings reported from this study are therefore limited in terms of their generalisability. The results were useful however in providing an indication of the scope of problems encountered by those participating and some of the findings were in accordance with those previously reported in the literature (CABE, 2005, 2007). A more robust approach would be to undertake a much larger survey incorporating new dwellings built by a wider sample of developers.

Participant recruitment throughout this work was challenging. This has been discussed briefly in Chapter 3 (Section 3.5.6). Despite a wide distribution of letters inviting interest, securing participants for the studies presented in chapters 2 and 4 was difficult. It has previously been postulated (Chapter 3) that this may have been due to the timing of the research whereby participants were required to participate shortly after moving into a new home. The interviews and home inspections undertaken were also intrusive in that they required participants to cooperate in their free time whilst allowing the researcher into their home; this may have discouraged some
from taking part.

Recent work examining occupier behaviour in the home has been affected by issues of trust (DCLG, 2007d). Honesty and trust (Miles & Huberman, 1994) were an important consideration throughout this research. It was desirable for the researcher to establish an honest and trusting relationship with the participants in order that they felt comfortable to divulge information regarding personal interactions within the home. During the interview studies a good rapport was initially established by the researcher prior to any research being undertaken. Full details of the research process and the research aims were discussed with participants and anonymity was assured. Such an approach can also reduce the potential for interviewer effects and its value is reflected in the rich and informative details provided in each of the studies reported in the previous chapters.

In conclusion, the use of a mixed methods approach during the course of this work was valuable in providing an amalgamation of findings regarding the influences underpinning the interactions which arise between occupier behaviour and the design of new homes. Whilst this approach enabled valuable information to be gained regarding the different aspects influencing environment-behaviour interactions the findings from each of the studies undertaken are not conclusive. Further work could incorporate more detailed investigation of environment-behaviour interactions underpinning specific types of injuries within the home, for example slips, trips and falls within the garden area and such work could include a more objective assessment of the environmental influences on injury risk. The limitations associated with each of the approaches used have been documented within the thesis and these limitations need to be taken into consideration when interpreting the findings.

7.6 Recommendations for future work

The findings presented within chapters 3, 4, 5 and 6 offer valuable information which informs the development of an ecological systems
approach to reducing unintentional home injuries within the UK. Such an approach however would benefit from more thorough assessment of the complex interactions between behavioural, environmental and social influences underpinning the risk of different types of home-based injury.

The community based approach to reducing unintentional injury has been employed in a number of other countries including Sweden, Norway, Australia and New Zealand. However, there remains a paucity of solid evidence on the effectiveness of these multi-strategy intervention programmes (Nilsen, 2004). This thesis offers valuable information concerning the nature of behaviour-environment interactions within new homes and further work is required to build upon this knowledge in order to develop our understanding of how an ecological approach may be used within the UK to address a variety of injuries sustained within the home environment.

Nilsen (2004) has demonstrated the importance of context in the effectiveness of a community-based approach to injury prevention and because of the interdependency between contextual, structural and process aspects of such an approach, it is difficult to identify key success factors. An ecological approach will therefore need to be tailored to a particular type of injury or a particular community group.

The current proposal to remove the requirement for self-closing fire doors within dwellings (ODPM, 2005) offers an opportunity for an ecological approach to be adopted to promote fire safety within homes in the UK. The proposal suggests an engineering approach supported by community-based programmes encouraging safe practices. This implementation of this would offer the opportunity for an effective evaluation of the adopted measures which would provide valuable information for the injury prevention community as a whole.
During the interviews conducted with occupiers in new build homes (chapter 3), particular difficulties were reported by one participant who was a wheelchair user. Unsuitable housing can lead to increased dependency amongst those with disabilities and unadapted housing has been identified as a risk factor for accidents (Heywood, 2004a). It was beyond the scope of this research to build upon the initial findings reported by this participant but they warrant further attention. A future study could explore the interactions experienced within the home from the perspective of non-ambulant individuals or occupiers with other special needs. Such findings would compliment the work presented here and would provide additional information in relation to the design of accessible and adaptable dwellings.

