

The effects of 'Secure Warm Modern' homes in Nottingham: Decent Homes Impact Study



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Published in 2016 by Nottingham City Homes
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ISBN: 978-0-9934093-2-5

Foreword

The Decent Homes Programme (DHP) was introduced by the UK Government in 2000 to address ‘a large backlog of repairs in local authority housing, estimated at £19 billion in 1997’. It aimed at improving the homes of social housing tenants, making them ‘warm, wind-and weather-tight, and with reasonable modern facilities’, based on a defined ‘Decent Homes Standard’ (National Audit Office, 2010). Nottingham City Homes (NCH) initiated its £187m Decent Homes Programme in 2008, branded locally as Secure, Warm, Modern (SWM), to improve the 28,300 council-owned properties in the city up to and beyond the Government’s standard.

It was widely assumed that making homes secure, warm and modern would result in a number of benefits to the lives of individual tenants, and also that a such a large investment would have a significant positive impact on particular neighbourhoods and on the city as a whole. However, as the National Audit Office highlighted, research was urgently needed in order to test these assumptions, and to assess the wider overall impact of the DHP on wider social outcomes.

To address this gap with robust knowledge and evidence, NCH launched its ambitious Decent Homes Impact Study in partnership with the Nottingham Business School, Nottingham Trent University, in 2010. Following initial consultation with relevant stakeholders, including NCH’s own tenants, four key themes were identified as the primary areas in which investment in social housing could have an impact on wider social outcomes: crime and security; energy efficiency and fuel poverty; health and wellbeing, and employment and the local economy. The impact study included an overall Social Return on Investment (SROI) assessment.

The positive reception of the reports by other housing organisations and local authorities that followed confirmed the value of the findings. The research project was an exemplar of stakeholder engagement, demonstrating the value of working in partnership with other government organisations, such as local government and businesses, the Police, and the NHS. It heralded the beginning of a wider, holistic approach to understanding the social value delivered by social housing providers in their communities, and also provided the necessary tools to enhance effective decision making. Unsurprisingly, this impact study received equal attention in central government. In June 2012, during a Parliamentary debate about the future of Decent Homes, a Minister for the government stated ‘the study, undertaken by Nottingham City Homes with Nottingham Trent University, of the wider impact of Decent Homes... has made a very useful contribution to our knowledge, and ought to be required reading for those who doubt the importance of investing in our social housing stock.’

NCH continues to use the findings from the impact study to inform its capital programmes and long-term investment plans. For example, the evidence of crime reduction resulted in the immediate prioritisation of further security improvements. Another long-term priority is improving the energy efficiency of NCH homes. The evidence showed that this not only has a positive effect on the environment, but also on tenants’ health and wellbeing and on fuel poverty. This supported NCH in initiating one of the largest insulation programmes in the country, and NCH’s achievements were recognised through the award of UK Housing’s ‘Sustainable Landlord of the Year’ in 2013.

This book gathers all the reports from the impact study. Subsequent research and development work has continued since, as new data are collected and as the methodological approach developed is embedded into the organisation’s planning and decision making process. Details of the subsequent research can be found at www.nottinghamcityhomes.org.uk.

July 2016

1. [https://hansard.digiminstor.com/Commons/2012-06-26/debates/1206271000002/DecentHomesProgramme\(Nottingham\)](https://hansard.digiminstor.com/Commons/2012-06-26/debates/1206271000002/DecentHomesProgramme(Nottingham))

Nick Murphy, Chief Executive of Nottingham City Homes:

Nottingham's City Homes' vision is to 'create homes and places where people want to live'. The Decent Homes Impact Study gave us the evidence to show that the investment in our homes is much more than 'bricks and mortar'; it demonstrably improves the quality of life for our tenants, as well as benefitting their communities, and the wider environment.

This has been the stepping-stone to building new and closer relationships with partners from other sectors, bringing together services that impact on our tenants' wellbeing. NCH now sits on the Nottingham Health and Wellbeing Board, gaining recognition both locally and nationally for the role of housing as an effective early-intervention health measure.

Since the Impact Study, there has been a growing emphasis on social value within the housing sector and wider public sector. The Social Value Act 2012 now requires all public service commissioners to consider how they might improve the economic, social and environmental wellbeing of the local area.

We have been fortunate to be able to work with one of our local academic institutions, drawing on the expertise of the Nottingham Business School, Nottingham Trent University, to develop our approach. This has enabled NCH keep pace and contribute to the developments in social value.

NCH has continued to build social value and impact into our strategic and operational approach. Our Corporate Plan for 2015-18 states: 'We are committed to increasing the social value of our core activities, service initiatives and projects and to measure the value and social impact of our work. We will 'design in' social value from the outset of any activity, and put in place processes and measures that will enable us to account for the social impact that we generate across NCH. This approach will help us explore where our investment may be most beneficial in helping us achieve our corporate ambition.'

(July 2016).

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NCH contractor partners: Bullock, Frank Haslam Milan, Nationwide Windows and Doors, SPI, Vinshire Plumbing and Heating Limited, Wates Living Space.

The project was supported through the Knowledge Transfer Partnerships programme (KTP). KTP aims to help businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK Knowledge Base. KTP is funded by the Technology Strategy Board, along with other government funding organisations. This project was also funded by One Nottingham.

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Impact study overview



**Nottingham
City Homes**



Introduction

The Decent Homes Impact Study provides an evaluation of the wider social impacts of Nottingham City Homes' Decent Homes programme, known locally as 'Secure Warm Modern'. While the initial vision for the Decent Homes programme emphasised the wider social benefits that such a programme would deliver, there has been little systematic data collection or analysis of these benefits to date. This research aims to fill that gap, by providing evidence of impact of the Secure, Warm, Modern programme on NCH's tenants and communities, covering the impact on crime and security, health and wellbeing, the environment and fuel poverty, and on the local economy and employment.

Many of NCH's tenants are affected by multiple factors of deprivation, with some estates within the most deprived areas in England. NCH is therefore a key partner in Nottingham's Sustainable Community Strategy, The Nottingham Plan to 2020, which sets out the long-term vision for promoting the economic, social and environmental wellbeing of the city.

The Knowledge Transfer Partnership between NCH and Nottingham Business School provided the opportunity to measure NCH's contribution to addressing deprivation through the Secure, Warm, Modern programme, and to use the knowledge gained to improve the impact of future housing investments.

The research has shown that the improvements to the physical condition of the property have led to improved outcomes for tenants in terms of their security, health and comfort, as well as wider impacts on the community such as carbon reduction, employment opportunities and neighbourhood improvement. These changes were measured using relevant indicators as well as qualitative information from tenants and stakeholders, giving a measurable indication of the size and scope of changes resulting from the Secure, Warm, Modern programme.

The Secure Warm Modern programme in Nottingham

Nottingham City Homes' Secure, Warm, Modern programme aims to bring Nottingham's 28,300 council homes up to and above the national Decent Homes standard.

The work began in 2008, with a total planned investment of £187 million between 2008 and 2015, delivered under the following streams:

- Nottingham Secure – replacing all single-glazed windows with 'Secured by Design' double-glazed units in around 15,300 properties
- Warmth for Nottingham – improving heating systems for 19,700 properties
- Modern Living – making internal improvements including new kitchens for 17,000 homes and new bathrooms in 12,700 homes.

Crime and security

Burglary to domestic properties has decreased by 42 percent between 2007 and 2010 on two sample estates after all single glazed windows were replaced with new Secured by Design double glazed windows; this is compared to a 21 percent decrease in burglary across the city over the same period.

Since the work was completed, there are 62 fewer burglaries a year to NCH properties on these estates, compared to 33 fewer a year to other (mainly privately owned) properties in the same area. Further to this, the proportion of burglaries via a window in NCH properties with new secure windows was half of that compared to NCH properties with the former single glazed windows.

Tenants in the area reported that they felt safer in their homes; they also felt warmer and suffered from less condensation, damp, draughts and external noise.

However, timber doors were identified as a weak spot in the houses' overall security. Under the current Decent Homes programme only those doors that were old or in need of repair were replaced; however, these findings provide evidence to support NCH in prioritising investment towards a full door replacement programme.



Energy efficiency and fuel poverty

The new double glazed windows, central heating systems and loft insulation fitted through SWM between 2008 and 2011 have increased the average energy efficiency (SAP) rating of NCH homes that have received the work to 68 points out of 100, compared to an average of 60 points before any the work.

This equates to a reduction in CO₂ emissions of 15,500 tonnes per year, a 15 per cent decrease in emissions from NCH properties. This annual carbon saving is equivalent to removing over 2,700 vehicles from the roads; or to planting over 360,000 tree seedlings and growing them for ten years.

It also contributes to reducing fuel poverty among NCH tenants. The Energy Saving Trust estimate that new windows can save between £95-223 a year and new boilers up to £225 from fuel costs, amounting to a potential saving of up to £3.5m each year for tenants who have received the work so far.

Once the SWM programme is complete in 2015, it is estimated that this will result in a total reduction in CO₂ emissions of 43,500 tonnes per year, contributing to achieving 17 per cent of Nottingham's total target for reducing carbon emissions from domestic properties.

However, the detailed case study carried out with tenants living in properties receiving SWM work highlighted that the choices and behaviour of tenants make a significant difference in the actual energy efficiency gains seen.

The analysis has demonstrated that work completed under the SWM programme has significantly improved the potential energy efficiency of the stock. However, in order to realise these efficiency gains the retrofit work needs to be combined with awareness and behavioural change among the occupants, as well as considering how the technology could be made more user friendly.

Health and wellbeing

Inequalities in health widely reflect the socio-economic circumstances across Nottingham, with those living in the most deprived areas (largely including council housing estates) experiencing worse health outcomes across a range of physical and mental health conditions. In Nottingham, the average life expectancy of those living in the most deprived neighbourhoods is ten years shorter than those from the wealthiest neighbourhoods.

Housing investment can improve health and wellbeing outcomes by: increasing energy efficiency, thereby increasing indoor temperatures, reducing damp and mould, and reducing fuel bills; removing health and safety hazards in the home; and by increasing the security of the property.

It is estimated Secure Warm Modern could potentially:

- Save two lives a year by protecting vulnerable tenants from the cold
- Improve the respiratory health (e.g., asthma) of over 1000 children
- Improve the mental health of over 1,400 tenants by relieving excess cold and fuel poverty
- Avoid 12 hospital admissions a year as a result of falls
- Prevent 144 accidents requiring medical attention

This is a small number of examples where a measurable change and cost impact for the NHS in Nottingham could be calculated; the costs saved as result of addressing these issues total almost £700,000.

Addressing housing conditions alone has a moderate impact on improving the health of adults, due to the complexity of the multiple causes of ill health. However, the cumulative and long-term effects may well be significant; for example, addressing housing conditions has a more significant impact on children, thus potentially resulting in a life-time of savings in terms of health costs.

Local economy and employment

There are currently 560 people employed on the SWM programme, around a third of whom live within the city boundaries, and just over half within the county of Nottinghamshire.

The analysis shows that every £1 of the initial investment from the Secure Warm Modern programme generates £1.36 within Nottingham city, or £1.46 spending across Nottinghamshire (including the city). This means that every £1 that is spent on SWM generates an additional 36p of spending in Nottingham city, due to the way it is re-spent by local businesses and people; when the rest of Nottinghamshire is included, the additional spending increases to 46p.

Therefore, the £37.6m spent on SWM in 2010/11 generated £54.9m spending in Nottinghamshire, i.e., the original investment plus an additional £17.3m spending in Nottinghamshire. Of this additional spending, £13.5m was spent within the Nottingham city boundaries.

In addition, investment in training through the 'One in a Million' Apprenticeship programme and staff training and accreditation has created at least £13m in social value (in terms of increased earnings over the lifetime of those individuals).

SWM has a significant positive effect on the local economy, employment and skills. However, further benefits could be achieved through small changes to the supply chain, making sure that the Decent Homes funding stays within, and has an exponential effect upon, the local economy. NCH is therefore able to contribute to the aims of Nottingham's Sustainable Communities Strategy by providing jobs and training to local people.



The total social value of these outcomes was calculated for a sample area, one of the first to receive the SWM programme. This found that every £1 invested in improving tenants' homes generates £4.76 in social value over 10 years after the work is completed. The initial investment is paid back within the year following the installations, after which the cumulative social value created exceeds the initial investment costs.

Key messages from the Decent Homes Impact Study

1. Research into social impacts provides valuable knowledge and information to inform future investment decisions
2. Continued partnership working is important in implementing solutions to issues raised and maximising positive impacts
3. Community engagement and communication are vital factors in achieving positive social outcomes from housing investment programmes
4. The practice of measuring social outcomes should be embedded in the organisation, including further research and evaluation.

Context and approach

Introduction

The vision for the Decent Homes programme, set out over ten years ago in the Government's Green Paper *Quality and Choice: A Decent Home for All*, was to 'offer everyone the opportunity of a decent home and so promote social cohesion, well-being and self-dependence'.¹ The aim was to bring all housing up to an acceptable standard,² including in the social sector where a backlog of overdue renovation work had accumulated as a result of past under-investment. The scale of the challenge was clear, demonstrated by the £19 billion budget and ten-year timescale set out by the Government at the time.

The initial Green Paper emphasised the wider social benefits that such a programme would deliver:

*People who are decently housed have a stronger sense of security and place. Decent housing strengthens communities and provides a better setting in which to raise families. It improves health and educational achievement and provides a long-term asset that can be passed on to future generations.*³

However, ten years on, the National Audit Office reported that information on these wider benefits had not been systematically collected, and therefore the 'lack of data on these wider benefits means that it is not possible to identify the Programme's true impact throughout its life'.⁴

Nottingham's Decent Homes programme began in 2008 when Nottingham City Homes (NCH) was awarded the necessary funding from the Department for Communities and Local Government. Reflecting the national picture, Nottingham's council housing stock required significant investment to address a backlog of major repairs and improvements to bring the 28,300 properties up to the Decent Homes standard. NCH is mid-way through its planned programme, with a total budget of £187 million, due to be completed by March 2015.

Following NCH's consultation with tenants on the design of the programme, it became known locally as 'Secure Warm Modern'. This was a clear reflection of tenants' priorities for the work to their homes and the impact that this would have on their families and communities. Given the scale and importance of this investment, NCH wanted to be able to measure this impact to understand how its work affected wider social outcomes, and to use this knowledge to inform the current and future investment programmes to ensure that they deliver the maximum benefits to tenants and communities.

NCH therefore established a Knowledge Transfer Partnership in 2010 with Nottingham Business School at Nottingham Trent University to carry out a two-year research project to measure these wider social impacts of its Decent Homes programme. This aimed to capture the true impact of the programme in Nottingham, filling the gap left at a national level by providing robust evidence on the wider benefits of the Decent Homes programme at a local level. This report sets out the findings from this research, covering the impact on crime reduction, energy efficiency and fuel poverty, health and wellbeing, and the local economy and employment.

1. Department of the Environment, Transport and the Regions (2000) Housing Green Paper - Quality and Choice: A Decent Home for All, p. 7.
2. The national Decent Homes standard specifies that properties should be free from serious hazards, in a reasonable state of repair, with modern facilities and sufficient thermal comfort.
3. Ibid 1.
4. National Audit Office (2010) The Decent Homes Programme: Report by the Comptroller and Auditor General, p. 36

Nottingham's socio-economic context

The city of Nottingham is home to a population of around 300,000 residents, and around a quarter of the city's properties are local authority-owned social housing, managed by Nottingham City Homes.⁵ The city has pockets of deprivation alongside more affluent areas, as well as a large student population from the city's two universities. Experian's Mosaic⁶ tool shows that 19 percent of the population are low-income families living in social housing estates, and a further 16 percent are communities living in social housing with uncertain employment in areas of deprivation. These areas of deprivation within the city mean that Nottingham was ranked the thirteenth-most deprived local authority according to the 2007 Index of Multiple Deprivation (IMD), improving slightly to the twentieth-most deprived in 2010.

Areas of deprivation tend to include council housing estates; this is as a result of the way social housing has been allocated over the last two decades. In particular, the allocations system prioritises those who have no other housing options (who are therefore deemed to be 'statutory homeless'), and other priority needs; for instance, where current accommodation is inappropriate due to medical needs, overcrowding, domestic violence or harassment, or major structural issues. The high demand for council housing means that those with these priority needs are likely to be awarded housing before those with a less immediate financial or other need. Therefore, the allocation system is likely to create a concentration of the most deprived living in council housing.

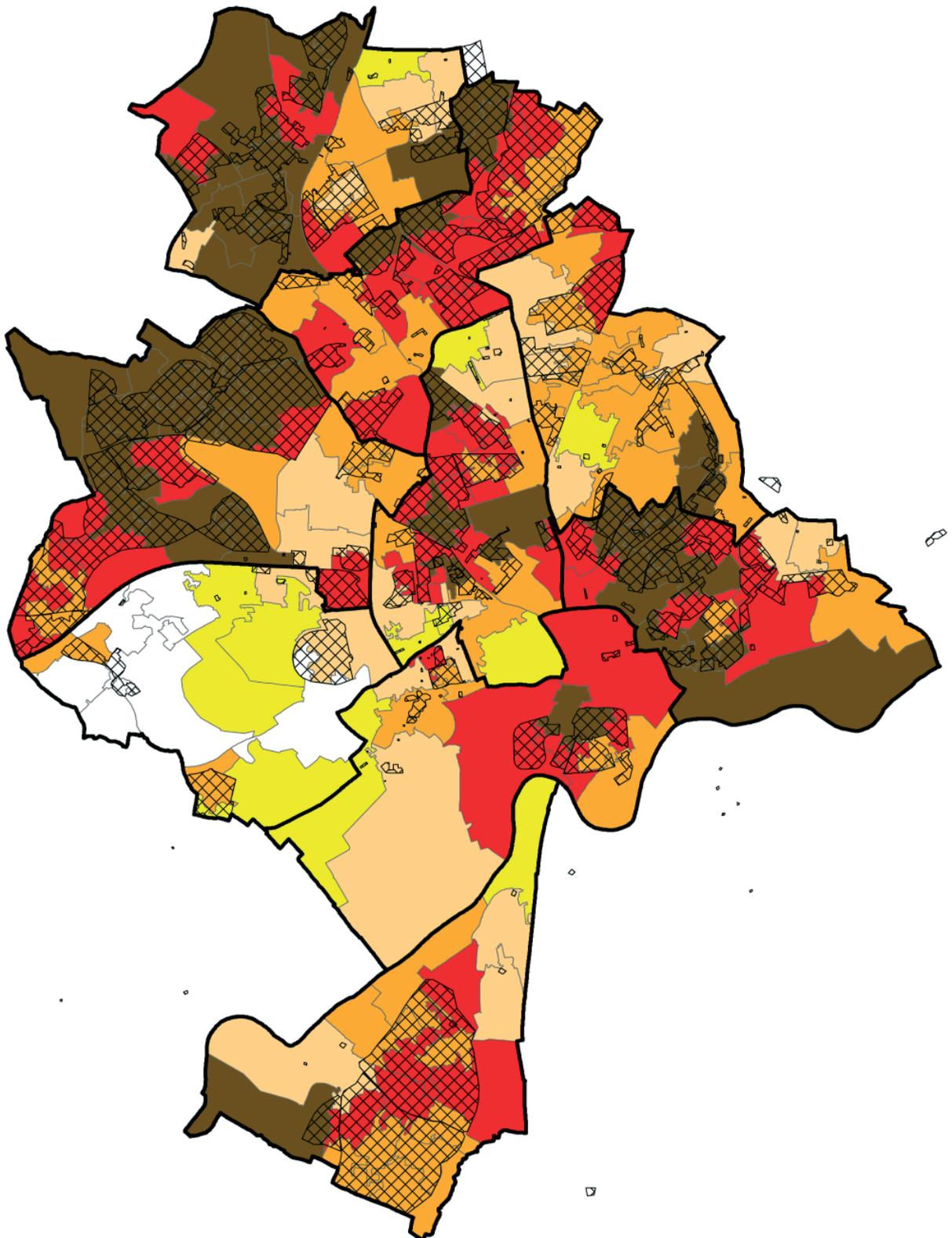
As the IMD demonstrates, those living in deprived areas have worse outcomes in terms of employment and income, education and skills, health and disabilities, and crime and disorder. NCH tenants are particularly vulnerable in many of these areas. Figure 1 shows that many council housing estates in Nottingham are in areas ranked in the worst ten per cent in England, according to the overall IMD index score. To provide a few examples of the kind of deprivation experienced, currently 67 percent of NCH tenants meet the criteria for and receive Housing Benefit, which is specifically to support those on the lowest incomes including those who are unemployed, suggesting that many NCH tenants are on low incomes. In terms of health, those living in areas with a high proportion of social housing have ten years shorter life expectancy than those in more prosperous areas nearby (for example, the lowest life expectancy in Nottingham is in Bilborough ward at 69 years, in which 41 percent of properties are social housing; compared to Wollaton where the life expectancy is 79 years and only 14 percent of properties are council housing).

The Nottingham Plan to 2020⁷ is the local Sustainable Communities Strategy that sets out the long-term vision for promoting the economic, social and environmental wellbeing of the city. Its goals include addressing the poverty and lack of aspiration seen in some of Nottingham's neighbourhoods, for example, by supporting people into work, encouraging skills development, improving both the physical aspects of neighbourhoods and the cohesion of communities, reducing crime, and improving health and wellbeing. NCH is a key partner in this strategy, particularly within the Housing Strategic Partnership under the Neighbourhood Nottingham theme, and NCH is also committed to playing its part in helping the city to achieve all of its wider goals.

5. NCH was established in 2005 as the Arms Length Management Organisation (ALMO) responsible for the management and maintenance of the social housing stock owned by Nottingham City Council.

6. Experian's Mosaic Public Sector tool uses information on demographics, lifestyles and behaviours to classify citizens by location into 15 groups, to help understand their needs for public services now and in the future.

7. One Nottingham (2010) The Nottingham Plan to 2020. Available at: www.onenottingham.org.uk



Title: Indices of Deprivation: Combined 2010



0 800 1,600 3,200 Meters

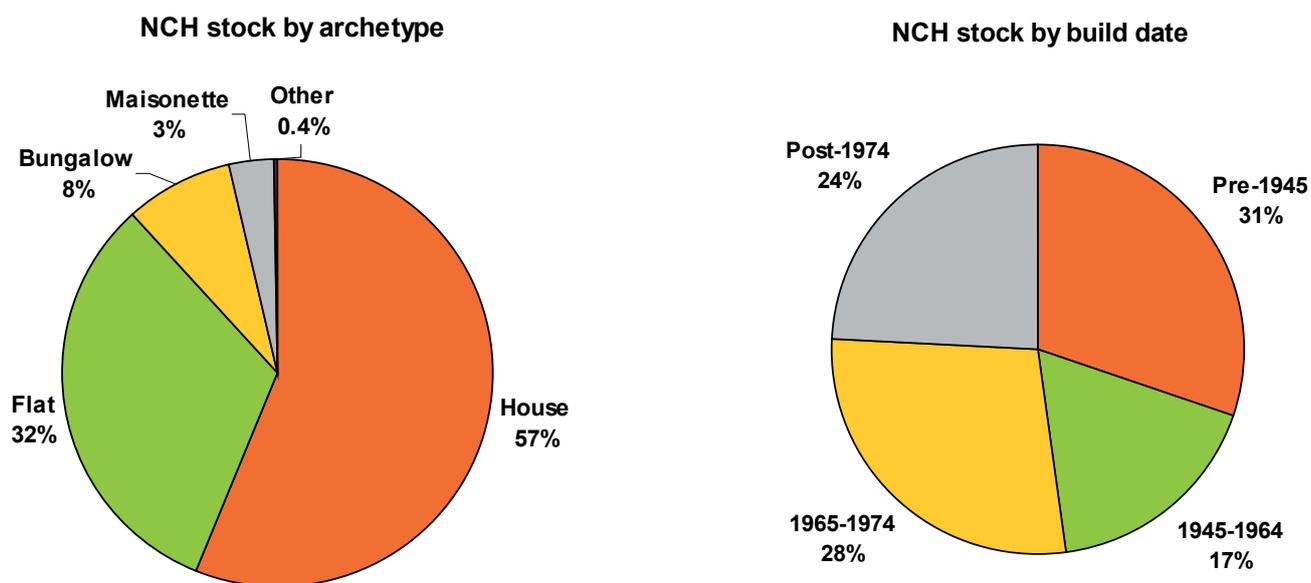
 Lettings Areas (Estates)

1:65,250



The Secure Warm Modern programme

The majority of NCH's 28,300 properties are houses, with a significant proportion of older housing – over a quarter of the stock consists of houses built before 1945. At the start of the Secure Warm Modern programme in 2008 around 32 percent of the stock was classified as non-decent, with further properties projected to fall into non-decency during the next few years as the programme was delivered. These properties would also have to be included in the works. The national Decent Homes standard specifies that properties should be free from serious hazards, in a reasonable state of repair, with modern facilities and sufficient thermal comfort. NCH's 'Nottingham Plus' standard goes beyond this minimum level in some areas, for example, by replacing every single glazed window with double glazing.