The findings presented in Chapter 6 offer an informative reflection on current practice during the design of new housing developments. However, many other stakeholder groups are involved in the development of new dwellings and to fully understand the influences which shape contemporary housing it will be necessary to explore the issues from the perspectives of all those involved. This could be achieved through the use of expert panels. Such an investigation would build upon the results obtained from this work and provide a detailed picture upon which to base future prevention efforts.

There is a requirement in the Construction (Design and Management) Regulations 2007 (HSC, 2007) for architects and designers to avoid foreseeable risks to those involved in the construction and future use of buildings, including dwellings in their designs. This is an important step in relation to ensuring the health and safety of those occupying new homes given the findings reported in this thesis. It would be useful to evaluate the effectiveness of these regulations against occupier experiences and their interactions within the home environment.

### 7.7 Contribution to knowledge
As discussed in chapter 2, current approaches to reducing the incidence of unintentional injury within the home focus on either primary or secondary
measures for prevention, with some primary measures being incorporated as legislative requirements. Whilst these measures have met with some success in preventing injuries and reducing the incidence of certain hazards within the home, they fail to adequately address the risks which result from the interactions which arise through occupier use of the features and systems within the home.

The major contribution to knowledge offered by this thesis is understanding of the varying interactions which take place within new homes and how these can lead to an increased risk of unintentional injury or ill-health. Until now, knowledge regarding the interactions between occupier behaviour and dwelling design has been limited with very few studies considering how behaviour can influence and change the home environment. Where this has been addressed, the attention has been of limited scope, e.g. stairs (Roys 1991; Haslam et al., 2006). An understanding of the different interactions that can arise and how these can influence health and safety is essential if future prevention strategies are to be effective.

An expansion of full market new homes is planned for the UK and this work offers information regarding behavioural responses to current environmental design which may assist in the development of new homes. The findings will be useful for architects and designers by providing information on the risks and hazards presented by some features within new homes. Through the application of the Construction (Design and Management) Regulations 2007 a number of the hazards identified in this work will need to be addressed. In addition to this, the findings suggest that some housing policies are incongruent with consumer requirements. The predicted growth in car ownership (DETR, 2005) for example, contrasts with the reduced provision for parking on new developments. This and previous studies (CABE, 2005, 2007) have highlighted how a behavioural response to reduced parking limits policy effectiveness. The findings will therefore be informative for those responsible for policy development.
Another important finding arising from this research is the identification of primary safety measures within new homes which can introduce additional hazards for injury. Whilst published work has previously examined the effectiveness of particular aspects of building regulations, investigations have tended to focus on the value of particular measures for minority groups such as disabled people. This thesis offers new information on recommended safety measures which have been shown to be hazardous.

The work also provides a new perspective on home injury prevention. It has been demonstrated that there are many interacting influences which determine injury risk within the home environment, yet previous injury prevention strategies have failed to address these. There is support for the application of behavioural science models to injury prevention (Dejoy, 1996; Carlson-Gielen & Sleet, 2003), and the work presented here offers the first consideration of the utility of such an ecological systems approach to the area of home injury prevention.

7.8 Final conclusions
This thesis aimed to gain a greater understanding of the interactions that arise between occupier behaviour and new homes and how such interactions may influence occupier health and safety. Unintentional home injuries are a priority concern within the UK and elsewhere in the developed world. Previous methods of reducing the incidence of domestic injury have been dominated by approaches that have separated consideration of individual factors, i.e. behaviour and environmental factors which have been addressed through primary or secondary intervention measures.