NCH adopted a streamed approach to the programme following consultation with tenants, who expressed a preference for prioritising elements of the work (starting with windows and doors, then heating, and then kitchens and bathrooms), rather than having all the works to the house completed at the same time. This also allowed NCH to procure specialist contractors for each element of the work, and provided cost savings on the procurement of each of the elements.

The work began in 2008, with a total planned investment of £187 million between 2008 and 2015.⁸

8. The original programme was planned for completion by 2013; however, following a re-allocation of funding by the Homes and Communities Agency (HCA) in January 2011 due to funding pressures the programme was extended to 2015.

The total planned work is as follows:



Nottingham Secure – replacing all single glazed windows with ‘Secured by Design’ double glazed units in around 15,300 properties, and replacing any doors that are old or in poor condition.

Warmth for Nottingham – improving heating systems for 19,700 properties and topping up loft insulation



Modern Living – making internal improvements including new kitchens for 17,000 homes and new bathrooms in 12,700 homes, and electrical rewires.

In addition, if a tenant identifies that they may have special requirements a referral is made to an Occupational Therapist (OT), who assesses the property and the needs of the tenant. The OT then recommends any special aids and adaptations required; these are undertaken alongside the Secure Warm Modern work. This scheme has identified over 500 special adaptations, such as adapting bathrooms with level-access showers or replacing them with a wet-room, to be made over the course of the programme.

The Secure Warm Modern programme is now well under way.

Between April 2008 – January 2012:

- 15,900 properties have had their windows upgraded⁹ and 3,400 doors have been replaced
- 10,200 heating systems have been upgraded, and 2,900 loft insulation top-ups carried out
- 9,000 kitchens and 7,200 bathrooms have been replaced
- 284 aids and adaptations have been made to properties.

9. The number of properties where single glazed windows were replaced has exceeded the initial estimate, which was based on a 10 per cent survey of properties. NCH is committed to replacing every single glazed window across the stock.

Individual properties may have had some or all of these improvements. This is determined by a survey carried out on each property, which identifies what is required to bring the property up to the 'Nottingham Plus' Decent Homes standard. Each house is assessed against the Housing Health and Safety Rating System (HHSRS), designed to identify any potential health and safety hazards within homes, with a view to addressing them under the Decent Homes work and thereby helping to prevent any incidents of harm arising from the home environment.

Aims and method

Aim and objectives

The aim of the Decent Homes Impact Study is to measure the impact of NCH's Secure Warm Modern programme and wider housing investment on certain social outcomes; also, to embed such knowledge and practices into NCH's decision making processes, for example, by informing future service provision and strategic investment decisions.

The research focused on the following social, environmental and economic outcomes:

1. Crime and security
2. Energy efficiency and fuel poverty
3. Health and wellbeing
4. Local economy and employment

The objectives of the research were to:

- Measure changes in social outcomes following the Decent Homes work, including both quantifiable indicators and qualitative information from affected stakeholders
- Evaluate the contribution of Secure Warm Modern to Nottingham city strategies and targets, including the Sustainable Communities Strategy
- Strengthen partnerships with other city agencies through joint research and demonstration of the overlapping impact of our work
- Provide a deeper understanding of the impact of housing investment, and actionable recommendations to maximise the positive social, environmental and economic outcomes of ongoing and future housing investment.

Method

The approach for the research was based on the logic model or 'theory of change', as set out in the Social Return on Investment (SROI) approach developed by the New Economics Foundation (NEF), sponsored by the Cabinet Office. This identifies the main stakeholders affected by a programme and aims to measure changes in outcomes for those stakeholders, which are the changes or benefits seen as a result of the inputs, activities and outputs of a programme. They are measured by establishing indicators then measuring changes to those indicators for each of the anticipated outcomes.

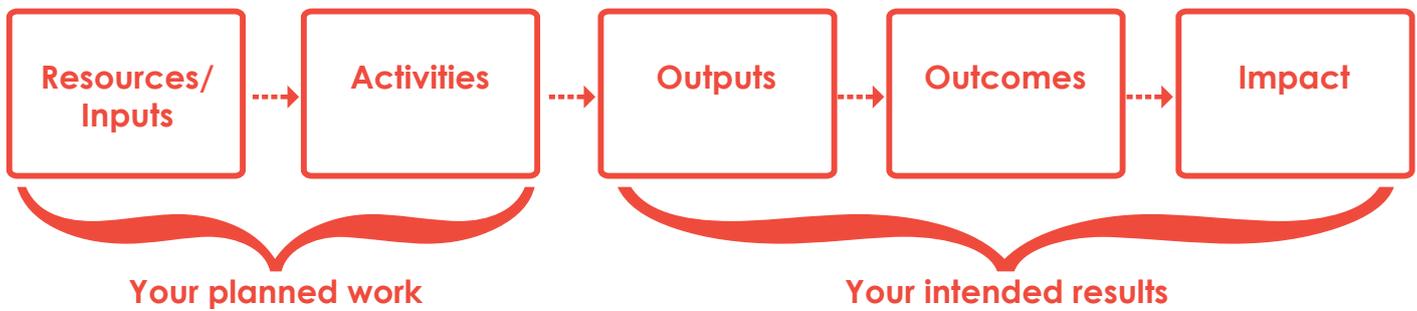


Figure 2: Logic model (adapted from W.K. Kellogg Foundation, 2004)

A variety of data collection methods were applied in order to gather a range of evidence of the impact, including both quantitative data on changes to selected indicators, and more in-depth information gathered directly from those affected by the changes and their views on these outcomes.

This included:

- Data on relevant indicators, collected through data sharing with partners including the police, NHS and contractor partners
- Data held by NCH on properties, tenants and programme progress; e.g., stock condition data (including HHSRS scores and SAP¹⁰ ratings), tenant profile information, customer satisfaction surveys and project management data
- Qualitative information, collected through interviews, surveys, discussion groups and case studies with tenants, front-line officers and other partners
- Primary data collection through technical monitoring of selected properties
- Contextual information from other relevant studies and reports, academic publications, national and local government publications and strategies.

Where possible, an indication of the overall cost impact of these outcomes to NCH and other local agencies was estimated. This covered only a sample of the outcomes, as many of the changes or benefits seen cannot be easily or robustly costed, or only covered a small group of beneficiaries (for example in the crime report, which only covers two sample estates). In order to overcome these difficulties so as to be able to explore this aspect in more detail, a sample area was taken to develop a more extensive Social Return on Investment (SROI) analysis. The area chosen was Aspley ward, which was one of the first areas to receive the SWM programme, and for which a more extensive range of data on outcomes was available. A full SROI calculation was carried out, by calculating the total present value of the social, economic and environmental outcomes of the SWM programme, compared to the investment costs in fitting new windows, heating systems, kitchens and bathrooms.

The following chapters summarise the main findings from each of the research strands, including further details on the methods used for each. Full reports covering each of the research strands in detail have already been published and are available on the NCH website at:

www.nottinghamcityhomes.org.uk

10. SAP is the Government’s Standard Assessment Procedure for Energy Rating of Dwellings, where properties are scored between 1 and 100 based on energy costs associated with space heating, water heating, ventilation and lighting, minus cost savings from energy generation technologies. A score of below 30 is considered very energy inefficient, while a score of 70 or more is considered very energy efficient.

Summary of findings

Crime and security

NCH tenants' first priority for their Decent Homes programme was to make their homes secure. Therefore, under the Secure, Warm, Modern programme all single glazed windows are being replaced by double glazed models that meet the Secured by Design (SBD) standard set by the Association of Chief Police Officers. In addition, all doors that are old or in poor condition are replaced with composite of PVC-u security doors, which also meet the SBD standard.

The research focused on the two estates of Bells Lane and Broxtowe, which were among the first estates to have an extensive programme of window replacement. The work programme took place in 2008/09, during which 1,520 properties had their windows replaced out of a total of 1,717 NCH properties on the two estates.

Crime in Nottingham

Levels of crime, and particularly burglary, have in the past been high across Nottingham, resulting in a number of operations by Nottinghamshire police and their partners in order to tackle crime in the city. The city's Crime and Drugs Partnership (CDP) brings together the police, local authorities, fire service and NHS primary care trusts in a partnership with other public, private and community organisations to take local action to reduce crime and the fear of crime. Overall, crime in Nottingham has fallen significantly since 2003 and has continued to fall in recent years, with 27 percent less overall crime in 2009 compared to 2007. However, Nottingham has the third-highest level of overall crime amongst its comparator group of similar Community Safety Partnerships (CSPs).¹¹ Acquisitive crime had been high in the past, and in 2008/09 accounted for 19 percent of all crime, including burglary from a dwelling, which accounts for nine per cent and is the third-most common type of crime in Nottingham.

The comparatively high levels of crime in Nottingham have been linked to the socio-economic and demographic profile of the city. The Nottingham CDP's 2009/10 Strategic Assessment found that there is a correlation between deprivation and acquisitive crime (particularly burglary) at the ward level. This also stated that low employment and educational attainment have also been shown to be correlated with crime levels; Nottingham has the third lowest employment rate amongst the Core Cities, and educational attainment in Nottingham is considerably lower than the England average (2007). Finally, Nottingham also has a relatively young population, with almost 16 percent of the population aged from 20 to 24, compared to a national average of 6.7 percent. This represents the largest proportion of 20 to 24-year-olds among the Core Cities. This age group is statistically proven to be the most likely to commit and also be a victim of crime.

Burglary has been particularly high in the Aspley ward (which the Bells Lane and Broxtowe estates – the subjects of this research – are within). The bi-annual trend for burglaries across each of the wards in Nottingham City is shown in Figure 3 (showing burglaries per 1000 households, to control for ward size), and shows that Aspley was among the wards with the highest number of burglaries across the city.

11. Information taken from the Crime and Drugs Partnership's 2009/10 Strategic Assessment

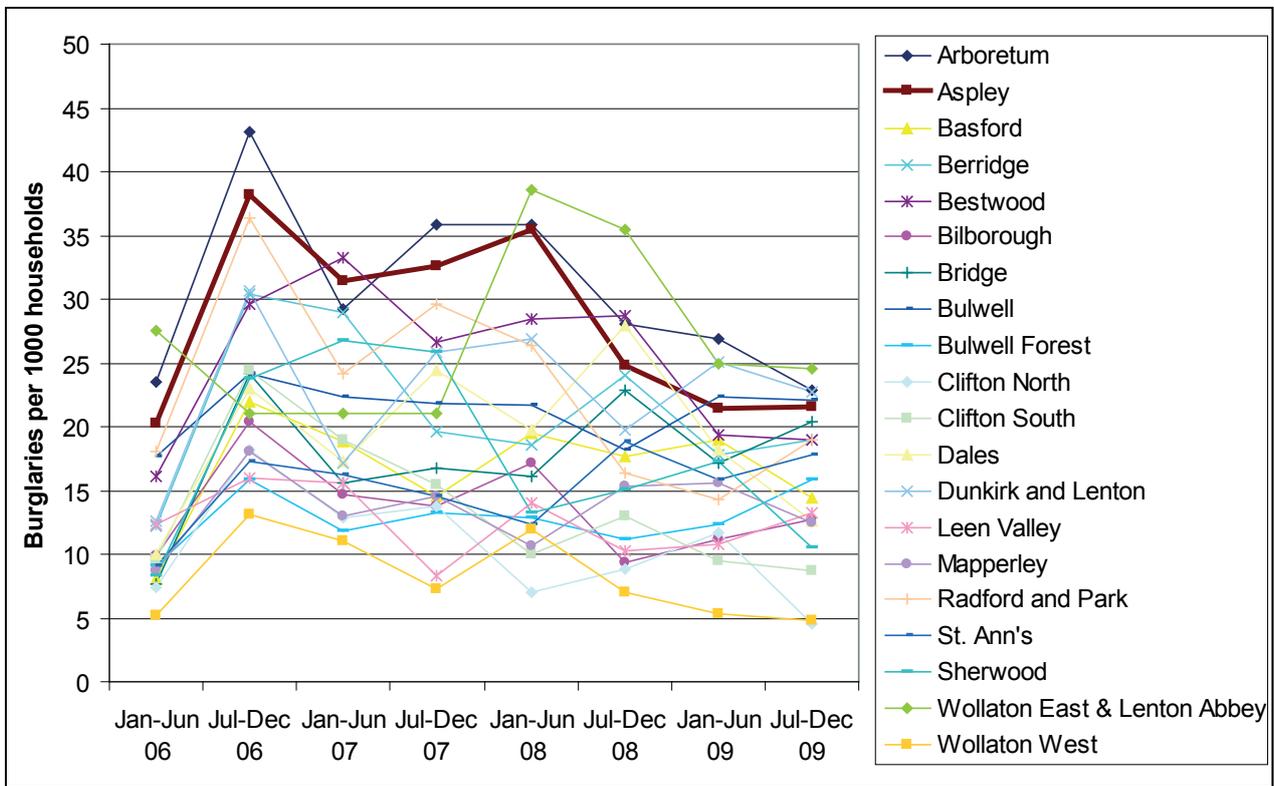


Figure 3: Bi-annual burglary figures for Nottingham City Wards, 2006-2009 (Source, Nottingham Insight database)

Measuring crime outcomes

The research aimed to measure to what extent the ‘Secure’ work had been successful in delivering its intended outcomes, addressing the following research questions:

- What has been the impact on housebreaking crime, including burglary and attempted burglary?
- Has displacement of crime occurred, either to other access points within a house, or to other non-target-hardened houses or areas, or to other types of acquisitive crime?
- How has this affected residents’ satisfaction with the area where they live, including fear of crime or perceptions of safety?
- What has been the cost effect of any changes? E.g. responsive repairs costs for NCH, costs of burglary on tenants, or costs to the police.

The first part of the method was to conduct a statistical analysis of burglary data supplied by the Nottingham CDP. This compared data from the financial year before the work was started (i.e., March 2007 to April 2008) with figures from the financial year after the work was completed (March 2009 to April 2010). A number of groups were also created for comparison, including: city-wide levels and trends over the same period; comparison with other NCH estates with a similar profile (e.g., property types and demographics) where SWM work had not then been carried out; and comparing properties within the same estates including non-NCH properties (largely privately owned) and NCH properties which had not undergone SWM work.

The aim of the data analysis was to examine any changes in trends before and after the Secure work was completed, and to measure whether any changes were significantly different for those homes or areas to undergo the Secure work.

Secondly, analysis was conducted of the results of the annual customer satisfaction (STATUS) survey,¹² conducted by NCH across a sample of all of its tenants. This explored aspects such as perceptions of safety in the home, satisfaction with the area and with NCH as a landlord.

Finally, the last part of the method was to carry out qualitative research with residents and frontline officers and staff in the estates where the work was carried out. This included a short telephone survey with tenants on the estates (completed by 25 tenants), discussion groups with Tenant and Resident Associations and other local meetings, and interviews with NCH and police front-line officers in the area. This added further understanding of the impact of the work on local residents and communities, looking at the impact on their quality of life and general satisfaction, and to understand the context of the changes on the estates over the period under review.

Main findings

Findings from the data analysis

In the year before the Secure work started (April 2007 – March 2008) there were 227 burglaries across the whole of the Bells Lane and Broxtowe estates, equivalent to seven per cent of the households in the area being burgled during this year. In the year after the work was completed (April 2009 – March 2010) there were 132 burglaries, equivalent to four per cent of the households in the area being burgled.

This shows that there were 95 fewer burglaries a year, representing a 42 percent reduction in the number of burglaries in Bells Lane and Broxtowe as a whole. This is a significant reduction in the number of burglaries over this period (significant at 95 per cent confidence level, $p=0.000$ two-proportions test).

Across Nottingham city as a whole during this period, the total number of burglaries was reduced from 4,631 burglaries in 2007 (four percent of all households) to 3,639 burglaries in 2009¹³ (three percent of all households). This represents a 21 percent reduction in the number of burglaries across the city over this period. The result demonstrates that the reduction in burglaries in the intervention area over the period was significantly greater than the overall reduction in burglaries across the city as a whole.

The four areas chosen as comparator estates (Edwards Lane estate, Old Highbury Vale estate, Southwold estate, and Balloon Woods police beat area) experienced lower levels of burglary than the Broxtowe and Bells Lane estates, despite a similar socio-economic profile. Across these four areas, there were a total of 119 burglaries in 2007-08, equivalent to four percent of properties in the area being burgled. In 2009-10 there were 74 burglaries, equivalent to two percent of properties being burgled. This equates to 45 fewer burglaries a year, representing a 38 percent reduction in total burglaries in the comparator areas over the time period. This is a smaller reduction in the number and percentage of burglaries than the reduction in the intervention area (42 percent).

12. NCH previously used the annual Standardised Tenant Satisfaction Survey (STATUS) as set out by the requirements of the Tenant Services Authority (TSA) and Department for Communities and Local Government (CLG). Following the announced closure of the TSA in 2010, NCH now uses the Survey of Tenants and Residents (STAR) developed by Housemark.

13. NB. Due to data availability, overall burglary numbers for Nottingham are given by calendar year rather than by financial year.

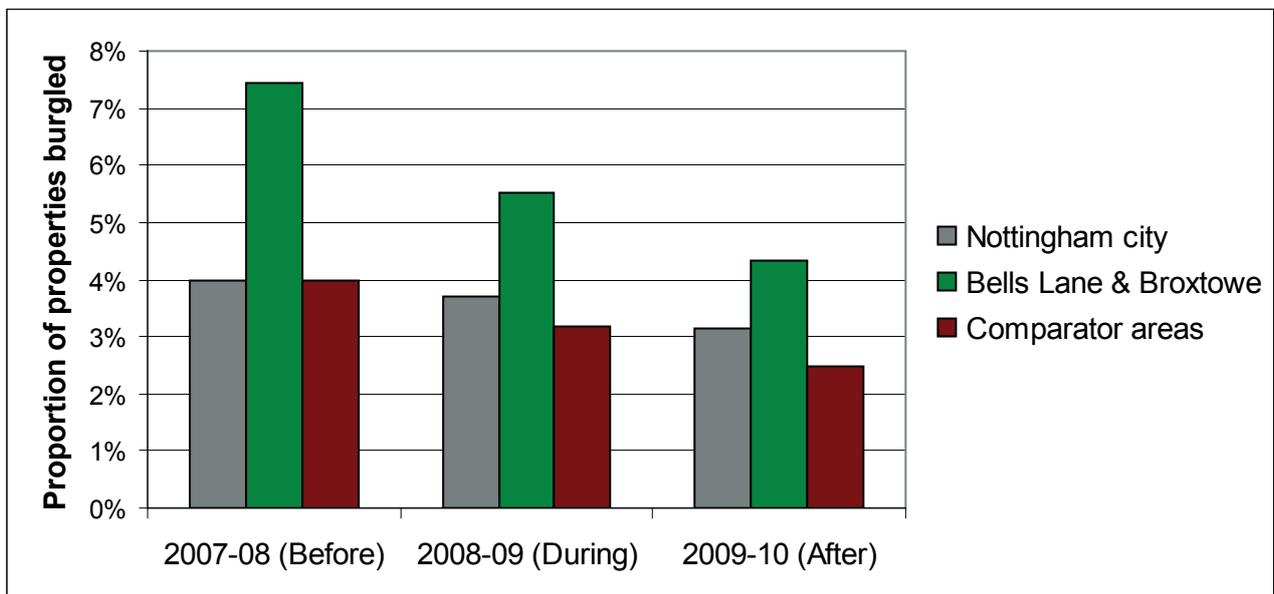


Figure 4: Proportion of properties burgled for Nottingham city, Bells Lane & Broxtowe, and comparator areas (Source: CDP)

Within the Bells Lane and Broxtowe estates there are 1,717 NCH properties and 1,333 non-NCH properties. Therefore, 56 percent of properties in the area are NCH properties (i.e. rented from Nottingham City Council, and managed by NCH). Non-NCH properties make up the rest of the area and (according to the 2001 census) consist of 33 percent owner-occupied, six percent rented from Registered Housing Providers and other organisations, and five percent rented from private landlords.

Before the Secure work took place, NCH properties had a higher level of burglaries than non-NCH properties (8.8 percent of NCH properties experiencing burglaries, compared to 5.7 percent of non-NCH properties, see Figure 5). Since the work was completed, both NCH and non-NCH have experienced a significant reduction in burglaries, although NCH properties have seen a larger reduction in the number of burglaries, with 62 fewer burglaries per year after the work was completed compared to 33 fewer burglaries to non-NCH properties per year. The Secure programme therefore appears to have reduced the difference between the proportion of NCH and non-NCH properties that are burgled.

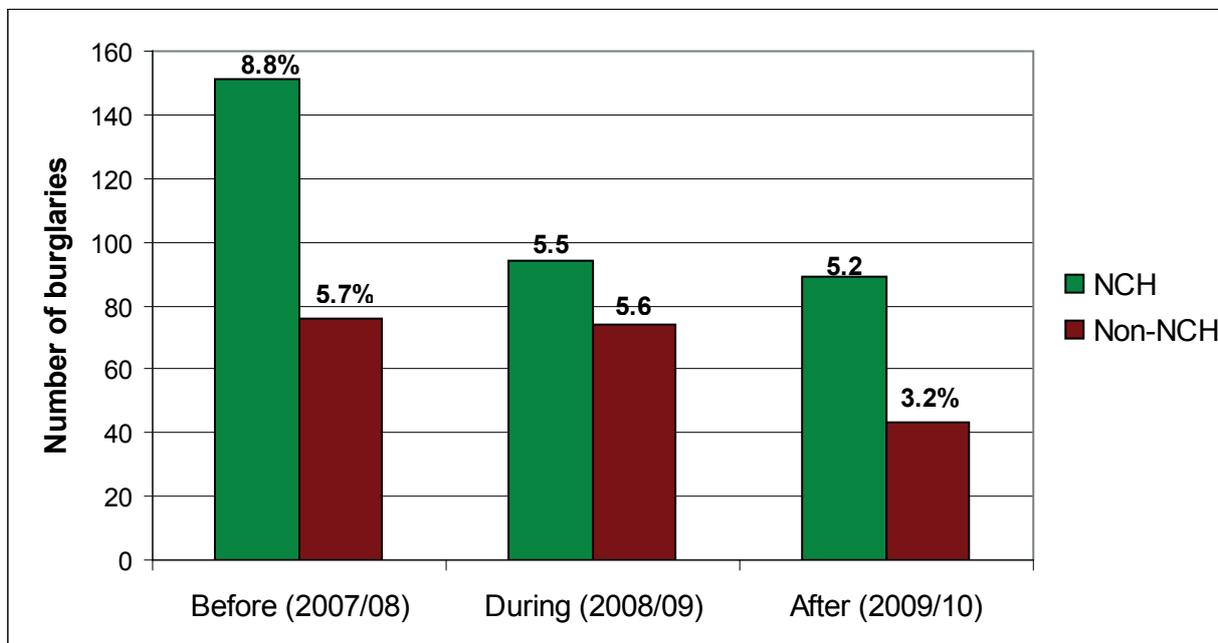


Figure 5: Burglary trends for NCH and non-NCH properties in Bells Lane and Broxtowe (Source: CDP)

The type of burglary was explored using data on whether the burglary was attempted or successful, the point of entry (window, door or other/unknown) and method of entry (forced, non-forced¹⁴ or other/unknown) for each burglary. These data were compared across NCH properties that were burgled before the Secure work was completed ('NCH non-Secure'), with properties that were burgled after the work was completed ('NCH Secure'), and with non-NCH properties on the estates (Figure 6).