The research presented in this thesis has shown that complex interactions arise between the individual and environmental features within the domestic setting. If injury prevention strategies are to be successful they need to address these interactions together with the environmental and social factors which can determine injury risk. An ecological approach to injury prevention offers a theoretical framework through which individual,
environmental and social issues which can give rise to an increased risk of unintentional injury can be attended to in a systematic manner.
References


Ellaway, A. & Macintyre, S. (1998). Does housing tenure predict health in the UK because it exposes people to different levels of housing related hazards in the home or its surroundings? *Health and Place*, 4, 141-150.


Factor, R., Mahalel, D. & Yair, G. (2007). The social accident: A theoretical model and a research agenda for studying the influence of social and cultural characteristics on motor vehicle accidents. *Accident Analysis and Prevention, 39, 914-921.*


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APPENDIX A

Participant Information Sheet
What is this research all about?
This research concerns how we interact with our homes and how we make changes to our homes to suit our lifestyles. Homes are one of the most expensive purchases we make during our lifetimes, and it is important that builders and designers get it right. New homes contain many features which are designed to increase the convenience of a property, and a number of builders promote their properties with convenience and attention to details as major selling points. This study looks at how owners and occupiers feel about the convenience and usability of their homes and the changes they make to ensure their homes are convenient.

What will be required if I agree to take part?
An interview will be conducted with you within your home. This interview will be recorded. You will also be asked to complete a home inspection which will consist of our researcher accompanying you going from room to room, discussing the usability of the different parts of your home and any changes you have made in each room.

What are the possible advantages/disadvantages of taking part?
This research will help professionals understand how we use our homes and will provide an opportunity to identify where improvements through design and occupier education can be made. The benefit to you is the opportunity to give your opinion on certain design features and to express exactly what you would like in a home. If you are interested, you will be kept informed of the project results.

Will my identity be kept confidential?
All the information collected about you during the course of the research will be kept strictly confidential. All references to participants in any report and subsequent publications will be anonymous. The information will be kept in a secure location, accessible only by the researcher. All of the data (audio tapes etc) will remain the property of Loughborough University and will be destroyed 10 years after publication.

What will happen to the results of the research study?
The results will be analysed by the researcher, and all participants will remain anonymous. The results may be presented in an appropriate scientific journal or at conferences. If you participate in this study, you will be able to obtain copies of these publications from the research team. The data will be stored by Hilary McDermott at Loughborough University under conditions specified by the Departmental Data Protection Advisor.

Who do I contact for more information?
You may contact Hilary McDermott on 01509 228485 or e-mail her at H.J.McDermott@lboro.ac.uk.

Thank you for taking part in this study
Example of Coding
Participant 14

HM  How long did this walk through take?
LP  I think it was a case of ‘here’s the keys, if you’ve got any questions, come down and ask’. It was the sales office as well and they didn’t want the sales office to be closed.
HM  Did he point out the smoke detectors?
LP  I think it was one of the things that was mentioned on all the sales information, that you have to have them.
HM  No specific reference verbally to the smoke detectors?
LP  No, he did mention them yeah, I think he mentioned the fact that they are already wired in to the mains, but because of the previous house we had been in as well, we already knew that.
HM  What about fire doors?
LP  Oh yeah these stupid... yeah, he did, no, no, no, we picked up on why there were chains on all the doors and he said it’s because they are fire doors, in three story houses it’s building regs. And we said ‘oh ok,’ so we moved in and took them all off.
HM  You took them all off?
LP  Every single one, and now we’ve had to go around and put them all back on again, obviously, so we can sell the house as you’ve got to comply with building regs. No actually we’ve not put this one on or the kitchen one on because they are the most used doors, and the kids, they are too dangerous, you are constantly propping doors open which is pointless when they are fire doors, so.

It’s very dangerous in itself, I mean we nearly lost a finger on the first one, so.
HM  How was that?
LP  Because they are so dangerous, because of the way they are built.
HM  The doors or the chains?
LP  No the chain when you take the chain off, we undid the screw and all of a sudden chhhhhewww, and we were just like ‘wow’ if you hadn’t have moved in the slight second.
HM  Because it’s on a tension?
LP  Yeah, and then we had a chippy mate who used to fit them and he was like no, no this is how you do it. We put them on for the surveyor, my husbands brother is a builder, and he knew that they all had to be on and it was something a surveyor would pick up upon.
HM  Have any members of your family trapped their fingers?
LP  Oh God yeah, the kids did, that’s was one of the reasons we took them off. I appreciate why they had to be on, but I don’t understand the difference between a three story and a two story, but the doors are very heavy and so there’s a lot of weight behind the tensioned spring and I’d say with two kids, and the dog keeps getting trapped as well if he’s not quick enough.
HM  The accidents that have happened to the children with their fingers, have they necessitated going to the hospital?
LP  Oh no, I’m medically trained anyway.
Participant Instructions for Diary Study
Diary Instructions for Participants

Equipment

You have been provided with a compact cassette recorder, spare batteries and an audio tape. If you are uncertain as to how to operate the equipment please ask. Your diary will be recorded onto the audio tape. Please record your entries one after another (i.e. please do not rewind the tape at any time).

When should I make an entry?

Try and make an entry on a daily basis if only for a few minutes. If you forget to make an entry one day, do not worry just continue to make future entries as planned. You may make more than one entry each day if you feel you would like to.

What information do I provide in my diary?

We would like to hear about your experiences as you settle into your new home, the changes you have made to your home (however small) and why you have made these changes. The list under the heading 'Making an entry' may help you remember specific points, but we are interested in all the things you do to your home as you settle in.

Making an entry

When you make a diary entry, please start with the time and date it was made. Then please use your own words to record your experiences. The following list may help, but is only a guide. This is your diary and it is your own personal experiences of making changes which we are interested in. Please be as open as possible, all information provided will be treated confidentially.

* What we are interested in hearing about *

- What have you done to your home today? Have you made any changes, for example:- changed the structure by knocking down walls? Have you put curtains or pictures up? Have you changed any internal fittings. Have you boarded the loft, fitted a loft ladder, drilled through walls, created more storage, removed internal doors? We would like to hear about how you have made these changes, why you have made them, and what problems (if any) you have encountered.
- What work have you done to the garden? For example, heavy digging, laid turf, created a patio?
- Are you happy with the design of your home? Does this meet with your needs? If not, why not?
- Is your home living up to your expectations. If yes, how is this happening, and if not, why is this?
- Have you encountered any on-going problems with a particular feature? If you have, what are these problems and how are you going to overcome them?
- Think about these things - light, noise, storage, fitted safety features such as fire doors & smoke alarms, loft access, the arrangement of fitted electrical items, hazards, accessibility, comfort, snagging, air ventilation, DIY etc.

The researcher will maintain contact with you and you will be able to discuss this with her. You may contact Hilary McDermott on 01509 228485 or e-mail H.J.McDermott@lboro.ac.uk
APPENDIX D

Copy of Questionnaire used in Study 3
The Health and Safety Ergonomics Unit at Loughborough University is conducting some research concerning the design of new houses and how we use our homes. As part of this research, this questionnaire is being sent to Haslam homeowners / occupiers.

The questionnaire has been developed following interviews with people who had moved into a brand new home. It aims to find out if some of the problems reported during those interviews are common in new homes.

This research will help house builders understand how we use our homes and will provide an opportunity to identify if the design of new homes can be improved.

For further information you may contact Hilary McDermott at Loughborough University on 01509 228485 or e-mail her at H.J.McDermott@lboro.ac.uk.

Please answer the following questions honestly and accurately.

All information is anonymous and strictly confidential.

The information will be used solely for research purposes.
1. Some questions about you

a. Your age?

<table>
<thead>
<tr>
<th>Age Range</th>
<th>18 – 25</th>
<th>26 – 35</th>
<th>36 – 45</th>
<th>46 – 55</th>
<th>56- 65</th>
<th>Over 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 – 25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 – 35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 – 45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46 – 55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56- 65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Your gender?