This analysis showed that doors are the most common point of entry for all categories of property, accounting for 58 percent of all burglaries (attempted and actual) during this period. Examining burglaries via a window, 42 percent of burglaries were via this point of entry in 'NCH non-Secure' properties, compared to only 32 percent of burglaries to 'NCH Secure' properties. The difference is more pronounced when looking only at forced entry via a window, where the proportion of burglaries occurring through this method in 'NCH-Secure' properties is half the level of that in 'NCH non-Secure' properties. This shows that a lower proportion of actual or attempted burglaries have been via a window since the new secure windows were fitted to NCH properties.

The data also show that 'NCH Secure' properties have the lowest rate of successful entry following a burglary attempt, with 70 percent of all attempts at burglary to 'NCH Secure' properties gaining entry, compared to 82 percent of burglaries successfully gaining entry to 'NCH non-Secure' properties and 83 percent to non-NCH properties.

In the context of a reduced overall number of burglaries, the results do, however, show an increased proportion of burglaries occurring via a door to NCH properties that have had their windows replaced. Thus, while the programme has had a positive impact on target-hardening the windows, this has shifted focus to the door as a point of entry. The current wooden-framed doors do not fail the national Decent Homes standard, and are replaced only if they are in poor condition, yet the evidence suggests that they are vulnerable to entry by intruders.

14. This included burglaries where the property was left unsecured, where the burglar used distraction or bogus official techniques to gain entry, or where a key or duplicate was used, i.e., the data include all methods where the physical security of the window or door was not challenged.

The evidence also suggests that attitudes to security may vary between occupancy types: eight percent of burglaries to NCH properties (both Secure and non-Secure) via a window occur as a result of the window being left unsecured; this is compared to only two percent of burglaries as a result of a window being left unsecured in non-NCH properties (mainly owner occupiers) on the same estates.

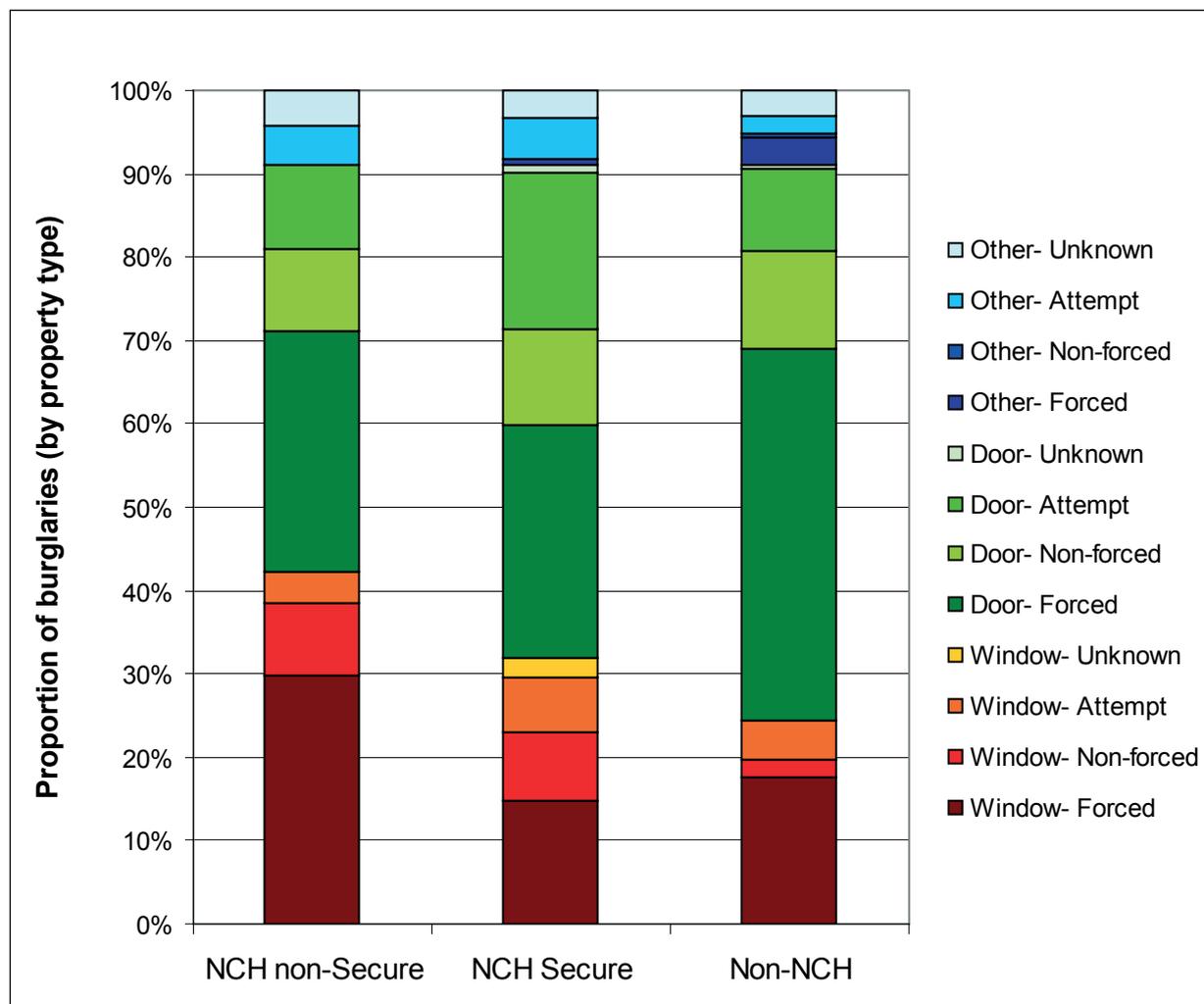


Figure 6: Point and method of entry for properties in Bells Lane and Broxtowe (Source, CDP)

Further investigation suggested that there was no evidence of displacement of burglary towards other types of acquisitive crime, such as vehicle crime, over this period.

Findings from local residents and Officers

NCH's annual Standardised Tenant Satisfaction Survey (STATUS) showed that, before the SWM work started, 46 percent of the Aspley tenants surveyed in 2008 said that burglary/theft was a 'very' or 'fairly' big problem. By 2009, the proportion of tenants that thought this had decreased to 37 percent. Also, the proportion of tenants who were 'very' or 'fairly' satisfied with their area as a place to live rose from 58 percent to 64 percent between 2008 and 2009. Satisfaction with the general condition of their property also increased from 62 percent to 73 percent over this period.

When tenants who were interviewed were asked about how safe they felt in their homes alone during the night before the windows were replaced, around a third of respondents said that they felt 'a bit' or 'very' unsafe. A number of tenants commented that they felt that the old single glazed windows were neither robust nor secure, with several tenants expressing similar views as captured by one tenant:

"With the other windows, you could just pull them out."

Since the windows were replaced with the new double glazed units, all of the tenants who had stated that they felt unsafe with the old windows indicated that they felt safe now that the windows have been replaced. A number commented that they "feel safer" or "more secure" now. Comments included:

"I feel a lot safer and warmer. The deadlocks make me feel very safe."

"[The windows] are very important – makes you feel safer."

A number of tenants felt more satisfied with the general condition and overall quality of their home since the windows had been replaced. For several, this was due to the improvement in the internal conditions of their home that the replacement of the windows had made, regarding condensation and damp, cold and draughts, and noise. Comments about the conditions in the home prior to the replacement of the windows included that generally the house felt "ready for a facelift". Several felt that they were "happier with my home" as a result of the improvements they had seen. The improvements extended to the neighbourhood as a whole, with several tenants stating that they felt it made the neighbourhood look better, as a result of the new windows.

*"The other windows used to have condensation running down them";
"The condensation made you feel the house was dirty".*

"Don't get condensation – did before."

"Previously you could see gaps around the window."

"Before the house was cold, now it's warmer."

"I've heard remarks, 'look at our lovely windows now'. I walk around the estates, and they do look much much better. And sometimes you don't know if they're privately owned or NCH owned – and that's good for the areas."

Further contextual information was supplied through interviews with the local Police Constable (PC) and Police Community Support Officer (PCSO), and the NCH Housing Patch Manager. They commented that the area has traditionally had a reputation for high crime and burglary rates; however, a reduction in crime has been achieved in recent years through strong multi-agency working, for example, among NCH, police, Nottingham City Council, caretakers and local Councillors. This was identified as a major strength and factor for change within the area, as agencies worked together to address shared priorities.

This is embedded at a strategic and operational level. For example, the 'Street Scene' initiative in the area has been working to address anti-social behaviour and drug issues, which has involved NCH officers working with both tenants and local police officers. The police have carried out operations to improve their visibility, including more time for PCSOs on the streets in the area. The monthly Local Action Group meetings provide an opportunity for the police, residents and local Councillors to raise issues and be updated on progress and action in the area.

The improvements to the estate have been noticed by local Councillors; they provided feedback to NCH that improvements to the properties from the SWM work, including the new windows, doors and fences, have improved the look of the area. The police also thought that this has had a positive effect; for example, the PSCO reported that they had seen cases of families who, since the work has been done on their homes, now take significantly better care of their properties and have more pride in their homes. The investment in the fabric of their homes creates a feeling that the community is valued. This supports the 'broken window theory',¹⁵ that improving the physical environment reduces minor crimes such as vandalism and other anti-social behaviour. Local police have noted a change in the community consensus, such that it is no longer acceptable to commit crimes against others within the community; this has resulted in considerably more information being provided to the police and closer integration between the police and the community in addressing crime.

However, concerns were raised about the door replacement programme, which currently replaces doors only if they are damaged or in need of major repair. The police find that the most common point of entry for burglars is via a door, and that local burglars know that the traditional wooden doors can be easily forced. The police therefore expect that where doors are being replaced with new PVC-u doors, this will have a significant effect on the number of burglaries.

Conclusions and recommendations

Burglary on the estates where Secure work has been carried out has reduced significantly since the windows have been replaced. The reduction has been above the city average, and slightly above the change seen in other, similar, estates. Within the estate, NCH properties have previously had much higher levels of burglary than non-NCH properties, but this difference has been reduced. The main difference is seen in relation to the point and method of entry; the data indicates that NCH properties are harder to access via a window, with fewer burglaries via a window, and lower proportion of successful forced entries via a window. This therefore suggests that the Secure work has successfully target-hardened the windows of NCH properties.

The cost of the window replacement programme in Bells Lane and Broxtowe was just under £3.3m. It is estimated that the reduction in the number of burglaries has already resulted in a saving of £241,800 in one year,¹⁶ with such savings expected to continue annually over the lifetime of the windows. Thus the initial investment in the windows would reach its break-even payback point after less than 14 years, which is considerably shorter than the viable life expectancy of the windows of 30 years. Furthermore, this figure does not include the expected financial benefits from improving thermal efficiency, for example, from improvements to health and savings on fuel bills.

15. G. Kelling and C. Cole (1996) 'Fixing Broken Windows: Restoring Order and Reducing Crime in our Communities'

16. Based on Home Office estimations of the social and economic costs of a burglary.

While the new SBD windows have clearly enhanced the security of the house, this research has shown that doors remain the most common point of entry, and therefore represent a significant weak spot in the house's overall security. Both tenants and local police support the widespread replacement of the existing wooden doors with the more secure PVC-u doors that the SWM programme has fitted to a number of properties. This is fully supported by NCH; while only those doors that are in need of replacement or repair are currently being replaced, the preference would be for a full door replacement programme if adequate resources were to be made available.

The replacement of the old single glazed windows with the double glazed SBD models has had a positive effect on tenants' perceptions of security within their home, particularly for those where safety was a significant concern. This is therefore likely to have a positive effect on the mental health of these tenants, with reduced concern about their home and personal security.

The impact on tenants of replacing the windows has been wider than merely security, with a significant number of tenants emphasising the difference that the windows have made to internal conditions, particularly warmth and condensation. Tenants have stated that since the replacement of the windows, their homes have been warmer, and less draughty and damp. The programme has therefore made tenants more comfortable in their homes, again potentially contributing to improved mental and physical health.

The Decent Homes investment has been an important part of the changes in the community that have collectively facilitated a reduction in burglary in Bells Lane and Broxtowe. It is a part of a wider programme of partnership activities that have worked to improve the physical condition of the estates and security of properties, and also to engage the community in dealing with local crime issues. The investment in the community is a key part in changing attitudes towards their homes and neighbourhood, creating a sense of positive progression within the community. Key to this has been a strong partnership approach among local agencies, including NCH.

A number of recommendations have emerged from the research:

1. To increase security further, a priority investment for any future resources that may be made available for further housing improvement should be the widespread replacement of the current wooden doors with Secured by Design PVC-u models
2. Evidence on the patterns and hotspots for burglary within neighbourhoods and across the city should be used to inform future investment decisions
3. Further work could be done to raise awareness that the new windows and doors meet the Secured by Design standard, and what this means. This would help to enhance perceptions of security, and therefore improve tenants' emotional well-being
4. Insecurity in NCH properties as a result of behavioural factors (such as leaving windows/doors unsecured) could be addressed through joint awareness raising between police and NCH
5. Further research should be undertaken to analyse the impact of Secure work undertaken in other areas during 2009/10, once a full year's data is available post-intervention. This would enable comparison with other areas, including those that have received a more extensive programme of door replacement.

Energy efficiency and fuel poverty

The concern regarding energy efficiency relates to the twin issues of climate change as a result of carbon emissions, and energy security and fuel poverty. Nottingham has set itself challenging targets in reducing energy use and carbon emissions, even though carbon emissions per capita in Nottingham are already comparatively low compared to those in other major cities. Work to improve the energy efficiency of council housing stock will play an important role in meeting these targets, as over one third of the city's emissions are from domestic housing, and council housing stock accounts for a quarter of properties in the city. This will also be important in addressing fuel poverty, as social housing tenants are more likely to be vulnerable to fuel poverty due to low incomes. The elderly, disabled or those in receipt of social security benefits are particularly at risk.

The aim of this research is to measure how the Secure Warm Modern (SWM) programme has contributed to these carbon reduction targets, and in doing so how this has impacted on tenants' energy costs and therefore fuel poverty.

Energy efficiency and fuel poverty context in Nottingham

Nottingham City Council's Energy Strategy for 2010-2020 provides an overarching framework for the City's plans, programmes and initiatives relating to sustainable energy supply and use to 2020. The central target for the Energy Strategy is to reduce carbon emissions by 26 percent from a 2005 baseline level by 2020, aiming for an emissions level of 1,329k tonnes CO₂ per annum by 2020. To achieve this, the target is for a 37.6 percent reduction in CO₂ emissions from domestic energy use by 2020.

Improving the energy efficiency of existing properties in the city will play a vital part in meeting these challenging targets. Domestic properties account for over a third of total energy use in Nottingham (36 percent in 2006); the majority of these properties will still be in use by the 2020 deadline. Therefore, retrofitting existing properties to make them more energy efficient and thus reducing carbon emissions is key to meeting Nottingham's and the UK's carbon reduction targets. As well as physical energy efficiency measures in the property, the programme also needs to be supported by behavioural change and education among residents.

With rising energy prices, the issue of fuel poverty is a key policy concern. Households are commonly defined as being in fuel poverty if they require 10 percent or more of their income to attain the recommended minimum temperatures (set by the World Health Organisation) of 21°C in the living room and 18°C in all other rooms. Fuel poverty is therefore affected by three main factors: (a) income levels, (b) fuel prices, and (c) the energy efficiency of the property - the 'fuel poverty triangle'.

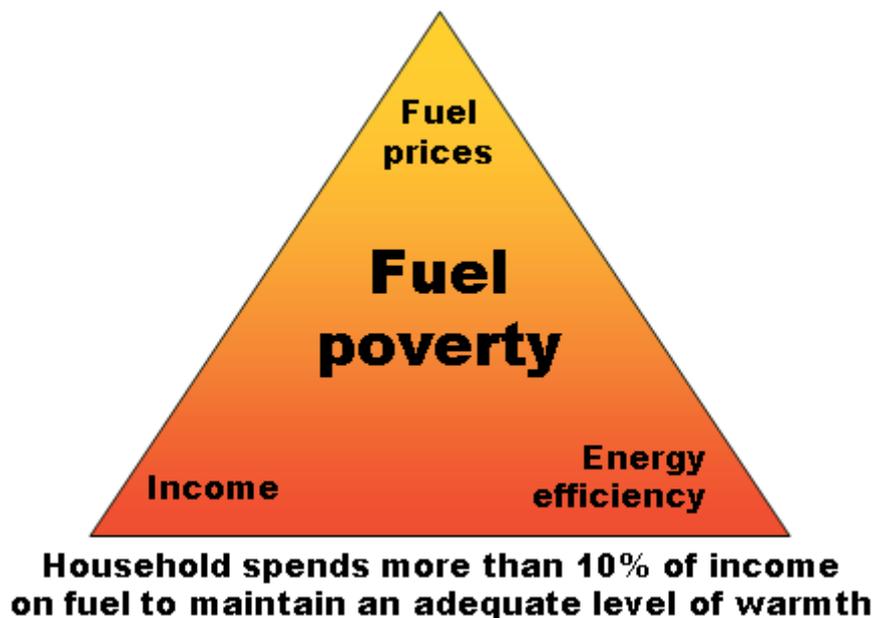


Figure 7: The Fuel Poverty Triangle

The number of households in fuel poverty in England has been rising since 2003, from 1.2m households to 3.3m households in 2008.¹⁷ Baseline data for Nottingham (i.e., prior to the start of the Secure Warm Modern programme) shows rising fuel prices were combined with high levels of deprivation. In 2008/09 12 percent of Nottingham's households were considered to be fuel poor (measured by proxy of those living in properties with a SAP rating of less than 35 in receipt of benefits), compared to 11 percent nationally.

Measuring environmental outcomes

The aim of the environment and fuel poverty strand of research is to evaluate the impact of the installations under the Secure Warm Modern programme on the energy efficiency of NCH properties, and therefore the effect on carbon emissions and on fuel poverty.

The objectives of the research are to:

- Evaluate the impact on energy efficiency, as measured by SAP ratings, across different housing types and the stock as a whole
- Estimate the resulting impact on carbon emissions, and contribution to city targets
- Estimate the resulting impact on tenants' fuel bills and measures of fuel poverty
- Investigate the effect on internal conditions within the home, such as temperature and humidity

The main sources of data for this research were:

- Data from stock condition surveys of 16,000 NCH properties, including SAP Energy Efficiency ratings and CO₂ emissions estimates
- A case study of two properties, including property monitoring (energy use, internal and external temperature and humidity, event loggers) and qualitative interviews with tenants.

17. Department of Energy and Climate Change (2010) Annual report on fuel poverty statistics 2010.

The stock condition surveys were commissioned by NCH from Savills, and use the Reduced Data Standard Assessment Procedure¹⁸ (RdSAP) to provide data including SAP ratings and CO₂ emissions for the property. The surveys began in 2009, with some completed prior to the installation of SWM elements, and some following the installation. This provides data for a benchmark and a comparison following the installation of windows and heating.

The aim of the case study is to collect and compare detailed information on a small sample of properties and their occupants that have undergone SWM work. The monitoring began with two properties in January 2011: both had double glazed windows; one had the heating upgraded prior to the monitoring; and the other had the heating upgrade in March 2011. The properties were monitored for comparison through the heating season from January to May 2011.

Main findings

Energy efficiency of NCH properties

Table 1 shows the average SAP rating and CO₂ emissions for properties receiving windows and/or heating improvements as part of the SWM programme. This compares the average ratings from surveys carried out in properties before they had the work; with the average ratings from surveys carried out in properties after the work was completed. The SAP rating takes into account the effect on energy used for space and water heating and lighting (although it does not include energy use, for example from household appliances). A SAP score of less than 30 is considered to be very energy inefficient, while a score of 70 or more is considered very energy efficient.

In 2008, around 40 percent of the UK housing stock had a rating of in the range of 50-65, while only 18 percent had a rating of 65 or more.¹⁹ Similarly for NCH properties surveyed before they received any SWM work, most were D-rated (SAP score between 55 and 68), although around a third had a score of 69 or above (Figure 9). The average SAP rating of NCH properties prior to the SWM work of 60.37 is well above the 2008 national average SAP rating of 51.8, yet is similar to the national average of social housing at 59.4 (see Figure 8).

SWM work	SAP rating (out of 100)			CO ₂ emissions (tonnes per year)		
	Before	After	Difference	Before	After	Difference
Windows	59.54	63.54	4.00	4.02	3.56	-0.47
Heating	60.81	74.30	13.49	3.81	2.22	-1.59
AVERAGE*	60.37	68.09	7.72	3.91	2.98	-0.93

Table 1: Average SAP and CO₂ emission ratings *Weighted by number of properties in each group

Table 1 indicates that installing either double glazed windows, upgrading heating systems or both leads to an improvement in the energy efficiency rating of the property and reduces CO₂ emissions. However, upgrading heating systems appears to have a much larger positive effect than installing double glazed windows, giving three times the improvement in average energy efficiency and CO₂ reduction than the windows. The heating upgrades improve the average energy efficiency rating to over 70, which is considered to be 'very energy efficient'.

18. The RdSAP was developed for existing homes (rather than new build) and uses information on the property type and age to calculate the energy performance information.

19. Ibid 17



Figure 8: Average SAP rating before and after SWM

Figure 9 and Figure 10 indicate the change in the distribution of properties across the SAP rating bands A-G (where A is the most efficient group and G is the least), before and after the SWM work. The most significant change is that following the SWM work more properties fall into the C band, rather than the D band as before. It also shows that the work has significantly reduced the number of properties scored in the poorest energy efficiency bands; prior to the work around 20 percent of properties surveyed were rated E to G, compared to after the work when only 10 percent of surveyed properties fell within these bands.