- Male
- Female


c. Who do you live with?

<table>
<thead>
<tr>
<th>Living Arrangement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I live alone</td>
<td>I am a single parent living with children.</td>
</tr>
<tr>
<td>I live with my spouse/partner (with children)</td>
<td>I live with my spouse/partner (no children)</td>
</tr>
<tr>
<td>I live in a multi occupancy dwelling</td>
<td>Other (please specify)</td>
</tr>
</tbody>
</table>

2. Some questions about your property.

a. What type of property?

<table>
<thead>
<tr>
<th>Property Type</th>
<th>Bungalow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apartment or flat</td>
<td></td>
</tr>
<tr>
<td>Terraced House</td>
<td>Semi-detached House</td>
</tr>
<tr>
<td>Detached House</td>
<td>Other</td>
</tr>
</tbody>
</table>

b. Number of Bedrooms?

<table>
<thead>
<tr>
<th>Number of Bedrooms</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
</table>


c. Your status?

- Owner occupier
- Tenant
- Shared ownership with Housing Association

d. The value of your property?

<table>
<thead>
<tr>
<th>Property Value</th>
<th>£50,000 - £99,999</th>
<th>£100,000 - £149,999</th>
<th>£150,000 - £199,999</th>
<th>£200,000 - £249,999</th>
<th>Over £250,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>£50,000 - £99,999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£100,000 - £149,999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£150,000 - £199,999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>£200,000 - £249,999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over £250,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

e. How long have you lived in this home?

<table>
<thead>
<tr>
<th>Length of Time</th>
<th>Less than 3 months</th>
<th>Between 3 - 6 months</th>
<th>Between 6 - 9 months</th>
<th>Between 9 - 12 months</th>
<th>Over 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 3 - 6 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 6 - 9 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 9 - 12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Some questions about aspects of your home. (please circle an answer)

a. Please answer the following questions about your garden.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have your own private garden?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Do you have a communal garden?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Does your garden meet your expectations from the site plan?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Is your garden smaller than expected?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Is your garden larger than expected?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Is your garden on a slope?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>If there is a slope, does this cause you any difficulties?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Are you completely satisfied with your garden?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Is there anything else you would like to mention about your garden?

b. Please answer the following questions about your garage.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have your own private garage?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Is your garage attached to your property?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Is your garage located in a nearby garage block?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Do you use your garage to park your car?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Do you use your garage for the storage of household items?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Is the size of your garage sufficient for your needs?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Is your garage fitted with an electric light?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>If there is no light, does this cause you any problems?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Do you have an electrical socket in your garage?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>If there is no electrical socket, does this cause you any problems?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Are you completely satisfied with your garage?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Is there anything else you would like to mention about your garage?

c. Please answer the following questions about your parking provision.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have a driveway attached to your home?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Do you have sufficient parking for your needs on your driveway?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Is your driveway wide enough to park 2 cars easily?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Is your allocated parking area within a communal parking area?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>If yes, does this cause you inconvenience or difficulties?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Is the communal parking area lit during the hours of darkness?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>If the area is unlit, does this cause you any concerns?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Do you have difficulties unloading your car due to parking arrangements</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
</tbody>
</table>

Is there anything else you would like to mention about your parking?
**d. Please answer the following questions about any fire doors in your home.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have fire doors fitted in your home?</td>
<td></td>
<td></td>
<td><strong>YES NO</strong></td>
</tr>
<tr>
<td>Were you given any information about the fire doors in your home?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td>N/A</td>
</tr>
<tr>
<td>Do you prop open your fire doors in some way?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td>N/A</td>
</tr>
<tr>
<td>Have you removed any closers from the fire doors?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td>N/A</td>
</tr>
<tr>
<td>Have you removed any fire doors altogether?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td>N/A</td>
</tr>
<tr>
<td>Has anyone trapped their fingers in any of the fire doors?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td>N/A</td>
</tr>
<tr>
<td>Are you completely satisfied with the fire doors in your home?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td>N/A</td>
</tr>
<tr>
<td>If you have propped them open or removed any doors or closers, please tell us why:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is there anything else you would like to mention about your fire doors?

**e. Please answer the following questions about any fire escape window in your home.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have a fire escape window in your home?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Were you told about a fire escape in your home?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Is your escape window lockable in any way?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Is your escape window lockable with a key?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Is your escape window fitted with an opening restrictor for safety?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Do you have any concerns that this window is a hazard for falls?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Are you completely satisfied with the fire escape window in your home?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
</tbody>
</table>

Is there anything else you would like to mention about your fire escape window?

**f. Please answer the following questions about any loft space in your home.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have a loft space within your home?</td>
<td></td>
<td></td>
<td><strong>YES NO</strong></td>
</tr>
<tr>
<td>Has any member of your household been in the loft since moving in?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Was there a loft ladder fitted when you moved in?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Have you fitted a loft ladder since moving in?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Do you use a portable ladder / stepladder to get into your loft?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Do you use furniture to stand on to get into your loft?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Do you rely on another person to assist you to get into your loft?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Have you boarded any part of your loft since moving in?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Was there an electric light fitted in your loft when you moved in?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>If not, have you installed a light in the loft since moving in?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Was there electricity fitted in your loft when you moved in?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>If not, have you fitted any supply yourself?</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Are you completely satisfied with the loft space in your home</td>
<td><strong>YES</strong></td>
<td><strong>NO</strong></td>
<td><strong>N/A</strong></td>
</tr>
</tbody>
</table>
Is there anything else you would like to comment on about the loft?


g. Please answer the following questions about any ventilation bricks/grills.

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have ventilation bricks or grills in the walls within your home?</td>
<td>YES</td>
<td>NO</td>
<td>Don't Know</td>
</tr>
<tr>
<td>Were you told about any ventilation bricks being in your home?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Are any of these bricks blocked by your furniture?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Have you blocked them in some other way?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Do the air bricks in your home create a draught?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Is there anything else you would like to say on about the air bricks?


h. Please answer the following questions about the hot water in your home.

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the temperature of your hot water comfortable?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Is the temperature of the hot water too hot?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Can you control the temperature of the hot water with a thermostat?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Can you control the temperature of the hot water with mixer taps?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Do your mixer taps actually mix the water?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Has any person scalded themselves because the water is too hot?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
</tbody>
</table>

Is there anything else you would like to say about the hot water?


i. Please answer the following questions about any sloped ceilings in your home.

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there any sloped ceilings in your home?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Has any person hit their head on these sloped ceilings?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Do the sloped ceilings cause you any other problem?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Is there anything else you would like to say about the sloped ceilings in your home?


j. Please answer the following questions about any sloped paths to your home.

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there any sloped paths giving access to your home?</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Does the sloped path become slippery in wet and icy conditions?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
<tr>
<td>Does the sloped path cause you any other problems?</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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Is there anything else you would like to say about any sloped paths?

k. Please answer the following questions about the stairs in your home.

Does any part of the supporting stair post come down into the living area?  
YES  NO
Has any person hit their head on this feature?  
YES  NO  N/A
Have you removed part of this post for any reason?  
YES  NO  N/A

Is there anything else you would like to say about your stairs?

l. Please answer the following questions about the pipes and wiring in your home.

Were you given a plan/map of the location of pipes and cables?  
YES  NO
Were you given any information about the location of these?  
YES  NO
When putting up pictures, do you use a services detecting tool?  
YES  NO
When putting up pictures do you think about the pipes or wires?  
YES  NO
Have you drilled into the wall without considering the pipes or wires?  
YES  NO
Have you accidentally drilled into a water pipe or electricity cable?  
YES  NO

Is there anything else you would like to say about your pipes and cables?

m. Please answer the following questions about your home information pack.