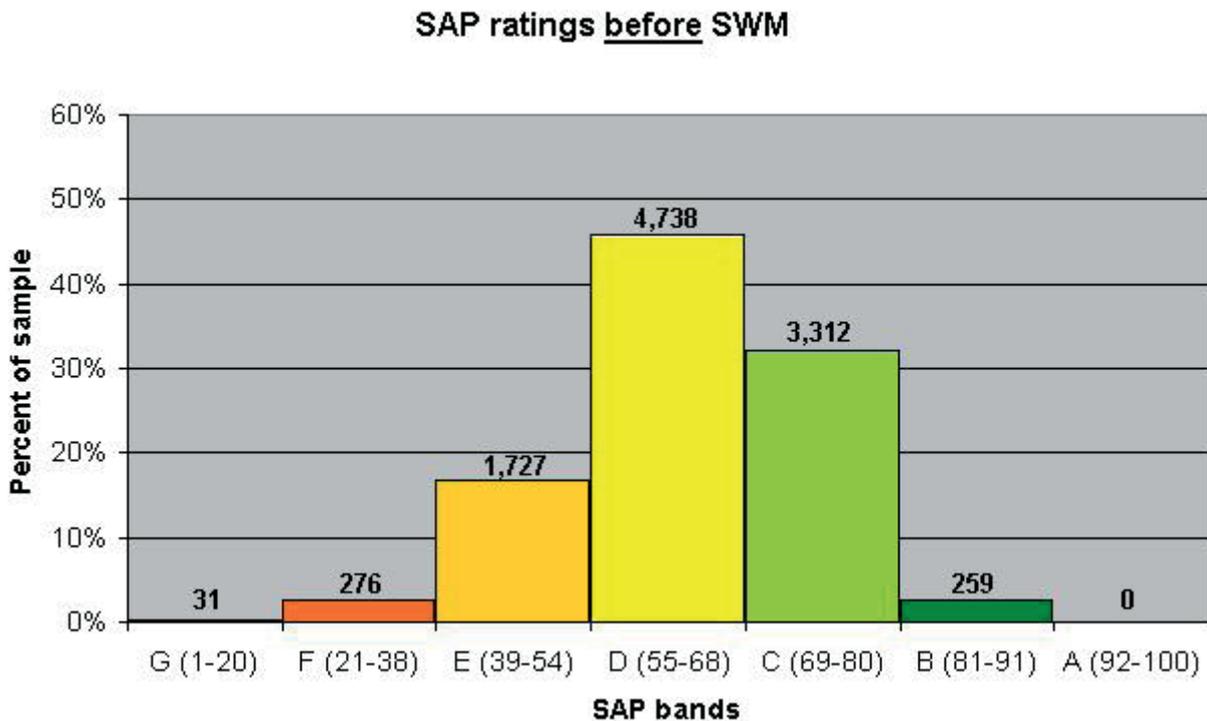


Figure 9: Spread of SAP ratings of properties before receiving SWM

SAP ratings after SWM

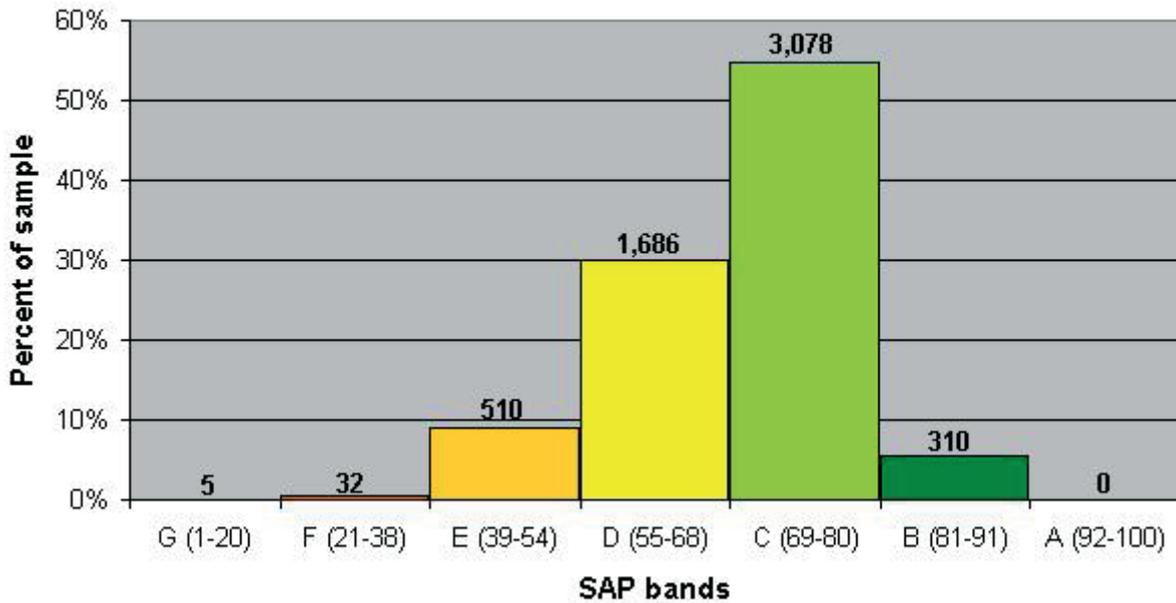


Figure 10: Spread of SAP ratings of properties after receiving SWM

The total CO₂ reduction is then estimated by applying these findings from a sample of the properties to the wider stock. Using this approach, it is estimated that the work completed so far under the SWM programme has resulted in a saving of 15,445 tonnes of CO₂ per year. This is a 15 percent decrease in emissions from NCH properties.²⁰

To provide some context to this figure; to achieve an equivalent annual level of reduction in emissions, Nottingham would have to remove over 2,700 vehicles from the roads; or to absorb the equivalent amount of carbon would need over 360,000 tree seedlings to be planted and grown for ten years.



Figure 11: Equivalent Carbon-saving Measures

20. Assuming the emissions were reduced to the 2010/11 baseline of 90,014, as per the NCH Low Carbon Roadmap.

The SWM programme will continue to 2012/13, and applying these carbon savings to the number of elements that will be fitted over the whole programme gives an estimated CO₂ reduction of 43,500 tonnes per year following the completion of the SWM programme. These reductions will account for achieving 17 percent of One Nottingham's target for reduction of domestic CO₂ emissions, and nine per cent of the total target for CO₂ emissions.

These improvements are also likely to have an impact on the internal conditions in the properties. For example, data from surveys undertaken for NCH across all of the stock prior to the SWM programme showed that there were around 5,000 properties suffering from excess cold conditions, and 200 experiencing significant damp and mould growth. These hazards were therefore addressed as a result of the SWM work undertaken.

Fuel poverty amongst NCH tenants

Prior to the SWM programme the local authority estimated that 12 percent of Nottingham residents were considered to be in fuel poverty. This was measured as part of the National Indicator set, using the proxy measure for fuel poverty as the proportion of residents in receipt of benefits and living in properties with SAP ratings of less than 35.

An update to this indicator in 2010/11 showed that the level of fuel poverty had reduced to 6.8 percent of Nottingham residents, exceeding the city's target (of eight percent for 2010/11) for reducing fuel poverty.

In terms of NCH tenants, the survey data shows that there were 291 properties with a SAP rating of less than 35 among the 10,343 surveys carried out before the SWM work, equating to 2.8 percent of properties surveyed. Among the 5,621 surveys conducted after the SWM work, only 23 returned a SAP rating of less than 35 (less than 0.005 percent). The SWM works have therefore had a considerable positive effect on reducing potential fuel poverty among tenants by increasing the energy efficiency of the properties. However, as outlined earlier, this is only one element of the 'fuel poverty triangle' and there is potential for other tenants still to be in fuel poverty due to low incomes or high fuel costs.

Broad estimations of the cost savings in terms of energy bills can be estimated using indicative figures supplied by the Energy Saving Trust (EST).²¹ For the windows, the EST's cost calculator models the savings from replacing timber-framed single glazed windows with A-rated double glazed models, for a range of property types. Applying the figures from the EST's cost calculator to NCH properties that received window upgrades suggests that each tenant could save between £95 and £223 each year on their fuel bill, giving a total estimated cost saving of just over £1.8m across households with window upgrades.

Turning to the heating upgrades, the EST estimates that a household will save £225 a year from their energy bills (1.1 tonnes of CO₂ a year) as a result of replacing an old G-rated boiler with an A-rated boiler, as was done under the SWM programme. Applying this to the 7,387 properties that had heating upgrades, this equates to a £1.7m cost saving for the tenants.

21. See www.energysavingtrust.org.uk/Home-improvements-and-products

In total, these estimates suggest that tenants will save £3.5m on fuel bills every year among those living in properties that have had windows or heating systems upgraded between 2008 and 2011.

The calculations given above for energy and cost savings are based on well-recognised modelling assumptions (particularly those incorporated into the SAP calculations). However, there is evidence to suggest differences between these theoretical changes (i.e., the potential for energy efficiency gains) and those actually achieved in properties receiving low-carbon retrofit. A recent study showed the differences between theoretical savings and those achieved in reality in a social housing retrofit programme; this demonstrated that customers made only around 40 percent of the expected energy and cost savings.²²

Therefore, the theoretical energy and cost savings based on SAP ratings show the potential amount of energy and money that could be saved as a result of the measures installed; however, the actual savings will depend on occupancy patterns and behaviours, in particular the choices made in the use of the systems installed.

In addition, the cost savings implied from energy savings will vary with fluctuations in energy prices. Domestic energy prices have been rising since 2001, peaking in 2008. Although costs have stabilised in 2009-10, recent announcements from utility companies indicates a significant rise in energy costs in 2011.²³ As a result of rising prices, savings in energy may not result in cost savings, but only in maintaining energy cost levels. Significant energy savings will be required in order to avoid increases in fuel bills.

Waste and recycling

A negative environmental side effect of the refurbishment process is the level of waste created in replacing the old elements. The negative effect is reduced if significant amounts of the waste can be recycled.

NCH and its constructor partners have in place site waste management plans outlining waste minimisation through segregation to reduce this amount of landfill and increase the recycling of materials to be used elsewhere. This measure has reduced the amount of waste taken to landfill and the SWM programme is currently achieving an average of 95 per cent level of recycling against a target of 80 per cent through the scheme. Other ways are also being considered for items that are currently not recycled or re-used, to find ways to further reduce landfill deposits.

Therefore, although a large amount of waste is generated from the refurbishment work, a very high proportion of this is recycled and re-used in other forms. For example, the main windows contractor produced over 2,000 tonnes of waste from 2009-11, and recycled 1,850 tonnes of this waste.

22. Gentoo (2011) Retrofit Reality report (Part 2)

23. See www.consumerfocus.org.uk/files/2011/07/Estimated-GB-Average-energy-prices-following-price-change-announcements.pdf

Findings from case study: property and tenant monitoring

The case study provides an alternative perspective, looking in depth at the impact on a small number of households to explore the actual effects on the conditions in their home, and their activities and energy behaviour.

Two identical properties with similar occupancy patterns were selected for monitoring; these were due to receive a heating upgrade at difference intervals, allowing a period for comparison between the old heating system and the new.

	Property A	Property B
Archetype	Mid-terrace house 3 bedrooms Built 1977 Timber frame walls, external tile cladding	Mid-terrace house 3 bedrooms Built 1977 Timber frame walls, external tile cladding
Occupants	Retired couple	Retired couple + granddaughter
SWM work	Heating (Jan 2011)	Heating (March 2011)
Other features	Double glazed windows (replaced 2002, C-rated) Loft insulation (275mm)	Double glazed windows (replaced 2002, C-rated) Loft insulation (275mm)

Table 1: Average SAP and CO2 emission ratings *Weighted by number of properties in each group

The original heating in both properties comprised of a partial heating system, with a gas fire and back boiler located in the living room, providing hot water and heating for a single radiator in the main hallway. As part of the Secure, Warm, Modern programme both properties received a heating upgrade to a full central heating system, including an A-rated boiler, independent heating and hot water controls, central thermostat and timer, wall thermostat, and radiators (with thermostatic valves) in the living room, kitchen, hallway, bathroom and bedrooms.

At the start of the monitoring period in January, the properties were fitted with data loggers continuously to record data over the whole period. This included recording the internal temperature and humidity around the house, external temperature, electricity and gas use, and event loggers for opening/closing windows and entry into/exit from the property. Tenants also completed in-depth interviews and a daily activity log (for two days).

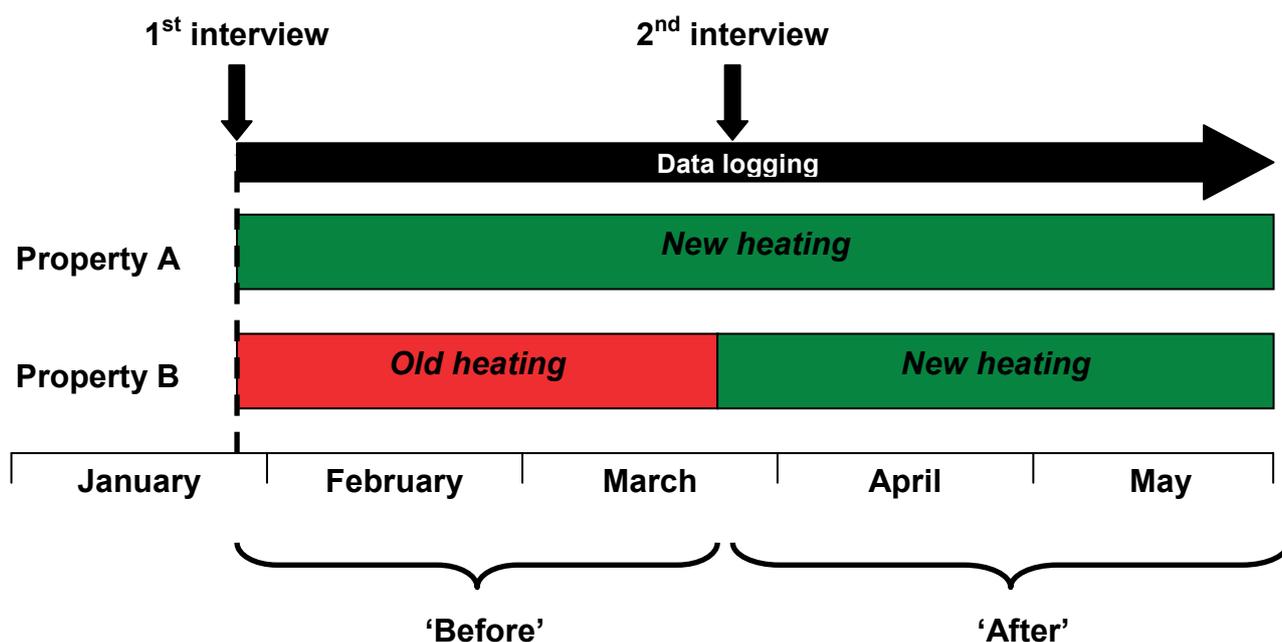


Figure 12: Timescales for Case Study Data Collection

The temperature data collected show that the temperature in the living area of Property A is consistently above the World Health Organisation's recommended living temperature of 21°C, averaging 23.4°C during the day and 23.8°C during the night. The temperature never dropped below 21.7°C during this period, and reached a maximum of 26.5°C.

In comparison, Property B is consistently below the recommended living room temperature, averaging 17.5°C during the day and 20.6°C during the night in the period prior to the heating upgrade, and 18.3°C during the day and 20.1°C during the night in the period after the upgrade. The temperature reached a minimum of 14.3°C and maximum of 23.1°C.

A similar pattern is seen in bedroom temperatures, with Property A consistently above the recommended bedroom temperature of 18°C and Property B consistently below this. In Property B the bedroom temperature reached a minimum of 10.4°C, reflecting the cold external weather conditions (between 2-3°C for a couple of days) at the time.

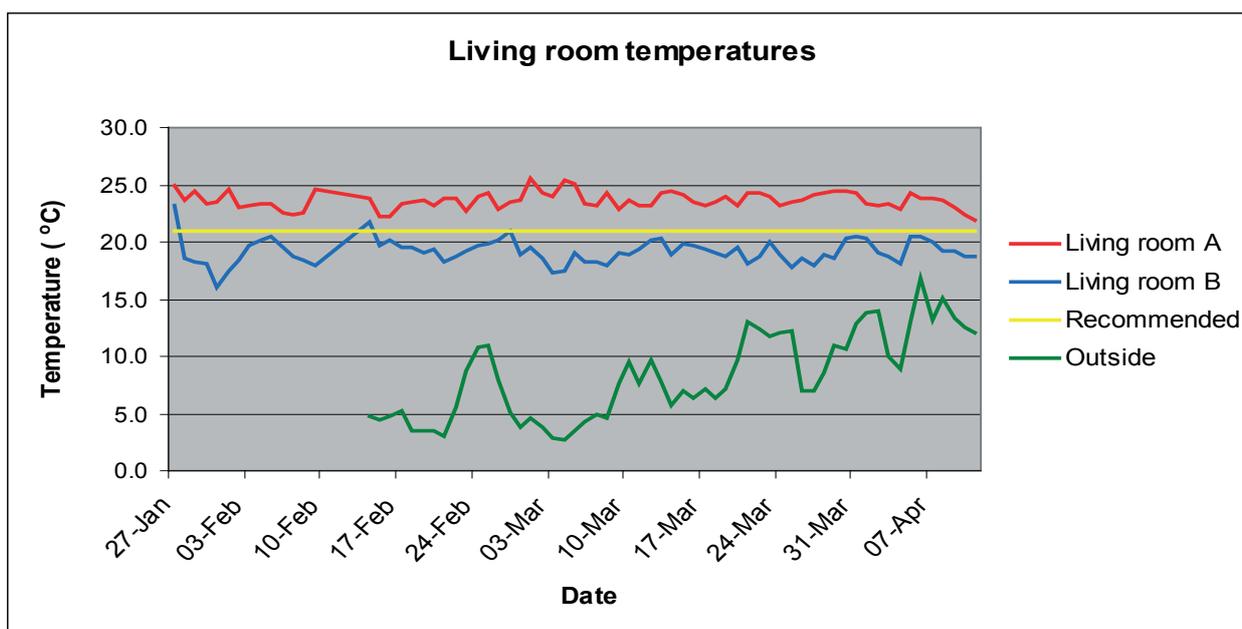


Figure 13: Living Room Temperatures in Properties A and B

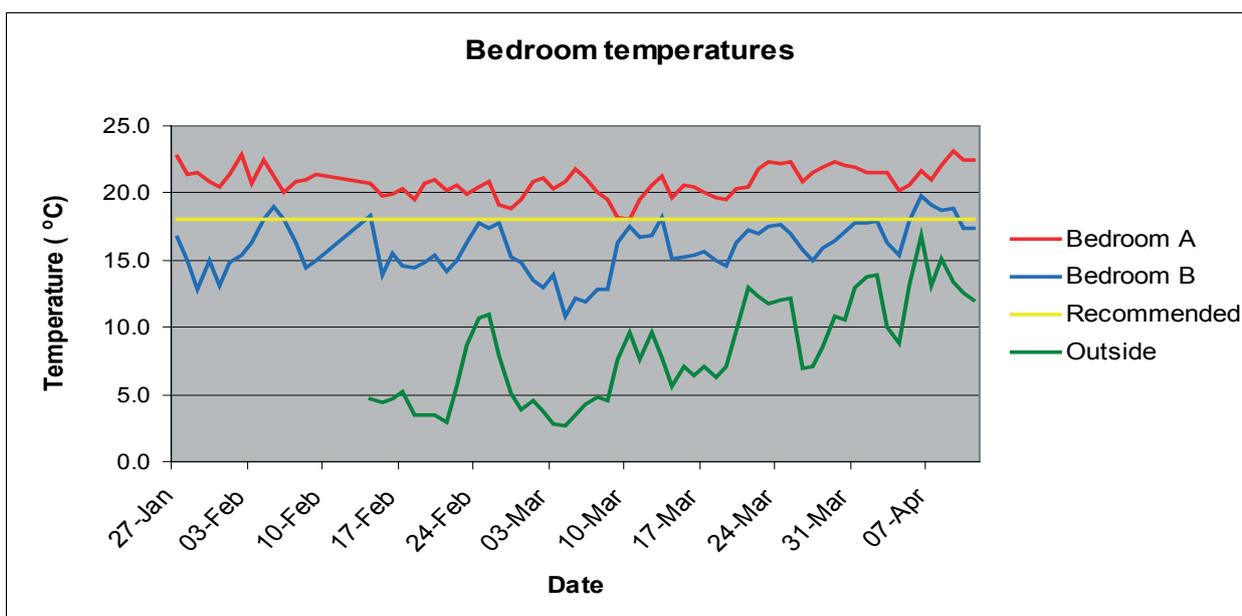


Figure 14: Bedroom Temperatures in Properties A and B

Energy use data shows that, even with the new energy efficient boiler over this period, Property A uses considerably more gas than Property B. Property A's energy use is higher than the national average for the year, while Property B's usage is lower than average (Table 3). This corresponds with the higher internal temperature maintained in Property A compared to that in Property B.

	Property A	Property B	National average*
Gas usage (kWh)			
Jan to Apr 2011	5,969 (£217)	3,587 (£141)	
Annual (Mar 2010 to Apr 2011)	19,483 (£762)	11,989 (£511)	18,000 (£658)
Electricity usage (kWh)			
Jan to Apr 2011	1,303 (£157)	574 (£87)	
Annual (Mar 2010 to Apr 2011)	5,213 (£626)	2,295 (£346)	3,300 (£417)

Table 3: Gas and Electricity Usage (Data from utility bills)

* National average energy usage and cost for 2010 (Source, DECC)

However, comparing Property A's gas consumption against the same period the previous year (i.e., the same occupancy pattern but prior to the heating upgrade), gas usage has declined (Figure 15). This indicates that the new heating system may have reduced gas usage year by year for the same property. Gas usage has also decreased in Property B year by year, despite the same heating system remaining; however, the reduction is smaller than that seen in Property A.

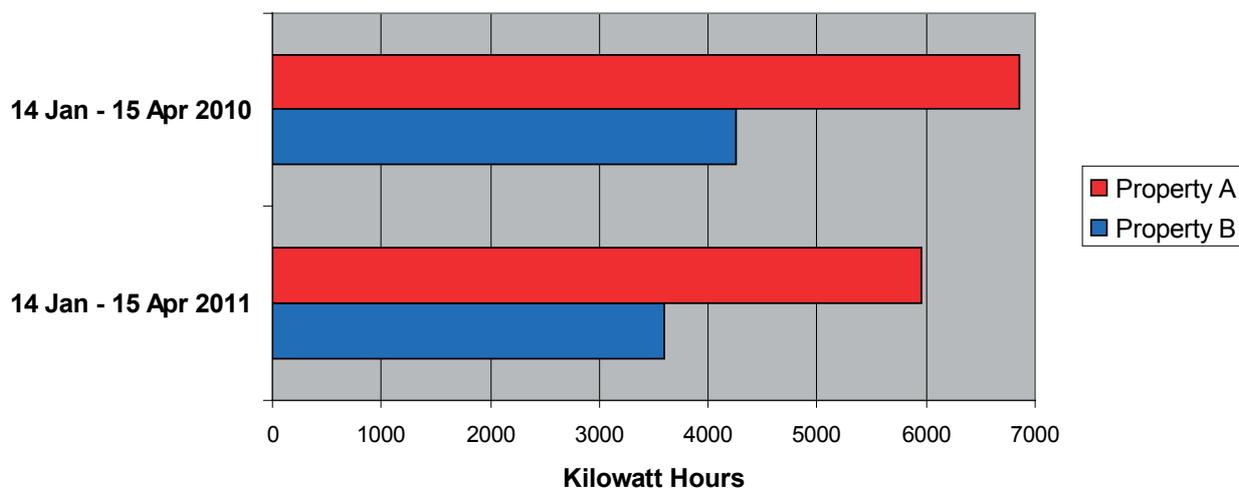


Figure 15: Gas Usage in Property A and B – kilowatt hours per quarter (Source: Utility bill)

Bringing together the evidence from the monitoring in the properties and interviews with tenants, the main conclusions from the case study were:

Despite limited expectations from the heating upgrade, tenants have noticed the difference made by the new heating system:

Both sets of tenants were at the time happy with the old heating system, having had the same heating system for the 30 years that they had lived in the property, and felt some trepidation at the prospect of having the heating replaced and the upheaval this would cause. However, in both properties the process of having the heating fitted went smoothly, and they are happy with the results.