Have you read the complete information pack for your home? (all pages)  
YES  NO
Have you read at least some of the information pack for your home?  
YES  NO
Was the new information pack for your home informative?  
YES  NO  N/A

Is there is anything else you would like to say about your home information pack?

n. Please answer the following questions about the window locks in your home.

Are all your windows lockable with a key?  
YES  NO
Are all your windows lockable with a button (instead of a key)?  
YES  NO
Do you usually keep them locked as a matter of course?  
YES  NO
Do you keep the keys hidden somewhere in your home?  
YES  NO
Do you keep the keys by the windows?  
YES  NO

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Is there anything else you would like to say about your window locks?

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o. Please answer the following questions about the cupboards and shelves in your home.

When you moved in, was there enough storage for your needs? YES NO
Since moving in, have you created more storage space? YES NO

Is there anything else you would like to say about the storage within your home?

---

p. If you have needed to make any changes to your home since you have moved in, please would you tell us about this. For example, have you made any changes to the structure, wiring, storage or electricity supply? Please tell us about these changes and why you felt the changes were necessary.

---

4. Any Other Problems/Concerns

Is there any feature in your property not covered by the above questions that has caused you any problems or concerns? YES NO

If Yes, please provide some information concerning the problems/concerns you have.

---

If you have any other comments (positive or negative) to make regarding your home, please use the space below to tell us this information.

---
Your views are important to us, and we very much appreciate your time in completing this questionnaire. Any data collected as a result of this study is strictly confidential and no persons or properties will be identified to a third party during the reporting of any findings.

Thank you very much for your time in completing this questionnaire.
APPENDIX E

Participant Information Sheet
What is this research all about?
This research concerns health and safety within the home and examines the interaction between occupier behaviour with dwelling design. The careful design of dwellings can minimise the risk of unintentional injury or ill-health, yet injury in the home remains extremely common. In 1999, 20.1 per cent of all UK home accidents were associated with a construction feature within the home. We are examining these issues from the perspectives of a number of people including those responsible for designing and building homes and also those who eventually inhabit them.

What will be required if I agree to take part?
An interview will be conducted with you. This interview will be recorded and later transcribed. All information provided will be securely stored and treated in strict confidence.

What are the possible advantages/disadvantages of taking part?
This research will improve understanding of this important area and will help identify where improvements through design, construction or occupier education may be possible. If you are interested, you will be kept informed of the project results.

Will my identity be kept confidential?
All the information collected about you or your work during the course of the research will be kept strictly confidential. All references to participants in any report and subsequent publications will be anonymous. The information will be kept in a secure location, accessible only by the researcher. All of the data (audio tapes etc) will remain the property of Loughborough University and will be destroyed 10 years after publication.

What will happen to the results of the research study?
The results will be analysed by the researcher, and all participants will remain anonymous. The results may be presented in an appropriate scientific journal or at conferences. If you participate in this study, you will be able to obtain copies of these publications from the research team. The data will be stored by Hilary McDermott at Loughborough University under conditions specified by the Departmental Data Protection Advisor.

Who do I contact for more information?
You may contact Hilary McDermott on 01509 228485 or e-mail her at H.J.McDermott@lboro.ac.uk.

Thank you for your interest in this study.
The photographs below show examples of where self-closing fire doors had been prevented from closing or where the self-closing mechanism had been removed.
Photograph showing egress window

Photograph showing position of loft

Photograph showing egress window

Photograph showing radiator located at the foot of the stairs

Photograph showing ramped threshold to property

Photograph showing outside ramp for wheelchair user
The Road goes ever on and on
Out from the door where it began.
Now far ahead the Road has gone,
Let others follow it who can!
Let them a journey new begin,
But I at last with weary feet
Will turn towards the lighted inn,
My evening-rest and sleep to meet.

J.R.R. Tolkien (1892 – 1973)
The Lord of the Rings