In Property A they have noticed the difference with the new system, with the particular benefits being the increased warmth in the bedroom and bathroom. The house is kept warm at a constant temperature, even through periods of cold weather outside. In Property B, the tenants have used the system intermittently since the new heating has been installed (as the weather has become warmer), and have found the main aspect they have noticed is that it is warmer in the bathroom.

The level of heating and therefore internal temperature depends on the occupant's personal choice, while it is also affected by tenants' interaction with the heating controls:

In Property A, the new heating system is switched on constantly, using the wall thermostat in the hallway to control the temperature. The house is kept at a high internal temperature, between 2-3°C over the recommended temperature for the living room and bedroom. This appears to be partly from personal choice, with the tenants preferring to keep warm and being aware of the risk of cold temperatures on their health.

However, it may also be due to incomplete understanding of how best to use the controls on the new system, such as the wall thermostat and the thermostatic radiator valves. As well as having the heating turned on, at the same time the windows are regularly open in the bedroom, bathroom, living room and kitchen. In the face of the apparent complexity of the heating controls, the tenants instead use basic means of temperature control, such as opening the windows. However, this allows the heat to escape and means that the boiler will have to be working hard to maintain the temperature at the level set on the thermostat, resulting in wasted energy use.

In Property B, the house is colder than the recommended temperatures, with the bedroom in particular dropping to low temperatures when the weather is cold outside. This is partially due to tenant choice in choosing a temperature that is comfortable to them, while it also reflects the lack of heating options in several of the rooms, such as the bedroom.

In this case study, the impact on energy efficiency of behavioural aspects (i.e. way in which the heating system is used) outweighs the impact of infrastructure improvements:

With the internal temperature kept high, Property A has higher gas use and costs than Property B (and higher than the national average), despite the higher efficiency boiler. The upgrade from a partial to a full central heating system means that there is a potential for higher energy use overall, as the system has to heat radiators in all of the main living areas, rather than only the one radiator in the old system. However, Property A has seen a decrease in its gas use since the same period the previous year, when they had the old heating system.

Although the old boiler was relatively inefficient, their limited use of the heating means that Property B's total gas use is lower than Property A's. This demonstrates the important factor of occupant choice and behaviour in achieving energy efficiency savings. Due to limited use of the new system since it has been installed (as the weather has become warmer), it is difficult to establish at this point whether the new heating system has so far made a difference to energy use in Property B. This will become clearer over the next heating season (October 2011 – May 2012) when Property B's energy use with the new system can be compared to the previous year's use with the old boiler.

To tackle fuel poverty, the energy efficiency element of the 'fuel poverty triangle' needs to take into account both the physical condition of the property and the energy behaviour of the occupants:

The case study has demonstrated the importance on the actual efficiency gains seen of the relationship between the actions of the occupants and the installations fitted. This widens our understanding of the fuel poverty triangle, adding a further dimension to the 'energy efficiency' factor that needs to account for both the physical changes made to the property and the occupants' interaction with the technology; both of these affect the efficiency with which energy is used in the home.

Conclusions and recommendations

Although significant improvements have been made in the energy efficiency of core elements of the infrastructure under the SWM programme, the choices and behaviour of tenants make a significant difference in the actual energy efficiency gains seen. Comparing the two case study households, this behavioural aspect outweighs the impact of the retrofit work; resulting in the property with an A-rated boiler and full central heating system using more energy than the neighbouring property, which has the same build specifications although with a G-rated boiler and partial heating system.

The analysis has demonstrated that work completed under the SWM programme has significantly improved the potential energy efficiency of the stock. However, in order to realise these efficiency gains, the retrofit work needs to be combined with awareness and behavioural change among the occupants, as well as considering how the technology could be made more user-friendly.

Understanding the impact of energy efficiency improvements on actual energy savings and fuel poverty is important as NCH continues to roll out further energy efficiency investments, including internal insulation under Community Energy Savings Programme (CESP) funding and installation of solar photovoltaic panels.

The following recommendations are put forward for the consideration of NCH and partners:

1. Develop a range of communication materials and methods for helping occupants make the most of any energy efficiency improvements in their home, and test their effectiveness with tenants.
2. Include energy saving advice and information on support for fuel costs (e.g., winter fuel and cold weather payments) in NCH's Debt Advice Service.
3. Continue to monitor the actual impact of energy efficiency programmes delivered by NCH on carbon emission reductions, tenants' energy awareness and fuel bills.
4. Develop wider data on fuel poverty prevalence (or suitable proxy) to monitor distribution and changes in fuel poverty (accounting for the impact of both changing energy use and changing prices in determining fuel costs) to inform NCH's future financial advice/energy efficiency programmes and initiatives.
5. Continue the commitment in current and new contracts to recycle waste, and investigate options for items that are currently not recycled or re-used to find ways further to reduce landfill deposits.

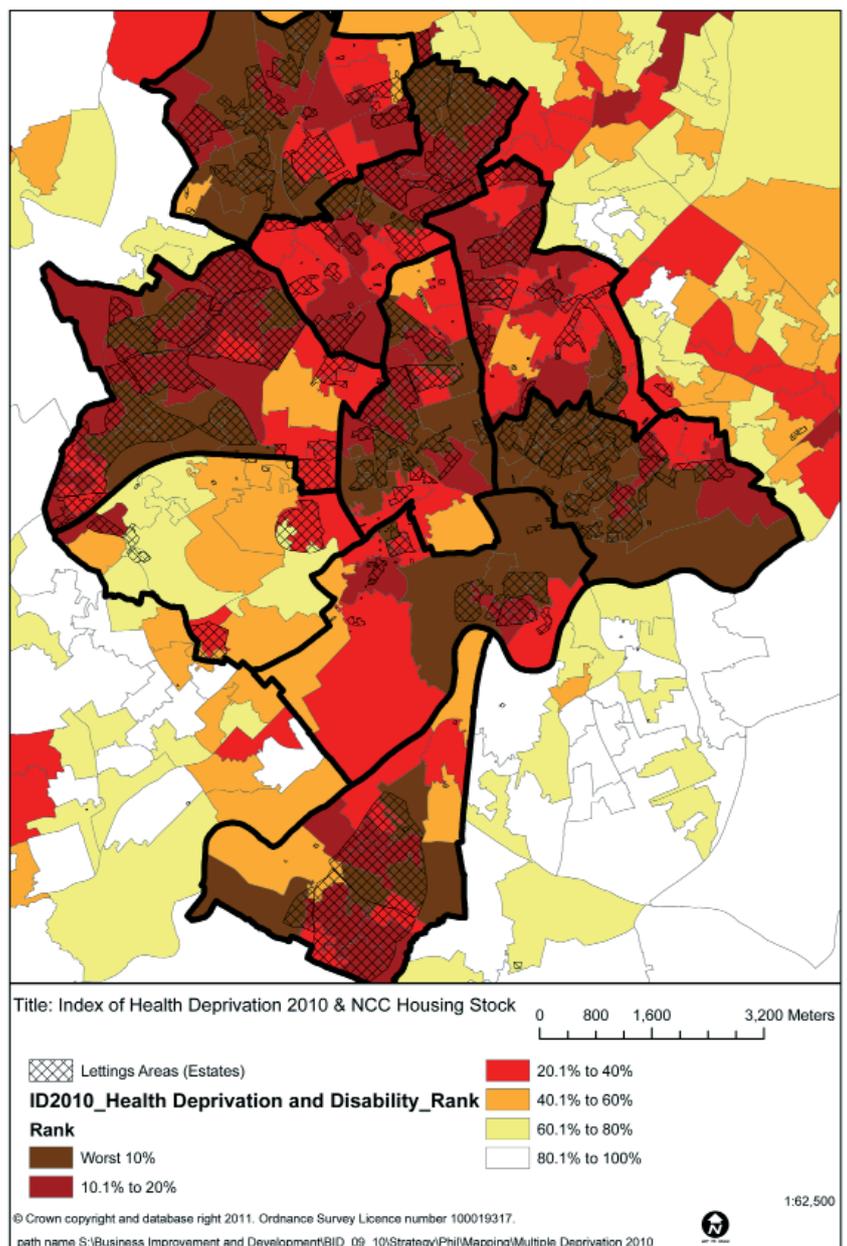
Health and wellbeing

Social inequalities and health

The inequalities in health seen in the UK – in terms of mortality, life expectancy or health status – are closely related to disparities in social and economic circumstances. In Nottingham, the average life expectancy of those living in the most deprived neighbourhoods is ten years shorter than those from the wealthiest neighbourhoods.

Tackling inequality in health is now one of the primary objectives for the NHS; but the core argument of the Marmot Review (2010) is that “Action on health inequalities requires action across all the social determinants of health... Action taken by the Department of Health and the NHS alone will not reduce health inequalities.”²⁴

Some of the poorest health outcomes in Nottingham are seen in estates with a high proportion of social housing. This is because of the way social housing is prioritised for the most disadvantaged, including those with medical needs. As a result, many of the Nottingham City Homes estates are in areas scoring amongst the worst ten per cent in England on the health indices. Because of this, NCH is committed to its role in helping to improve the health of our tenants.

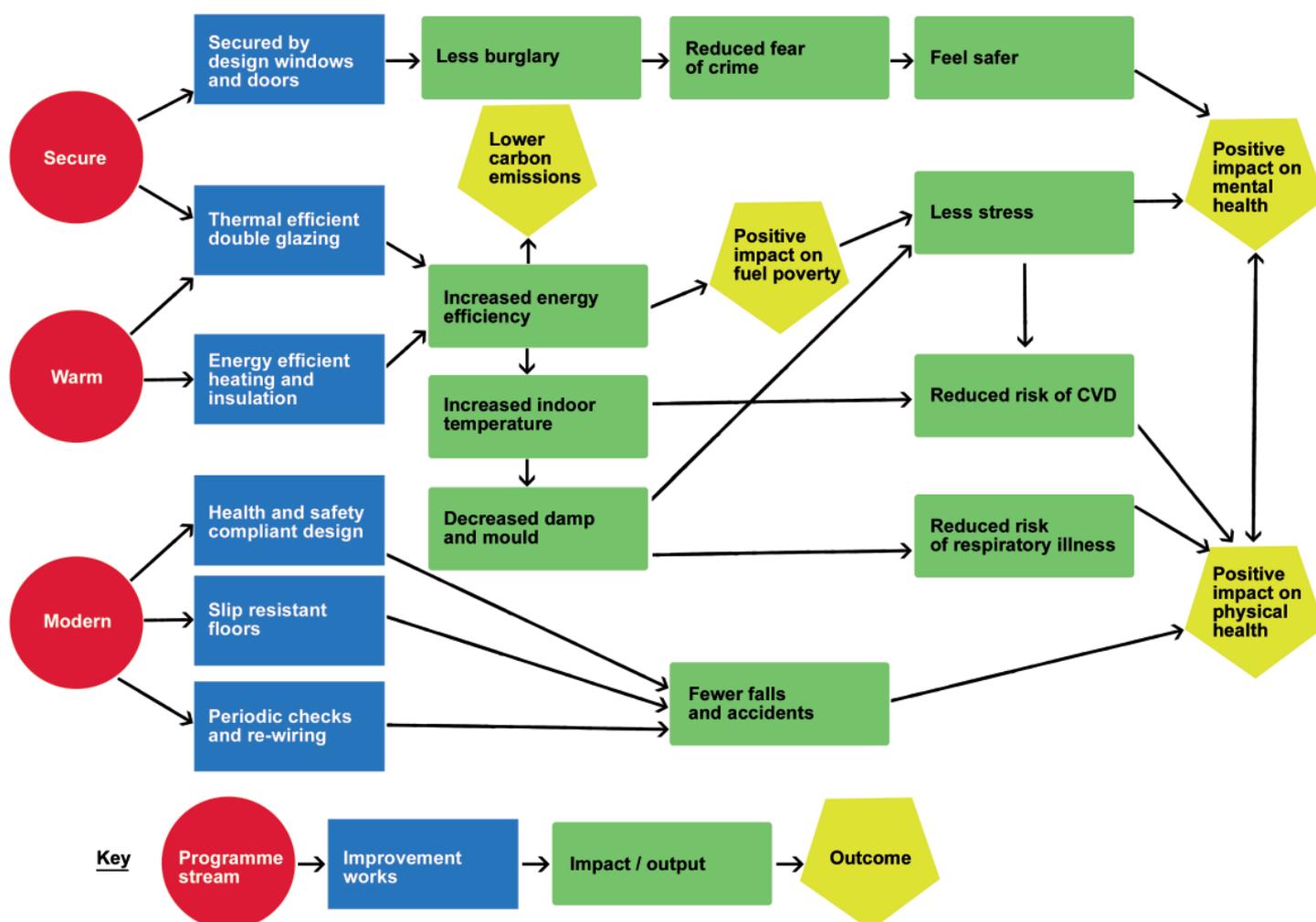


Housing is one of the factors that determines health outcomes. Evidence shows that poor housing leads to poor health. Poor housing quality, including cold, damp and insecure conditions, has a negative impact on both physical and mental health.

24. Marmot (2010) Fair Society, Healthy Lives: Strategic review of health inequalities in England post-2010, p. 16.

Measuring health outcomes

The aim of the health strand is to evaluate the impact of installations under the Secure Warm Modern programme on both the physiological and the mental health of residents and their communities. The health impact map was developed to show the anticipated causal mechanisms and expected health outcomes as a result of the housing improvements carried out under the Secure Warm Modern programme:



The appraisal aims mainly to characterise and, where possible, to quantify the health impact of the SWM programme. It therefore includes a variety of data collection techniques in order to attempt to triangulate the findings from each of these in order to reach a more robust conclusion.

The evidence for the Health Impact Assessment for SWM was gathered through:

- A review of previous studies relating to the health impact of housing
- Analysis of local demographic and hospital admissions data for relevant health conditions
- Modelling of the health impacts of removing identified health and safety hazards
- Interviews with NCH tenants and local health professionals

Main findings

Impact on physical health

The causal mechanisms explaining the relationship between poor housing and ill health are many and varied, and the strength of evidence also varies widely. Poor housing can affect specific conditions, such as cardio-vascular or respiratory diseases, as set out below. In addition, there are a number of more general ways that poor housing can affect health, which would result in a lower assessment of general health.

Cardio-vascular disease

Cold temperatures cause raised blood pressure and increased viscosity, and has been shown to cause hypertension, ischemic heart disease and strokes.

Around a third of all Excess Winter Deaths are caused by cardio-vascular disease.

Falls and accidents

45 percent of people aged 80 and over are at risk of falling, and between 10-25 percent will sustain a serious injury as a result. Hazards for trips and falls in the home are a causal factor.

Over 2 million injuries from accidents occur in the home each year. Fatal accidents are more common in the winter, as cold reduces body temperature and so mental function, dexterity, strength and sensation.

Respiratory illness

At temperatures below 16°C resistance to respiratory infections is reduced.

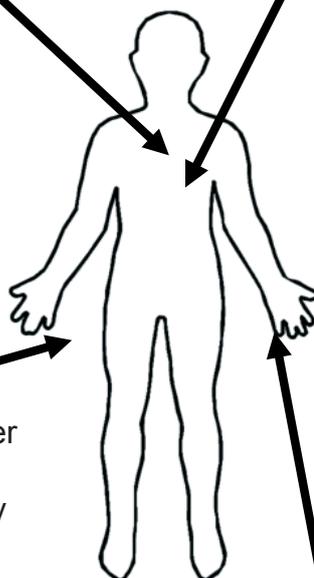
Cold conditions also impair lung function and can trigger bronchoconstriction in asthma and COPD.

Damp and mouldy conditions can also cause asthma symptoms and contribute to respiratory infections.

Respiratory disease accounts for over a third of all Excess Winter Deaths.

Joints and mobility

Cold conditions are thought to worsen pain associated with arthritis and rheumatism.



Both cardio-vascular and respiratory diseases are more prevalent in areas of council housing, as anticipated given the social gradient in health described above. These illnesses are also the main causes of Excess Winter Deaths (EWDs) in the UK (i.e., the number of deaths that occur during the winter months (December to March) over and above those that occur in the summer months). Excess winter mortality is higher in the UK than in many other European countries that experience colder winters. Vulnerability to excess winter mortality has been shown as related to the temperature conditions inside the home.

A study of Excess Winter Deaths in Nottingham found that there were on average 128 EWDs each winter in Nottingham City between 2002 and 2008.²⁵ This equates to 15.9 percent more deaths in the winter months compared to the non-winter months. The Joseph Rowntree Trust concluded that: *'The findings suggest that people in poorly heated homes are indeed more vulnerable to winter death than those living in well-heated homes. This suggests that substantial public health benefits can be expected from measures that improve the thermal efficiency of dwellings and the affordability of heating them.'*²⁶

The evidence suggests that improving the energy efficiency of properties will have a positive impact on both cardiovascular and respiratory conditions, leading to a modest improvement in physical health in adults.²⁷

It is estimated that SWM has saved two lives a year by reducing excess cold conditions in the home through SWM.

While the impact on adults' health of housing improvements is modest, a repeated finding in the literature is a significant improvement in childhood health following such improvements, particularly asthma, with positive knock-on effects such as a significant reduction in asthma-related school days missed.²⁸

The World Health Organization found that children living in homes with low quality heating systems showed double prevalence for respiratory problems. By improving heating systems, SWM is therefore estimated to have reduced 1,039 cases of respiratory illness in children living in NCH properties.

Falls and accidents are also another health risk in the home. Both falls and accidents have multi-factorial causes, yet addressing hazards in the home is one way of reducing risk of their occurring.

NCH identified 235 serious fall hazards in NCH properties prior to SWM; by removing these hazards, it is estimated that this has prevented 12 hospital admissions a year.

NCH identified over 2,000 hazards that could cause accidents, such as electrical and fire hazards. By removing these hazards, it is estimated this has prevented 144 hospital admissions a year. This could save the NHS around £175,000 each year in treatment costs.

Poor housing conditions can have wider effects on general health and wellbeing. For example, cold conditions are thought to worsen pain associated with arthritis and rheumatism.²⁹ Damp and mould are strongly linked with symptoms such as nausea, breathlessness, backache, fainting, headaches, fever and vomiting in children. They are also linked to allergies, infections (other than respiratory), toxic reactions and some cancers.³⁰

25. Howard, R. (2009) Excess Winter Mortality: A Health Needs Assessment for NHS Nottingham City

26. Wilkinson, P., Armstrong, B., Landon, M. et al. (2001) Cold comfort: The social and environmental determinants of excess winter deaths in England, 1986-1996 Joseph Rowntree Foundation.

27. Liddell, C. and Morris, C. (2010) 'Fuel poverty and human health: A review of recent evidence', Energy Policy, 38(6), pp. 2987-2997.

28. Somerville, M., Mackenzie, I., Owen, P. and Miles, D. (2000) 'Housing and health: does installing heating in their homes improve the health of children with asthma?', Public Health, 114 (6), pp. 434-439.

29. Gilbertson, J., Stevens, M., Stiehl, B. and Thorogood, N. (2006) 'Homes is where the hearth is: Grant recipients' views of England's Home Energy Efficiency Scheme', Social Science and Medicine, 63, pp. 946-956.

30. Baker, W. (2001) Fuel Poverty and Ill health – A Review, The Centre for Sustainable Energy, Bristol.

Some of the other health benefits that have been reported following housing improvements include fewer mobility problems,³¹ fewer aches and pains, and fewer runny noses.³² Two individual studies and one systematic review found that housing improvements led to a reduction in GP attendances.³³

The experience of local GPs supports this evidence; they reported that poor or inappropriate housing, combined with other issues relating to deprivation, has an impact on their patients' general health, and therefore on GPs' workload:

Housing issues do have an impact, specifically if you're looking at things like large families in small accommodation... patients who are in inappropriate accommodation, perhaps because as they've got older they've stayed in the same place and can't manage the stairs... some of the housing stock where it has been quite run-down, where there's been damp... the noise impact and issues with neighbours. That has an impact on their mental health and their physical health.

This is also supported by the findings from interviews with tenants. All of the tenants interviewed felt that the housing conditions prior to the improvements impacted negatively on them and made their general health or existing health conditions worse. A common issue was cold indoor temperatures, due to draughts and poor insulation (particularly from single glazed windows) and inadequate (or too expensive to run) heating. Other issues included condensation and damp, causing mouldy conditions on the windows and walls. For some tenants, their housing quality caused them to worry; particularly about security and vulnerability to break-ins, and also about the gas fires and the possibility of accidents or carbon monoxide poisoning.

Nearly all of the tenants interviewed felt that their general health was better since they had the SWM work completed. In the majority of cases, the tenants felt that the housing conditions did not directly cause poor health, but exacerbated existing conditions. For example, a number had conditions made worse by the cold conditions, causing pain or discomfort, such as arthritis or asthma (examples can be found in each of the four case studies in the original report). In a small number of cases, the tenants felt that housing conditions had contributed to causing illness, such as cold, damp and mouldy conditions contributing to respiratory infections such as colds or influenza; since the work was completed they had had fewer or no bouts of cold or influenza.

Impact on mental health

Security and fear of crime

A lack of a sense of safety in the home can lead to anxiety and problems with nerves, whilst improvements in safety and security have led to a significant reduction in self-reported mental health problems, for example reducing self-reporting mental health problems from 52% to 41% of adults.

As outlined previously, fitting 'Secured by Design' windows in NCH properties reduced burglary by 42% on two sample estates where the windows were fitted, compared to a 21% reduction city-wide over the same period.

31. Barnes, R. (2003) Housing and health uncovered, Shepherds Bush Housing Association. London.

32. Taske, N., Taylor, L., Mulvihill, C. and Doyle, N. (2005) Housing and public health: a review of reviews of interventions for improving health, Evidence briefing, 2005: National Institute for Health and Clinical Excellence, p. 60.

33. Couch, C. and Fitzharris, T. (2003) Merseyside Health Action Zone: Safe and warm housing improvement project final monitoring report. John Moores University, Liverpool.

“I had been burgled, and every night I checked everything, it was like an obsessive thing... So from the day I had my windows I felt 100 percent safe”

Damp and mould

Damp and mould may have a considerable negative affect on mental health. The World Health Organization (WHO) found that extensive exposure to dampness and mould increased the chance of depression by 60 percent.³⁴

NCH found that around 200 homes had severe damp and mould prior to the Decent Homes work. Based on the prevalence of depression in Nottingham and the findings from the WHO above, it is estimated that removing this damp and mould could lead to a reduction of 38 cases of depression among NCH tenants.

“I was just miserable, you know, because it was cold and damp and then you’d have to be putting on loads of clothing and things like that, you know, it was like miserable and gloomy I should say.”

Excess cold and fuel poverty

Nottingham City 2011 Joint Strategic Needs Assessment on adult mental health reported that those with cold homes or experiencing fuel poverty have a four-fold increased risk of depression or anxiety. NCH found that over 5,000 homes were suffering from excess cold prior to the Decent Homes work; it is estimated that remedying this excess cold (and potential fuel poverty) could lead to a reduction of around 1,400 cases of depression amongst NCH tenants. This could save the NHS almost £200,000 in treatment costs.

As outlined in the previous section, the Secure, Warm Modern programme has had a positive impact on increasing the energy efficiency of properties and therefore on reducing fuel poverty, with a potential collective saving of £3.5m a year on fuel bills for tenants who have received new windows or boilers.

“You’d have to be putting more money in just to keep it warm... so obviously you’re trying to save as much as you can, so that was like a big hole in my pocket... “The [gas payment] reduced down from £30 to £15, so I just top up every week and it has saved me a lot of money”

34. WHO (2009) Housing and Health in Europe - The WHO LARES project. Routledge, New York.

Conclusions and recommendations

There is a clear social gradient in health in Nottingham, with those living in the most deprived areas experiencing worse outcomes across a number of health conditions and overall life expectancy. Housing conditions are one of the multiple factors of deprivation that have a negative impact on health outcomes.

Addressing housing conditions alone has a moderate impact in improving the health of adults, due to the complexity of the multiple causes of ill health. However, the cumulative and long-term effect may well be significant; for example, addressing housing conditions has a more significant impact on children, thus potentially resulting in a lifetime of savings in terms of health costs.

A number of national studies have calculated the cost implications of poor housing that falls on the NHS as treatment costs; these estimates range from £1.5 billion to £2.5 billion a year.^{35 36} In this research, a small number of examples were selected for which a measurable change and cost impact for the NHS in Nottingham could be calculated; the costs saved as a result of addressing serious hazards in the home, reducing asthma in children, and relieving depression from damp and mould, excess cold and fuel poverty total almost £700,000. Only this small number of examples accounts for one per cent of Nottingham City PCT's cost of provision for 2010/11 (totalling £56.5m). In addition, the improvements made to the NCH properties will make a long-term difference to these homes (for example, the anticipated life-span of a new boiler is 15 years) thus the health benefits will be cumulative over this period.

The core recommendations, and a number of examples of how they could be applied based on the evidence outlined throughout the HIA, are as follows:

1. Maximise opportunities to continue to lever in health benefits through improvements to the quality of council housing stock, through NCH's Asset Management Strategy.
Examples include:
 - Supporting the neighbourhood renewal project to build 500 'lifetime homes' and minimise the negative wellbeing impact of the moving process
 - Building cost-effective health and safety features into ongoing asset management programmes, e.g., hard-wired smoke detectors, thermostatic mixer valves
2. Develop understanding and integrate delivery of public health outcomes through wider services such as housing, by engaging with the Health and Wellbeing Board and Clinical Commissioning Groups. For example:
 - Contributing to local strategies, such as the Joint Strategic Needs Assessment (JSNA) and Joint Health and Wellbeing Strategy (JHWS)
 - Engaging with GPs and Clinical Commissioning Groups through information sharing and building relationships at a neighbourhood level
3. Consider how NCH's engagement with tenants through existing services could potentially complement or support public health initiatives. Examples include:
 - Facilitating tenants' engagement with public health services, such as smoking cessation, weight loss, Occupational Therapists, etc.
 - Supporting the continued delivery of the Nottingham On Call telecare alarm service.

35. Nicol, S., Roys, M., Davidson, M., Summers, C., Ormandy, D. and Ambrose, P. (2010) Quantifying the cost of poor housing. BRE Information Paper 16/10.

36. Friedman, D. (2010) Social Impact of Poor Housing. ECOTEC.

Local economy and employment

Employment, skills and the local economy in Nottingham

The Secure, Warm, Modern programme is a large capital development project for the city, with a total budget of £187m. It therefore represents a significant financial injection into the construction industry, along with associated impacts such as increased employment, training and the stimulation of the local economy.

The Sustainable Communities Strategy, The Nottingham Plan to 2020, is the city's long-term plan for maintaining its economic competitiveness, and ensuring that all local residents benefit from it. A strategic aim of the Nottingham Plan is to 'tackle poverty and deprivation by getting more local people into good jobs', including targets to increase employment and reduce workless households, increase skills and qualifications required to progress in work and earn more, and thereby significantly reduce poverty and deprivation. This is particularly relevant for Nottingham, which has higher unemployment and lower skills than the national average.

The construction sector is the fifth-largest employer in Nottingham, but was badly hit by the economic downturn and reduction in house building.³⁷ Nottingham City Council has therefore pledged to focus on creating local jobs in the construction industry, by ensuring that infrastructure developments that are planned for the city are enabled to draw on local employment sources.

Measuring local economic outcomes

The aim of this strand of the research is to evaluate the impact of the SWM programme on money flows and employment within the local economy, and the outcomes these deliver for local businesses and people. The objectives were therefore to:

- Map and measure money flows from the SWM spend within the local economy
- Evaluate any additional benefits to organisations and individuals as a result of the programme
- Evaluate the impact of SWM on the objectives of Nottingham's Sustainable Communities Strategy within the 'Working Nottingham' theme.

The impact of the SWM programme is assessed against a 'theory of change' model, i.e., a map of potential anticipated impacts in a number of areas. This is set out in the impact map diagram overleaf, showing the anticipated outcomes and impact of the SWM programme on relevant stakeholders, including NCH, its employees and contractors, and local businesses. The diagram also shows the money flows as a result of investment in the SWM programme. The method then assesses and measures whether these anticipated outcomes have occurred, and the levels of any changes that have taken place.

37. Nottingham's Local Economic Assessment (2011). Available at: www.nottinghaminsight.org.uk/

The impact of the Secure, Warm, Modern programme on the local economy and employment was measured using the New Economic Foundation's Local Multiplier 3 tool, which measures how money is spent and re-spent within a defined local area.

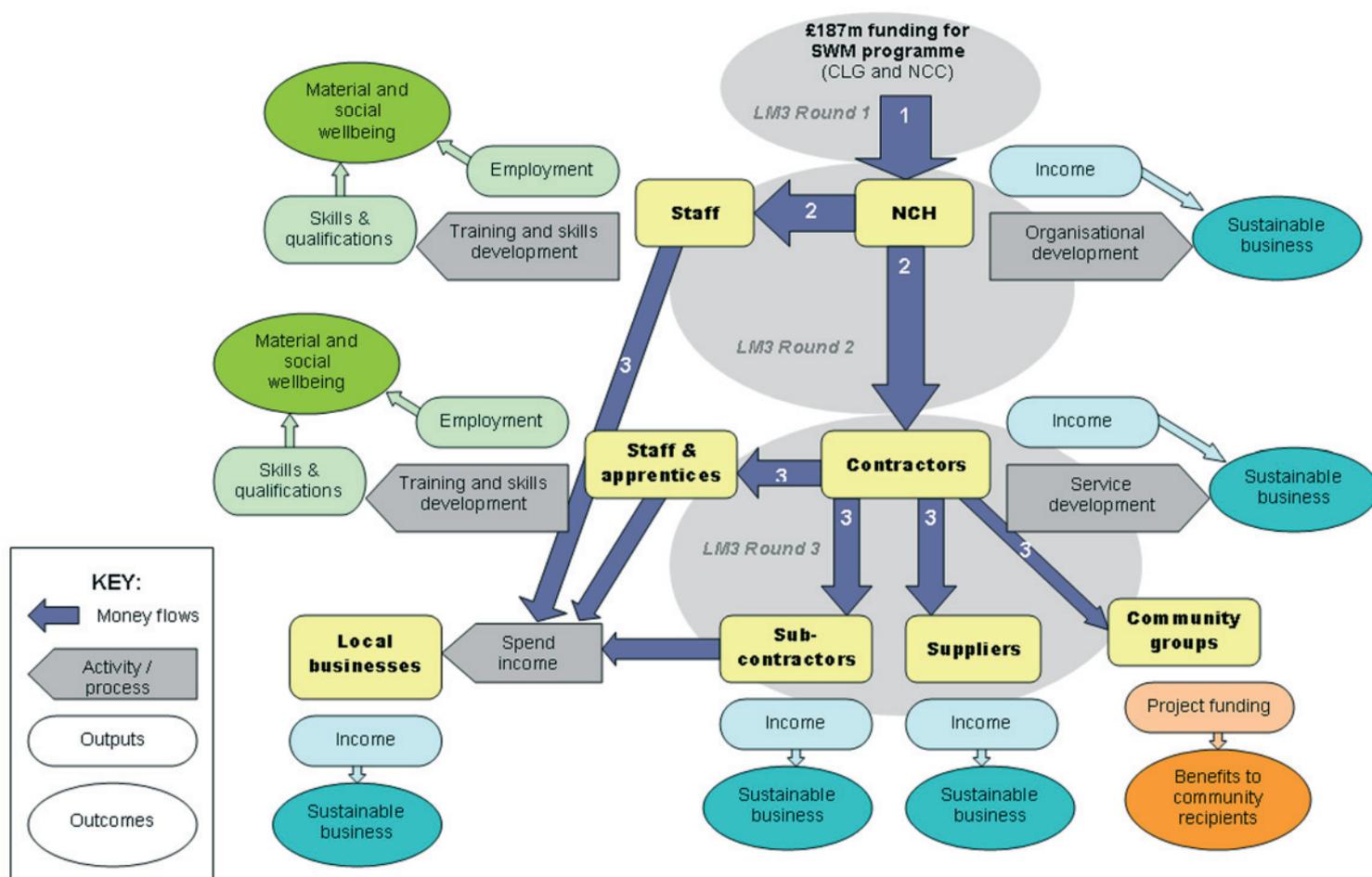
The stages in the LM3 model are:

1. Define the local area
2. Identify initial income source (Round 1)
3. Break down how this income is spent within the local area (Round 2)
4. Survey the businesses and people who spend this money in order to determine where they spend their incomes (Round 3)
5. Add the spending and re-spending within the local economy.

The local area was defined, firstly, as within the Nottingham City boundaries, encompassing the 20 wards of Nottingham City. However, a wider local area was also defined as the county of Nottinghamshire, which includes Nottingham City and the boroughs of Gedling, Broxtowe, Rushcliffe, Ashfield, Newark and Sherwood, Mansfield, and Bassetlaw.

Data were collected from NCH's internal finance records, and from a short survey with contractor partners. The outcome is a local multiplier 'score', showing the amount spent in the local economy for each pound of the original investment.

The impact on skills and training, business development and on local communities was also measured using a range of indicators.



Main findings

Local multiplier for Secure Warm Modern

Over the course of the Secure Warm Modern programme from 2008 to 2015, NCH will receive just over £187m in funding from the Department for Communities and Local Government (under the national Decent Homes programme) and from Nottingham City Council. The Local Multiplier 3 (LM3) model analyses how much of this spending remains within the local economy, and is re-spent by local people and businesses. The local areas are defined here as, firstly, within the boundaries of Nottingham city and, secondly, within the county of Nottinghamshire (including the city).

In the last financial year (2010/11) 560 people were employed on the SWM programme, including NCH staff, contractors and sub-contractors. Of these employees, 28 percent live within Nottingham city, and 51 percent within Nottinghamshire (including the city).

The programme is delivered by seven contractor partners, only one of which (NCH's Direct Labour Organisation) is based in the city. The remaining contractors are part of larger regional or national construction companies that specialise in the delivery of large-scale capital projects in the social housing sector. The profile of the construction industry in the region, with very few medium or large sized companies with the required specialist expertise, restricts the choices available to NCH in selecting its contractors. However, each of the companies has established an operational base within the city, and around 30 percent of contractor staff live in Nottingham. They also make use of local sub-contractors and suppliers; 23 percent of sub-contractors are based within the city and 53 percent within the county (including those in the city), and 52 percent of the spending with suppliers is with businesses located in the city.

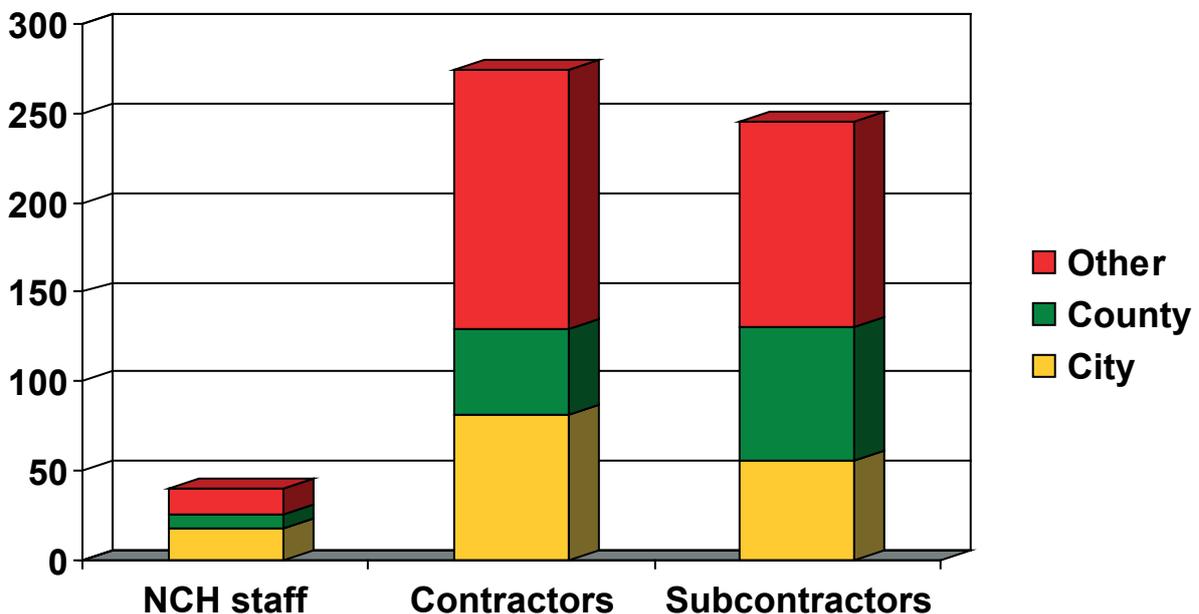


Figure 17: Home address of SWM staff

The Local Multiplier score for 2010/11 is calculated by adding up the local spending on the programme for all three rounds, and then dividing the result by the initial income (Round 1):

2010/11		Nottingham City		Nottinghamshire (including city)	
		Local spend	% total	Local spend	% total
Round 1:	SWM funding	£37.6m		£37.6m	
Round 2:	NCH salaries	£4.8m	13%	£4.9m	13%
	Contractors				
Round 3:	NCH staff re-spend	£8.7m	35%	£12.3m	50%
	Contractor salaries				
	Sub-contractors				
	Suppliers				
	Local rent				
	Community grants				
LM3 score:		£1.36		£1.46	

Table 4: LM3 Calculations and Score

The LM3 score shows that every £1 of the initial investment from the Secure, Warm, Modern programme generates £1.36 within Nottingham city, or £1.46 spending across Nottinghamshire (including the city). This means that every £1 that is spent on SWM generates an additional 36p of spending in Nottingham city, due to the way it is re-spent by local businesses and people; when the rest of Nottinghamshire is included, the additional spending increases to 46p.

Therefore, the £37.6m spent on SWM in 2010/11 generated £54.9m spending in Nottinghamshire, i.e., the original investment plus an additional £17.3m spending in Nottinghamshire. Of this additional spending, £13.5m was spent within the Nottingham city boundaries.

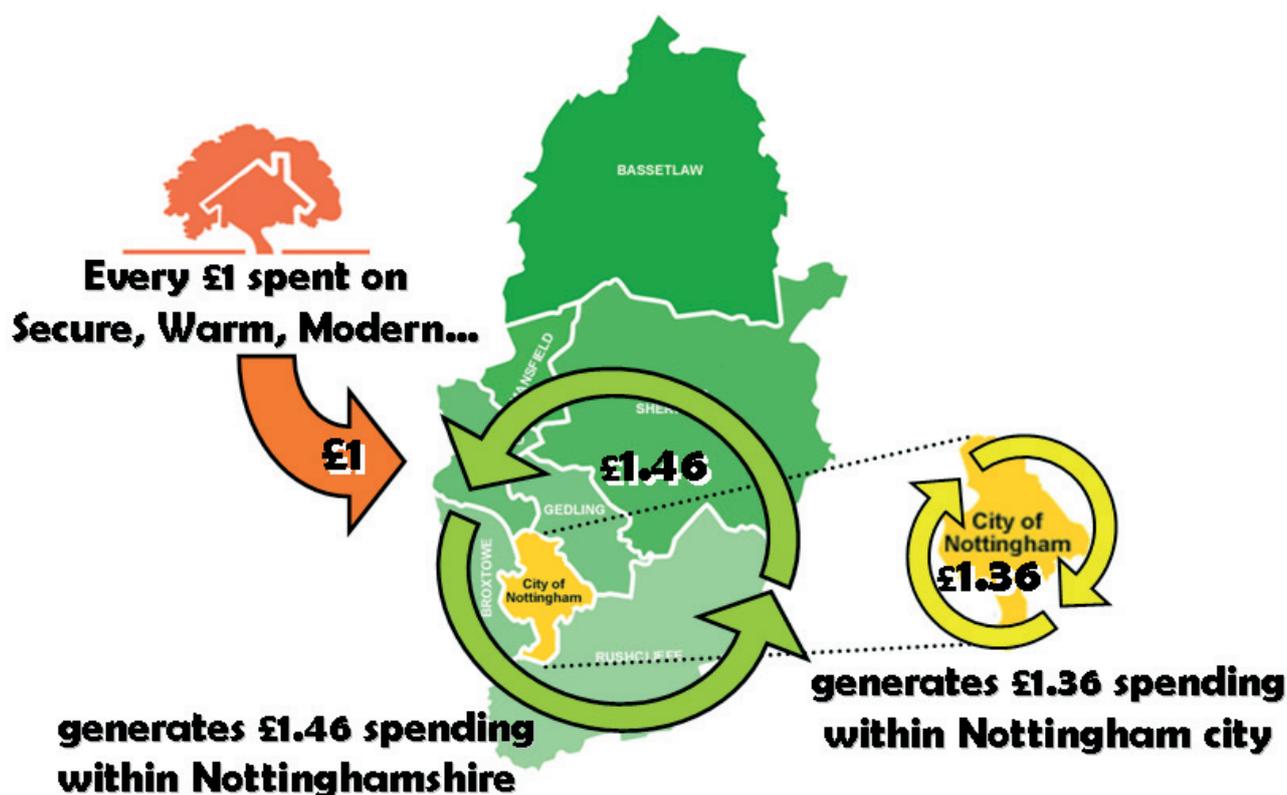


Figure 18: SWM Local Multiplier Score for Nottinghamshire and Nottingham city

Business benefits

As shown in the impact map, an additional outcome of the SWM programme for NCH lies in its increased capacity to deliver a large-scale capital programme as a result of the organisational learning and development acquired during the delivery programme. This means that NCH has the capacity to make the most of new business opportunities as they arise, contributing to the sustainability of the business model. NCH's Business Plan for 2010-13 states that *'We need to secure a viable future for the organisation through securing new business, exploring alternative ways of working, developing new funding routes and making the most of the resources we have'*.

Delivering a large-scale capital programme such as Secure, Warm, Modern has helped to build the organisational capacity of both NCH and contractor partners. Key Performance Indicators (KPIs) show that the programme has been delivered on time and within budget, and that customer satisfaction has been increasing throughout. Such evidence of the organisation's capabilities has contributed to NCH and partners winning a further £12m for 2010-12 to deliver energy efficiency improvements to the stock.

Skills and training

The SWM programme has additional social benefits through the training and skills development that it encourages. The 'One in a Million' scheme requires that contractors take on an apprentice for every £1m of their contract. This has created 105 Apprenticeships to date, with a target to create 200 Apprenticeships by the end of the programme in 2015. In addition, NCH staff are also supported through relevant training and qualifications. Since the start of the SWM programme in 2008, staff on the team have undertaken over 2,000 hours of training (an average of 56 hours per staff member) and completed over 400 training courses. This includes both internal and e-learning courses, as well as eight externally accredited qualifications. The total cost of this investment in training for the SWM team is around £33,000.

An accredited qualification is a signal of a higher level of skills of an individual, which is valued in the job market and reflected in higher earnings than those with lower or no formal qualifications. A number of studies have quantified this effect, measuring the increase in earnings of those with certain qualifications, and estimating a financial value resulting from increased earnings and employment opportunities over the working lifetime of that individual.

This is known as the Net Present Value (NPV) of that qualification, and reflects the social value (i.e., indicating the higher productivity of that individual and therefore increased contribution to the economy) of that qualification. By referring to a range of published reports,^{38 39} the relevant figures (where available) are shown in Table 5 for the qualifications completed by members of the SWM team.

38. London Economics (2010) Returns to BTEC vocational qualifications. EdExcel.

39. Jenkins et al. (2007) The Returns to Qualifications in England: Updating the Evidence Base on Level 2 and Level 3 Vocational Qualifications. London School of Economics.

Qualification	Number completed	Increase in earnings*	Social value (NPV) per qualification
NVQ Level 2	2	3%	Not available**
City & Guilds Level 2	2	9%	£24,000 to £35,000
City & Guilds Level 3	3	15%	£48,000 to £74,000
HNC Level 4	1	22%	Not available**
TOTAL	8		£192,000 to £292,000

Table 5: SWM staff accredited qualifications and social value

**Compared to lifetime earnings of others with only a Level 1 or 2 qualification*

*** The NPV of these qualifications was not reported in the relevant literature*

Similar figures are available to calculate the social value of the Apprenticeships completed through SWM. Research evidence shows that completing a Level 2 Apprenticeship increases a person's earnings by 16 per cent compared to an individual whose highest qualification is at Level 1 or 2; a Level 3 Apprenticeship increases potential lifetime earnings by 18 per cent. Apprenticeships in the construction industry have an even higher wage return, increasing earnings by 32 per cent. The Net Present Value (NPV) of a construction Apprenticeship (i.e., the future stream of benefits in terms of higher earnings, minus the cost of training) is around £157,000, while the NPV of a Business Administration Apprenticeship is lower, yet still positive, at around £57,000.⁴⁰ This indicates a significant benefit to both the individual (in terms of higher earnings) and the economy (indicating increased productivity) as a result of Apprenticeships, particularly in the construction industry.

Using these figures, the 105 Apprenticeships delivered under the 'One in a Million' programme have therefore generated a total social value of £12.9m over the future working lifetime of these apprentices.

Apprenticeship	Number completed	Increase in earnings*	Social value (NPV) per qualification
Construction	66	32%	£156,253
Business Administration	11	7%	£56,765
Customer Service	3	Not available	£31,928
Other Level 2	25	16%	£73,001
TOTAL	105		£12,875,742

Table 6: Social value of Apprenticeships completed through One in a Million

**Compared to lifetime earnings of others with a only Level 1 or 2 qualification*

40. McIntosh (2007) A Cost-Benefit Analysis of Apprenticeships and Other Vocational Qualifications. Department for Education and Skills Research Report 834.

Community legacy benefits

In order to create further legacy benefits from the SWM programme, an initiative was devised whereby contractor partners provided grants to fund three community projects. Following local advertising and short-listing of bids, a 'Dragons Den'-style event was held where the groups set out their plans for the grant to a panel made up of NCH and contractor representatives.

The following three projects were each awarded a grant of £5,000:

- **Pro-vision:** This is a not-for-profit organisation providing free clothes to homeless people, single parent families and people fleeing domestic violence. The grant will be used to open a second-hand shop in Sneinton where the public will be able to drop off any donations. It will also host workshops on CV and letter-writing skills, interview preparation and practical driving skills
- **Kings Meadows:** This community group will use the grant to open a soft play community cafe in the Meadows. The cafe will provide affordable healthy food and a safe environment for children to play, and the potential for training in hospitality and healthy eating. This will help contribute to bringing the community together
- **Aspley Park Football Club:** The grant will help the club to gain access to indoor facilities during the winter and to set up the 'mini-kickerz' project for local children (boys and girls from four to eight years old). The funding will also help to train adults to become football coaches, and to buy kits and equipment for future teams.

These projects will deliver a number of wider benefits to the community, and these will continue beyond the SWM programme.

It is beyond the scope of this report to measure in detail the long-term social impacts of these projects, although some of the relevant indicators of these outcomes (from the initial grant applications) include:

- Five employment/work experience opportunities;
- Eight formal training courses;
- Further training opportunities (including Apprenticeships), job-preparation coaching and work experience for volunteers, once up and running.

The community-based nature of each of these projects means that the impact of any spending and re-investing of revenue generated is likely to be concentrated locally.

Conclusions and recommendations

The Secure, Warm, Modern programme represents a significant investment in the local council housing stock, and this research has aimed to measure its wider social impact in terms of the effects on the local economy and employment.

The LM3 analysis shows that the overall score for SWM is at the lower end of the possible range of LM3 scores (the lowest possible score being £1 and the highest around £2.20). This is mainly due to the non-local nature of the majority of the main contractors, most of whom are part of a larger regional/national company.

Although the multiplier score is fairly low, the size of the spending on the SWM programme overall means that the multiplied effect on the local economy is significant. This also means that a small increase in the local multiplier score could bring considerable extra resources to the city. For example, if the current multiplier for Nottingham city of 1.36 were to continue for the remainder of the programme, this would generate an additional £37m spending within the city over this period (2011-15). However, if the multiplier were to increase by just 1p for every £1 spent to 1.37 (for example, by increasing spending with local sub-contractors by 5 percent), this would generate a further £1m spill-over into the city's economy for the remainder of the programme. This statistic demonstrates how small changes in procurement arrangements could make a large difference to Nottingham's economy.

The guiding principles in Nottingham's Commissioning Framework, produced by Nottingham City Council, states that supporting local employment and a thriving Third Sector, and stimulating local markets should be included in commissioning strategies, procurement plans, processes and sub-contracting arrangements within the context of compliance with procurement law. A common perception is that procurement law is a barrier to specifying 'local' suppliers, by contravening competition or EU law; however, there are a number of ways in which organisations are able to maximise local benefits without breaching procurement law.

A number of best practice examples have been developed to show how these principles may be supported in practice, for example, through social clauses in procurement and contracts.⁴¹ For example, the London Borough of Camden together with NEF developed a Sustainable Commissioning Model, in which potential contractors are asked to describe (and are scored on) how their activities and outputs will contribute towards specified service level and community outcomes as set out in the Sustainable Communities Strategy, including goals for local employment and skills.

NCH is committed to bringing maximum benefits to the local communities through the work it does, as demonstrated by the One in a Million programme targeting Apprenticeship opportunities for local people, particularly those who have been out of work. NCH works with BEST (Broxtowe Education, Skills and Training), a local social enterprise that finds ways of improving skills and employment opportunities for those living in and around the Broxtowe estate, to recruit Apprentices. NCH has also supported the development of BESTbuild, which employs local trades-people as jobbing contractors on building programmes and is now a Principle Contractor for NCH.

41. For examples, see www.procurementcupboard.org/Tools.aspx

The recommendations provide considerations for NCH: to build on existing initiatives and commitment to playing a positive role in the local economy and developing training and skills, and to develop a strategic approach to sustainable procurement that will maximise the potential positive impact of all future investment programmes.

Recommendation 1: Develop a sustainable procurement strategy and toolkit to embed social benefits into all purchasing and contracting arrangements.

Recommendation 2: Work with contractors and partners to maximise the positive impact of current and ongoing programmes.

Recommendation 3: Establish monitoring with contractors to identify the destination of apprentice leavers, as a first step towards supporting apprentices beyond the completion of their training.

Recommendation 4: Consider conducting a Local Multiplier 3 analysis on other sections of the company, such as repairs and maintenance, and housing support services.

The report has shown that the Secure, Warm, Modern programme has a significant positive effect on the local economy, employment and skills. It has also demonstrated how further benefits could be achieved through small changes to the supply chain, ensuring that the Decent Homes funding stays within, and has an exponential effect upon, the local economy. NCH is therefore able to contribute to the aims of Nottingham's Sustainable Communities Strategy by providing jobs and training to local people.

Crime and security



**Nottingham
City Homes**



Chapter summary

“Burglary of homes has historically been a problem in Nottingham which the city’s broad partnership of agencies with the CDP has sought to address. The quality of windows, doors and locks are a clear measure of the vulnerability of properties to burglary.

The study undertaken by the Knowledge Transfer Partnership between Nottingham City Homes and Nottingham Trent University has worked effectively in developing a report that will assist the wider partnership in pursuing our joint objectives and the CDP is very happy to support the project.

This study demonstrates the effectiveness of NCH’s Secure, Warm, Modern project in providing not only decent housing to their tenants but also contributing to lower levels of crime in Nottingham. The report, in indicating the higher than normal level of failed attempted burglaries, can point to individuals who have been protected from the traumatic experience of burglary as well as to the safer neighbourhoods that the work has contributed towards.

The recommendations of the report, namely that future work along this model should be undertaken, and evidence gathered on the effects of such projects to inform future work are welcome. Experimental studies which give practitioners a sound basis on which to make resourcing decisions are essential as we strive to target resources effectively to deal with local problems.”

Peter Moyes

Director of Nottingham Crime and Drugs Partnership

Introduction

Nottingham City Homes, in partnership with Nottingham Trent University, are conducting a two-year impact study on the wider social benefits of the Decent Homes programme (known in Nottingham as Secure, Warm, Modern). The first stage of the research was to conduct a pilot study, which aimed to evaluate the impact of installing secure windows and doors on burglary in NCH properties, and the impact on residents and surrounding communities. This report sets out the findings from data analysis and interviews with local tenants and front line officers.¹

The research focuses on the two estates of Bells Lane and Broxtowe, which were amongst the first estates to have an extensive programme of window replacement. All the new windows are double glazed and meet the Secured by Design (SBD) standard managed by the Association of Chief Police Officers (ACPO). The work programme took place in 2008/09, during which 1,520 properties had their windows replaced out of a total of 1,717 NCH properties on the two estates.

Key findings

Levels of crime, and particularly burglary, have in the past been high across Nottingham, and in the Bells Lane and Broxtowe area in particular. This area has seen higher burglary rates than the city average, and higher than similar areas (in terms of tenure type and demographic profile) within the city.

1. We would like to thank the Nottingham Crime and Drugs Partnership, in particular, Nick Rowe (Senior Partnership Intelligence Analyst), for supplying data and supporting analysis.

The analysis took the financial year 2007/08 as a benchmark, i.e. the year before the Secure programme of window replacement started in Bells Lane and Broxtowe. This was compared with figures from the financial year 2009/10 (the year following the completion of the programme).

The analysis found:

- Burglary was reduced by 42% across Bells Lane and Broxtowe, compared to a city wide reduction of 21% over the same period. This was also higher than the reduction seen in similar areas (in terms of tenure and demographic profile) in the city, of 38%. NCH properties experienced 62 fewer burglaries per year after the work was completed, compared to 33 fewer burglaries a year to non-NCH properties on the estates
- The proportion of burglaries via a window is lower for properties that have had the secure windows fitted. The major change is that the proportion of burglaries that successfully gain entry by forcing the window has halved – going from 30% of burglaries to NCH non-Secure² properties, to 15% of burglaries to NCH Secure properties
- There is a higher proportion of attempted burglaries (which do not successfully gain entry) for NCH Secure properties compared to NCH non-Secure properties, which indicates that there is therefore a lower success rate for burglaries against NCH Secure properties.

NCH's annual customer satisfaction survey indicates that tenants perceive burglary to be less of an issue since the Secure work was completed. Tenants also appear to be more satisfied with the general condition and overall quality of their homes. Overall satisfaction with their neighbourhood as a place to live has risen from 58% of tenants being fairly or very satisfied to 64% since the work was completed.

The tenants consulted as part of the research reported that they feel safer in their homes as a result of having the new windows fitted. Other benefits that are also widely reported by tenants are improvements in internal conditions of their home, which are now warmer and less prone to condensation and damp. Local tenants, Councillors and front line officers all felt that the work had improved the look of the estates, and that investment in the fabric of their homes makes the community feel valued.

The cost of the window replacement programme in Bells Lane and Broxtowe was just under £3.3m. It is estimated that the reduction in the number of burglaries has already resulted in a saving of £241,800 in one year,³ with further savings expected over the lifetime of the windows. This also does not include the expected financial benefits from improving thermal efficiency, for example from improvements to health and savings on fuel bills.

Conclusions

Burglary on the estates where Secure work has been carried out has reduced significantly since the windows have been replaced. The reduction has been above the city average, and slightly above the change seen in other similar estates. Within the estate, NCH properties have previously had much higher levels of burglary than non-NCH properties, but this difference has been reduced. The main difference is seen in relation to the point and method of entry; the data indicates that NCH properties are harder to access via a window, with fewer burglaries via a window, and lower proportion of successful forced entries via a window. This therefore suggests that the Secure work has successfully target-hardened the windows of NCH properties.

2. This includes properties that were burgled before the Secure work was completed and those where Secure work was not undertaken.

3. Based on Home Office estimations of the social and economic cost of a burglary.

Whilst the new SBD windows have clearly enhanced the security of the house, this research has shown that doors remain the most common point of entry, and therefore represent a significant weak spot in the house's overall security. Both tenants and local police support the widespread replacement of the existing wooden doors with the more secure PVC-u doors which the SWM programme has fitted to a number of properties. This is fully supported by NCH; whilst only those doors that are in need of replacement or repair are currently being replaced, the preference would be for a full door replacement programme if adequate resources were to be made available.

The replacement of the old single glazed windows with the double glazed SBD models has had a positive effect on tenants' perceptions of security within their home, particularly for those where safety was a significant concern. This is therefore likely to have a positive effect on the mental health of these tenants, with reduced concern about their home and personal security.

The impact on tenants of replacing the windows has been wider than just security, with a significant number of tenants emphasising the difference that the windows have made to internal conditions, particularly warmth and condensation. Tenants have stated that since the replacement of the windows, their homes have been warmer, and less drafty and damp. The programme has therefore made tenants more comfortable in their home, again potentially contributing to improved mental and physical health.

The Decent Homes investment has been an important part of the changes in the community that have facilitated a reduction in burglary in Bells Lane and Broxtowe. It is a part of a wider programme of partnership activities that have worked to improve the physical condition of the estates and security of properties, and also to engage the community in dealing with local crime issues. The investment in the community is a key part in changing attitudes towards their homes and neighbourhood, creating a sense of positive progression within the community. Key to this has been a strong partnership approach between local agencies, including NCH.

Recommendations

A number of recommendations have followed from the work on this pilot project:

1. To increase security further, a priority investment for any future resources that may be made available for further housing improvement should be the widespread replacement of the current wooden doors with secured by design PVC-u models
2. Evidence on the patterns and hotspots for burglary within neighbourhoods and across the city should be used to inform future investment decisions
3. Further work could be done to raise awareness that the new windows and doors meet the 'secured by design' standard, and what this means. This would help to enhance perceptions of security, and therefore improve tenant's emotional wellbeing
4. Insecurity in NCH properties as a result of behavioural factors (such as leaving windows/doors unsecured) could be addressed through joint awareness raising between police and NCH.
5. Further research should be undertaken to analyse the impact of Secure work undertaken in other areas during 2009/10, once a full year's data is available post intervention. This would enable comparison with other areas, including those that have received a more extensive programme of door replacement. Other areas for further research would be to measure more fully the wider impacts of fitting the new double glazed windows, such as the improvement in internal temperature and humidity, and the impact that this may have on things like health, environmental impact and fuel poverty.

Introduction

Nottingham City Homes, in partnership with Nottingham Trent University, are conducting a two-year impact study on the wider social benefits of the Decent Homes programme (known in Nottingham as Secure, Warm, Modern). The first stage of the research was to conduct a pilot study, from which learning could be applied to the rest of the research project. This investigated the impact of fitting secure windows and doors on crime in local areas, particularly burglary. The research focuses on the two estates of Bells Lane and Broxtowe, which were amongst the first estates to have an extensive programme of window replacement.

The Secure, Warm, Modern programme

Nottingham City Homes' Decent Homes programme is known as Secure, Warm, Modern (SWM). This reflects the priorities set by tenants in upgrading their homes to the Decent Homes standard, with security as a key concern.

The Secure stream of work focuses on replacing windows and doors:

- All existing single glazed windows and frames will be replaced with double glazed PVC-u frames
- Existing front and back doors will be replaced if they are old and in poor condition or need a lot of maintenance. The new replacement doors will either be a composite, or a PVC-u security door, door frame and ironmongery.

All new windows and doors meet the Secured by Design (SBD) standard managed by the Association of Chief Police Officers (ACPO). In addition, NCH is working with Nottinghamshire Police to protect homes using 'SmartWater' technology. These measures are known collectively as 'target hardening' measures.

The Secure work was carried out in Bells Lane and Broxtowe in 2008/09, and was one of the first areas to receive the Decent Homes work. The bulk of the work during that period was replacing single glazed windows with double glazed. During this period, 1,520 properties had their windows replaced out of a total of 1,717 NCH properties on the two estates. A map showing the estate boundaries where Secure work was completed is shown in Appendix A.

Crime in Nottingham

Overall crime in Nottingham has fallen significantly since 2003, and has continued to fall over the last two years with 27% less overall crime in 2009 compared to 2007. However, Nottingham has the third highest level of overall crime amongst its comparator group of similar Community Safety Partnerships (CSPs).⁴ Acquisitive crime had been high in the past, and in 2008/09 accounted for 19% of all crime, including burglary from a dwelling which accounts for 9% and is the third most common type of crime in Nottingham.

The comparatively high levels of crime in Nottingham have been linked to the socio-economic and demographic profile of the city. For instance, Nottingham is the 13th most deprived local authority in England,⁵ and there is an established relationship between deprivation and crime. For instance, the Nottingham Crime and Drugs Partnership's 2009/10 Strategic Assessment found that there is a correlation between deprivation and acquisitive crime (particularly burglary) at the ward level.

4. Information taken from the Crime and Drugs Partnership's 2009/10 Strategic Assessment

5. According to the 2007 national Indices of Multiple Deprivation

Low employment and educational attainment have also been shown to be correlated with crime levels, and Nottingham has the third lowest employment rate amongst the Core Cities, and educational attainment in Nottingham is considerably lower than the England average (2007). Finally, Nottingham also has a relatively young population, with almost 16% of the population aged from 20 to 24, compared to a national average of 6.7%. This represents the largest proportion of 20 to 24 year-olds amongst the Core Cities. This age group is the most likely to commit and also be a victim of crime.

Burglary has been particularly high in the Aspley ward (which the Bells Lane and Broxtowe estates are within). The bi-annual trend for burglaries across each of the wards in Nottingham City is shown in Figure 1 below (showing burglaries per 1000 households, to control for ward size), which shows that Aspley is amongst the wards with the highest number of burglaries across the city.

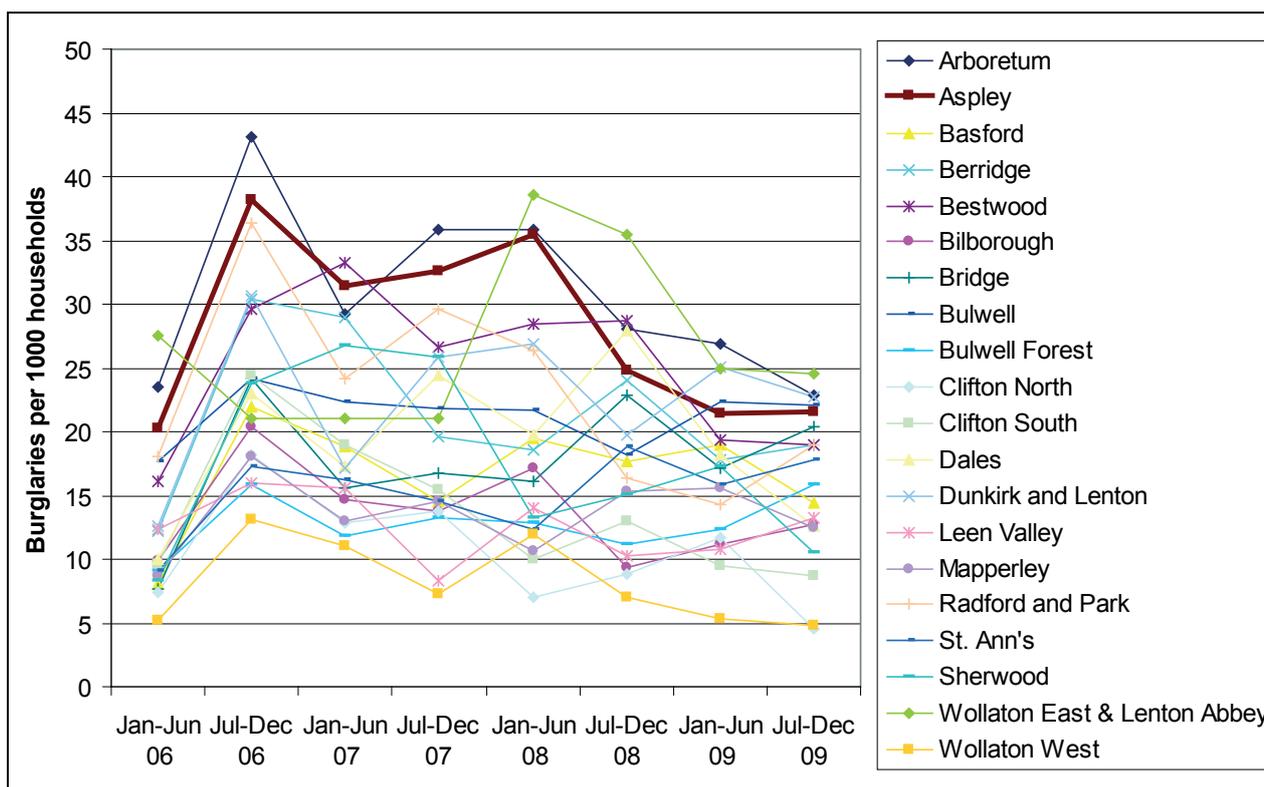


Figure 1: Bi-annual burglary figures for Nottingham City Wards, 2006-2009 (Source, Nottingham Insight database)

A number of operations have been undertaken by Nottinghamshire police and their partners in order to tackle crime in the city. The city's Crime and Drugs Partnership (CDP) brings together the police, local authorities, fire service and NHS primary care trusts in a partnership with other public, private and community organisations to take local action to reduce crime and the fear of crime. The CDP monitors and then produces strategies to address the problems identified. The CDP's objectives for 2008-11 include reducing crime, with a particular focus on violent crime, burglary, car crime and robbery (specifically to reduce 'serious acquisitive crime' by 37%), and reducing the fear of crime and disorder and improve feelings of safety within communities.

Burglary reduction has been tackled by the CDP in a number of ways. These have included: data analysis to produce Hotspot Maps to focus attention on areas with high burglary rates; Offender Management and profiling; the use of civil as well as criminal law to deter offender activities; and Target Hardening and SmartWater. The city has a Burglary Reduction Team which focuses on providing crime reduction advice, target hardening and SmartWater. In addition a General Offender Management (GOM) programme was introduced in Nottingham West (including Aspley Ward) in late 2008, which focused on tackling burglary, robbery and autocrime by working closely and monitoring known prolific offenders in the area.

There have also been a number of local initiatives within the Aspley ward. The Safer Neighbourhood Team consists of a number of beat officers (including PCs, PCSOs and CPOs) who work within each individual neighbourhood. This team is responsive to local needs and issues, for instance implementing operations to increase patrols and police visibility in problem areas, or at certain times. This is informed by monthly 'Local Action Group' meetings, which bring together local police officers with Councillors, housing officers and residents to discuss community issues and update on activities in the area. The ward also has a Neighbourhood Management Team, which brings together people and services to address issues on a neighbourhood level.

Aims and method

Aims

The aim of the pilot study was to evaluate the impact of installing secure windows and doors on crime in NCH houses, and therefore the impact on residents and surrounding communities.

Areas for consideration within the study included:

- What has been the impact on housebreaking crime, including burglary and attempted burglary?
- Has displacement of crime occurred, either to other access points within a house, or to other non-target hardened houses or areas, or to other types of acquisitive crime?
- How has this affected residents' satisfaction with the area where they live, including fear of crime or perceptions of safety?
- What has been the cost effect of any changes? e.g. responsive repairs costs for NCH, costs of burglary on tenants, costs for police.

Method

The first part of the method was to conduct statistical analysis on burglary data supplied by the Nottingham Crime and Drugs Partnership (CDP). As the Secure work was completed during the financial year of 2008/09, the analysis focused on comparing data from the financial year before the work started (i.e. March 2007 to April 2008) with figures from the financial year after the work was completed (March 2009 to April 2010).

Various groups were created to enable comparison of crime trends over this period:

- Intervention area: Looking at the whole area within the two estate boundaries of Bells Lane and Broxtowe. This includes 1,713 NCH properties, the majority of which received Secure work during 2008-09, and 1,337 non-NCH properties⁶
- Nottingham city: Comparison of crime levels and trends in the intervention area and overall city-wide trends
- Comparator groups:
 - a. Estate comparators – areas with a similar profile (e.g. property types and demographics), where SWM work hasn't been carried out
 - b. Within estate comparators – comparing NCH properties which have received Secure work, with NCH houses which haven't had Secure work and non-NCH houses within the estates where SWM work has been carried out.

The analysis compared the trends in burglaries over the period between the various groups. As well as overall burglary levels, the data allowed a comparison of the point and method of entry for burglaries, between properties that have received Secure work and those that haven't, within the same estates.

The aim of the data analysis was to examine any changes in trends before and after the Secure work was completed, and to measure whether any changes were significantly different for those homes or areas that received the Secure work.

Secondly, analysis was conducted on the results of the annual customer satisfaction (STATUS) survey, conducted by NCH across a sample of all of its tenants. The results were broken down to the ward level by year, and certain questions were examined for any changes over the period before and after the Secure work was completed. This explored aspects such as perceptions of safety in the home, satisfaction with area and with NCH as a landlord.

6. Figures calculated using NCH records of properties within the estates and data from the 2001 census on the total number of households at the lower super output area (LSOA) level; i.e. the number of non-NCH properties was calculated by subtracting the number of NCH properties from the total number of households in the census.

Finally, the last part of the method was to carry out qualitative research with residents and frontline officers and staff in the estates where the work was carried out.

This included:

- A short telephone survey with tenants on the estates
- A discussion group with NCH staff and representatives of local Tenant and Resident Associations
- Attendance at local meetings, such as Local Action Group meeting and an Over-50's Lunch Club
- Interviews with front line officers in the area, including the Police Chief Inspector during that period, the local Police Beat Manager and Police Community Support Officer (PCSO), and NCH Housing Patch Manager.

The aim of the qualitative research was to understand the impact of the work on local residents and communities, looking at the impact on their quality of life and general satisfaction, and to understand the context of the changes on the estates over the period under review.

Data analysis findings

Before-after comparison in Bells Lane and Broxtowe

In the year before the Secure work started (April 2007 – March 2008) there were 227 burglaries in Bells Lane and Broxtowe, equivalent to 7% of the households in the area being burgled during this year. In the year after the work was completed (April 2009 – March 2010) there were 132 burglaries, equivalent to 4% of the households in the area being burgled.

This shows that there was a 42% reduction in the number of burglaries in Bells Lane and Broxtowe as a whole. This is a significant reduction in the number of burglaries over this period (significant at 95% confidence level, $p=0.000$ two-proportions test).

	Before: 2007-08	During: 2008-09	After: 2009-10
Number of burglaries	227	168	132
Proportion of properties burgled	7%	6%	4%

Table 1: Trend in burglaries in intervention area (Source, CDP)

City wide trends

Across Nottingham city as a whole during this period, the total number of burglaries was reduced from 4,631 burglaries in 2007 (4% of all households) to 3,639 burglaries in 2009⁷ (3% of all households). This represents a 21% reduction in the number of burglaries across the city over this period. This shows that the reduction in burglaries in the intervention area over the period was significantly bigger than the overall reduction in burglaries across the city as a whole.

7. N.b. Due to data availability, overall burglary numbers for Nottingham are by calendar year rather than financial year.

Comparator areas

A number of areas were chosen as comparators to the Bells Lane and Broxtowe estates, in order to establish 'constructed control groups', i.e. matching groups to the intervention area in terms of characteristics, but which haven't received Secure work. The areas were selected by isolating those with appropriate characteristics; firstly, the comparator areas were NCH estates, or included a number of NCH properties within the boundary. Secondly, only those estates that had not received any Secure work to date were selected. This limited the choice of comparator areas, as the Secure programme of work has been a primary focus for NCH and work has been carried out across much the city in 2008/09 and 2009/10. Finally, of those estates remaining, four were chosen which had a similar socio-economic profile to the intervention area.⁸ The chosen intervention areas were Edwards Lane estate, Old Highbury Vale estate, Southwold estate and Balloon Woods police beat area. These areas are shown on the map in **Appendix A**.

Across these four areas, there were a total of 119 burglaries in 2007-08, equivalent to 4% of properties in the area being burgled. In 2009-10 there were 74 burglaries, equivalent to 2% of properties being burgled. This represents a 38% reduction in total burglaries in the comparator areas over the time period. This is a slightly smaller percentage reduction than the reduction in the intervention area (42%).

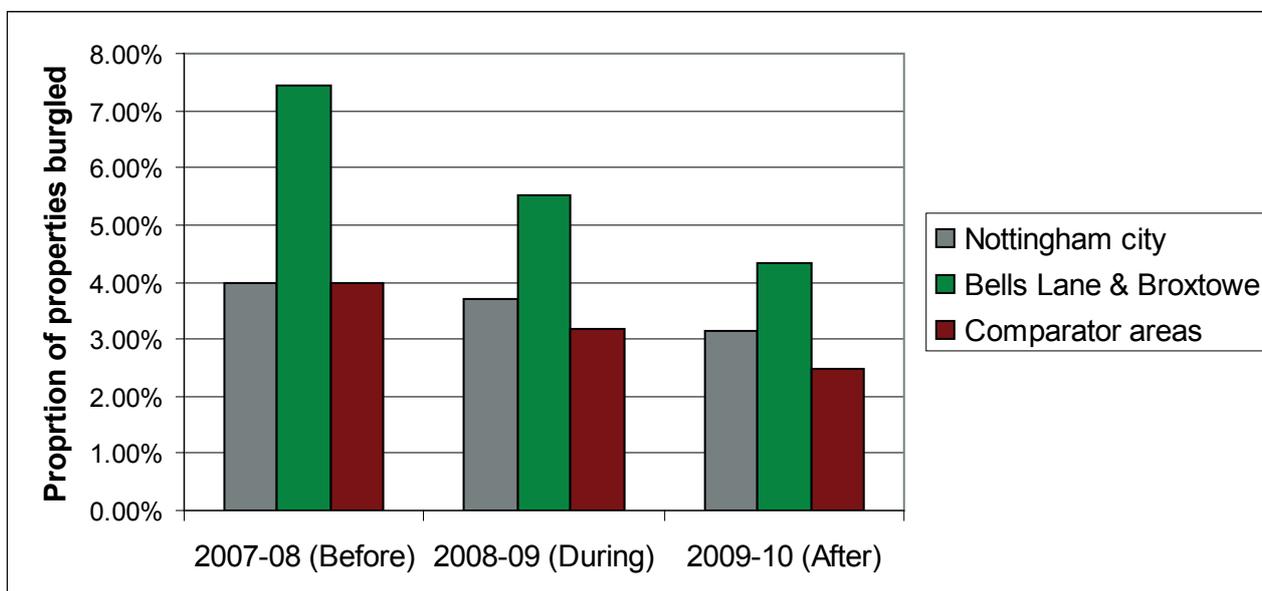


Figure 2: Proportion of properties burgled for Nottingham city, Bells Lane & Broxtowe, and comparator areas (Source, CDP)

8. This comparison was made using Experian's Mosaic Public Sector tool, which draws on over 400 data elements to create a classification system, defining groups by their location, demographics, lifestyles and behaviours. The most dominant profile in Broxtowe and Bells Lane (and therefore comparator areas) is Group G: Municipal Dependency.

Within estate comparison

Within the Bells Lane and Broxtowe estates there are 1,717 NCH properties and 1,333 non-NCH properties. Therefore 56% of properties in the area are NCH properties (i.e. rented from Nottingham City Council, and managed by NCH). Non-NCH properties make up the rest of the area, and (according to the 2001 census) consist of 33% owner-occupied, 6% rented from Registered Housing Providers and other organisations, and 5% rented from private landlords.

However, further information is not available on the property type and standard of the non-NCH properties. For instance, there is no information on the types of windows and doors in these properties and therefore how secure the properties are by comparison.

Details of the number of burglaries to NCH and non-NCH properties in Bells Lane and Broxtowe are set out in Figure 3 below. This also shows the percentage of NCH and non-NCH properties that were burgled (above each bar).

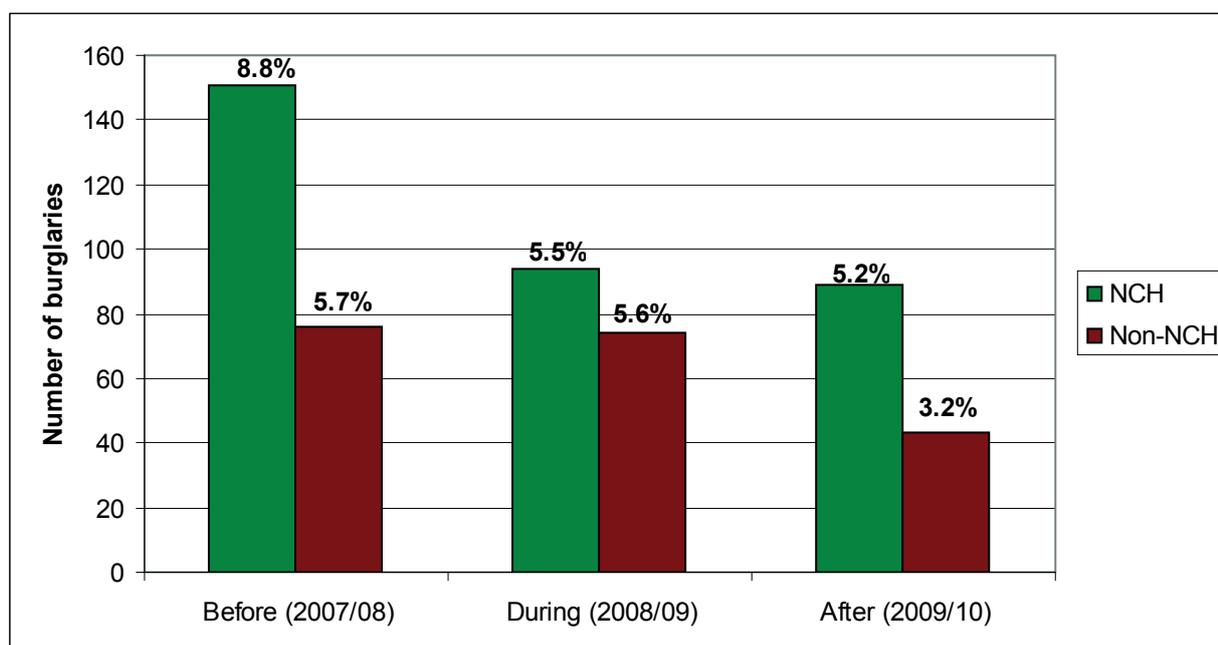


Figure 3: Burglary trends for NCH and non-NCH properties in Bells Lane & Broxtowe (Source, CDP)

As shown in Figure 3, before the Secure work took place NCH properties had a higher level of burglaries than non-NCH properties (8.8% of NCH properties experiencing burglaries, compared to 5.7% of non-NCH properties). Since the work was completed, both NCH and non-NCH have experienced a significant reduction in burglaries, but NCH properties have seen a bigger reduction in the number of burglaries, with 62 fewer burglaries per year after the work was completed compared to 33 fewer burglaries to non-NCH properties per year. The Secure programme therefore appears to have reduced the difference between the proportion of NCH and non-NCH properties that are burgled.

Point and method of entry

The type of burglary was explored using data on whether the burglary was attempted or successful, the point of entry (window, door or other/ unknown) and method of entry (forced, non-forced⁹ or other/unknown) for each burglary.

This data was collated for the total period from April 2007 to March 2010 for the Bells Lane and Broxtowe estates, and the factors were then compared for the types of burglaries to:

- NCH properties before the Secure work was completed, or that didn't have Secure work (NCH non-Secure)
- NCH properties since the Secure work was completed (NCH Secure)
- Non-NCH properties.

This analysis showed that doors are the most common point of entry for all categories of property, accounting for 58% of all burglaries (attempted and actual) during this period. There is some variation in the point of entry between the types of properties. Looking at burglaries to NCH non-Secure properties, doors and windows were fairly equally targeted as a point of entry, with 49% of burglaries to NCH non-Secure properties via a door, and 42% via a window. Comparing this to NCH Secure properties, 59% of burglaries to these properties were via a door, and 32% were via a window. This shows that a lower proportion of actual or attempted burglaries have been via a window since the new secure windows were fitted to NCH properties.

Point of entry	Method of entry	NCH Secure		NCH non-Secure		Non-NCH	
Door	Forced	34	28%	61	29%	86	45%
	Non-forced	14	11%	21	10%	23	12%
	Unknown	1	1%	1	0%	1	1%
	Attempt	23	19%	21	10%	19	10%
	Door total	72	59%	104	49%	129	67%
Window	Forced	18	15%	63	30%	34	18%
	Non-forced	10	8%	18	8%	4	2%
	Unknown	3	2%	0	0%	0	0%
	Attempt	8	7%	8	4%	9	5%
	Window total	39	32%	89	42%	47	24%
Other	Forced	1	1%	0	0%	6	3%
	Non-forced	0	0%	0	0%	1	1%
	Unknown	4	3%	9	4%	6	3%
	Attempt	6	5%	10	5%	4	2%
	Other total	11	9%	19	9%	17	9%
TOTAL		122	100 %	212	100 %	193	100 %

9. This included burglaries where the property was left unsecured, where the burglar used distraction or bogus official techniques to gain entry, or where a key or duplicate was used i.e. includes all methods where the physical security of the window or door was not challenged.

The proportion of burglaries that are successful, as opposed to those that are attempted but do not gain entry, also differs between the property types. NCH Secure properties have the lowest success rate, with 70% of all attempts at burglary gaining entry, followed by NCH non-Secure properties at 82% and finally non-NCH properties at 83%. There is therefore a higher proportion of attempted burglaries that are not successful to NCH Secure properties than to NCH non-Secure and non-NCH properties.

Focusing in on the window as the point of entry, there are also differences in the method of entry between the types of property in the area. For burglaries to NCH non-Secure properties, 30% were achieved by forcing a window. However, for burglaries to NCH Secure properties, only 15% were by forcing a window. This is also lower than for non-NCH properties, for which 18% of burglaries were by forcing a window. Meanwhile the proportion of attempted burglaries via window is highest for NCH Secure properties, accounting for 7% of burglaries to these properties; compared to 4% of attempted burglaries via a window to NCH non-Secure properties. This indicates a lower proportion of successful burglaries via a window to NCH Secure properties.

Non-forced entry via a window, which is mainly accounted for by the window being left unsecured, is the same for NCH properties, both Secure and non-Secure (8% of burglaries for both), but is lower for non-NCH properties at 2% of burglaries to this type of property. This may be indicative of different security behaviours between NCH tenants and non-NCH tenants (mostly owner occupiers) in Bells Lane and Broxtowe.

This information is displayed in Figure 4, which shows the point of entry, broken down by method of entry (attempted, forced, non-forced or other) as a proportion of total burglaries to each type of property.

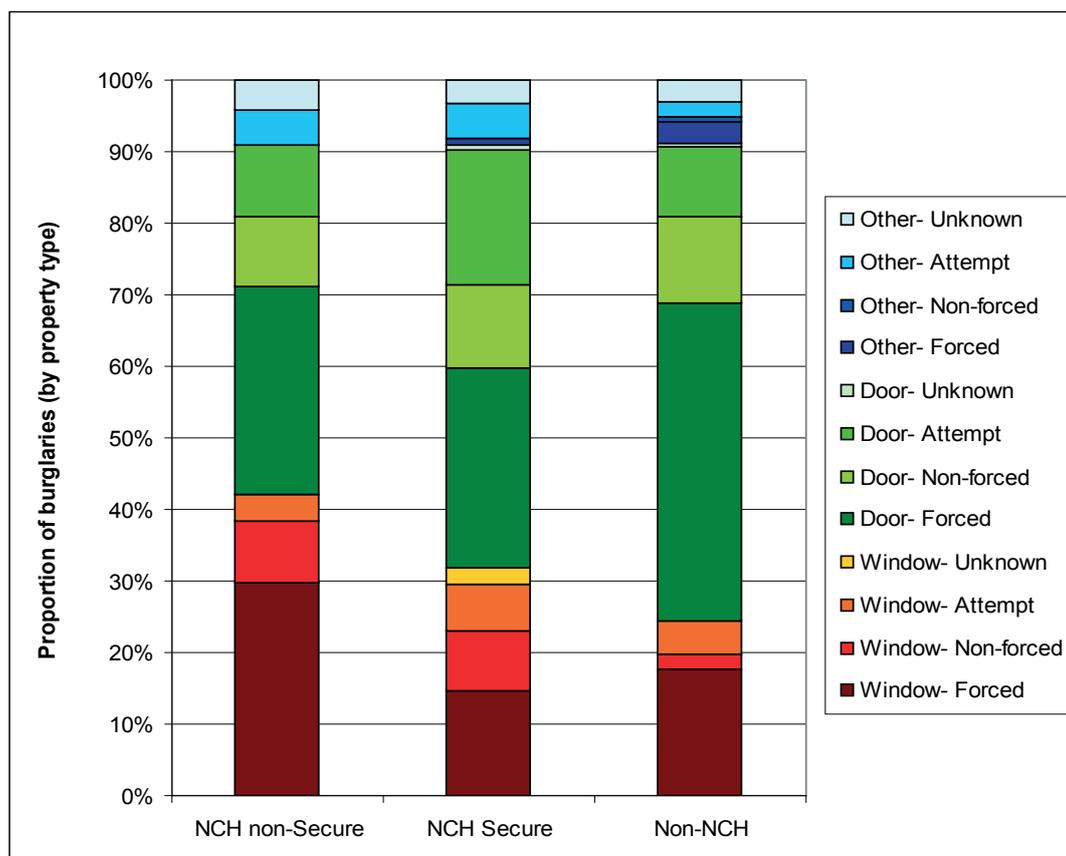


Figure 4: Point and method of entry for properties in Bells Lane and Broxtowe (Source, CDP)

Other types of crime

Another aspect that the research aimed to investigate was whether, if burglary was reduced, there was a displacement effect towards other types of crime. A potential alternative type of acquisitive crime other than burglary to a dwelling could include vehicle crime, which encompasses theft of a vehicle and theft from a vehicle. Looking at the trends in vehicle crime in Bells Lane and Broxtowe, and Nottingham city as a whole, there has been a reduction in the number of vehicle crimes over the period from 2007 to the end of 2009¹⁰ (see Figure 5).

The level of vehicle crime in Bells Lane and Broxtowe has decreased since the Secure work started in the area (Q2 2008), and has continued to decrease since. This is broadly in line with patterns across the city, which shows a steady decrease over the same time period. If displacement of crime from domestic burglary to vehicle crime had occurred, the opposite effect would be expected (i.e. a rise following the installation of secure windows); therefore there does not seem to be any evidence of displacement of crime in this direction. This may be as a result of the General Offender Management programme operating over this period, which focused on monitoring known prolific autocrime offenders, and therefore making vehicle crime a more risky and less attractive option and discouraging offenders.

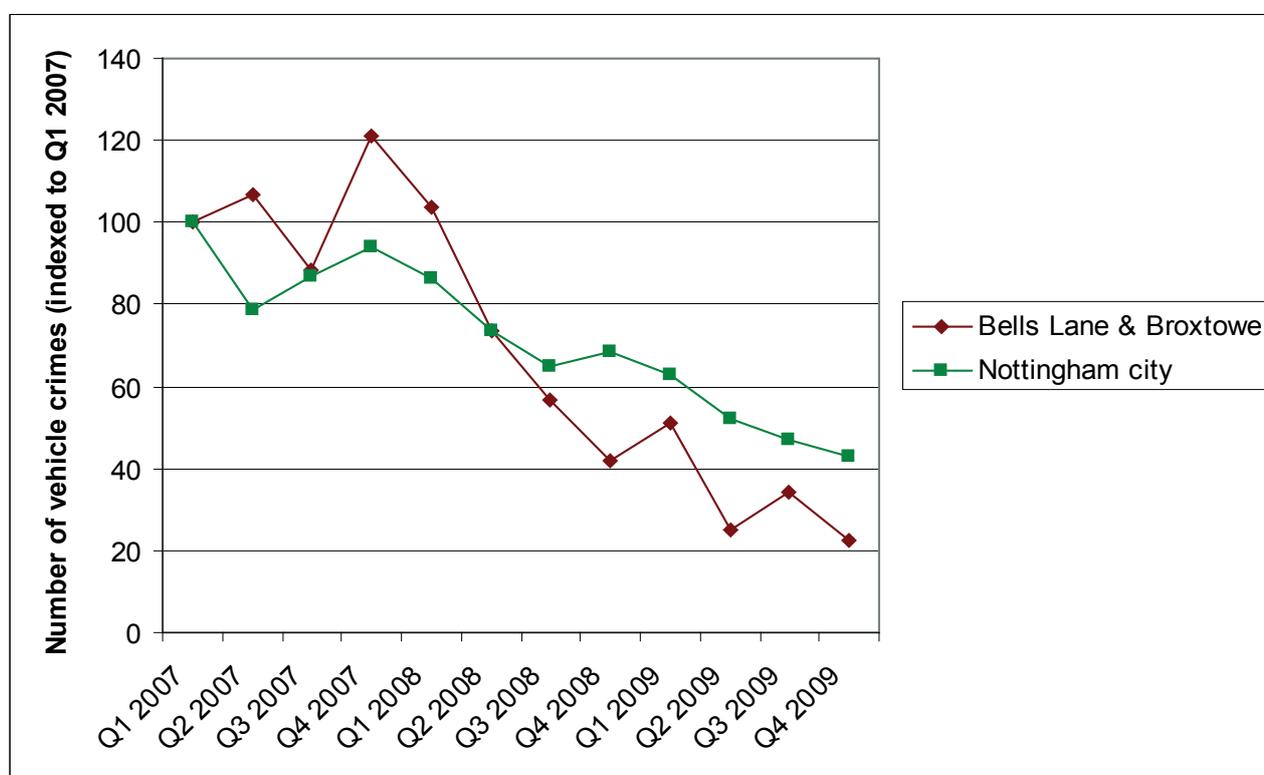


Figure 5: Vehicle crimes in Bells Lane & Broxtowe and Nottingham city (Source, Nottingham Insight database)

10. Note that the number of crimes has been indexed to Q1 of 2002 (April-July 2007) at 100, so as to be able to compare the trends in burglary in the area and across the city as a whole since this start date.

Findings from local residents and officers

Customer satisfaction surveys

The following information is taken from NCH's annual Standardised Tenant Satisfaction Survey (STATUS).¹¹ This provides information on tenants' satisfaction with the services they are receiving and the house and area where they live, from a sample of tenants across the city. The lowest level at which the data is available is at ward level, and therefore the data is filtered for the Aspley ward, which the Bells Lane and Broxtowe estates sit within.¹² The 'before' benchmark is taken as the 2008 survey, which was completed in June 2008. Although this is part way into the delivery period of the Secure work, only 10% of the properties in the area had been completed by this date. A comparison is then made with the 2009 survey, completed in August 2009 (five months after the Secure work was completed in the area).

When asked about problems in their neighbourhood, 46% of the Aspley tenants surveyed in 2008 said that burglary/theft was a 'very' or 'fairly' big problem. By 2009, the proportion of tenants that thought this had decreased to 37%. Also the proportion of tenants who were 'very' or 'fairly' satisfied with their area as a place to live rose from 58% to 64% between 2008 and 2009.

Tenants were also asked about their satisfaction with their home. In 2008, 63% of Aspley tenants were 'very' or 'fairly' satisfied with the general condition of their property; by 2009, 72% of tenants thought this. When asked about the overall quality of their home, 65% were 'very' or 'fairly' satisfied in 2008, compared to 73% in 2009.

This gives indicative evidence to suggest that over the period since the Secure work has been completed, tenants in Aspley feel there has been a decrease in crime, and are more satisfied with the area they live in. They are also more satisfied with the general condition and overall quality of their home.

Tenant surveys and discussion groups

A sample of streets was selected from the Bells Lane and Broxtowe estates, and all tenants on these streets who have had their windows replaced were contacted by phone to complete a short survey. Of the 157 tenants sampled, 25 responded to the survey. Views from tenants were also collected at various local meetings, including a discussion group with tenants and representatives of the Tenant and Residents' Association, a Local Action Group meeting and an Over 50's Lunch Club meeting.

Tenants were asked about their perceptions of safety and security, and their satisfaction with their home and neighbourhood. For each question they were asked to think about how they felt before the windows were replaced, and how they felt now. They were also given the opportunity to express their views about if and how the window replacement had made a difference to them more generally. Finally, they were asked whether they were aware that the windows met the Secured by Design standard, and what this meant.

11. The survey follows a national format, as set out by the requirements of the Tenant Services Authority (TSA) and Department for Communities and Local Government (CLG).
12. Properties on Bells Lane and Broxtowe estates account for 54% of NCH properties within the Aspley ward. The remaining properties within the ward underwent a window replacement programme in 2009/10.

Tenants' perceptions on whether burglary was an issue in the neighbourhood varied; with around a third of those surveyed stating that it was a 'fairly' or 'very' big problem, whilst another third stated that they felt it 'wasn't a problem at all'. Around a third of respondents felt that burglary had gone down over the last few years, compared to a fifth who thought it had stayed the same, and only two respondents who felt it had gone up.

When asked about how safe they felt in their home alone during the night before the windows were replaced, around a third of respondents said that they felt a bit or very unsafe.

A number of tenants commented that they felt that the old single-glazed windows were not robust or secure, with several tenants expressing similar views as captured by one tenant:
"with the other windows, you could just pull them out"

Since the windows were replaced with the new double glazed units, all the tenants who had stated that they felt unsafe with the old windows indicated that they felt safe now that the windows have been replaced. A number commented that they "feel safer" or "more secure" now.

Comments included:

"I feel a lot safer and warmer. The deadlocks make me feel very safe"
"[The windows] are very important- makes you feel safer"

There were more tenants who weren't aware that the windows met the 'Secured by Design' standard, and what this meant, than those who were aware. Despite this, a number of those who were unaware that the windows were SBD did feel safer after they were fitted. Those who were aware that the windows were SBD felt safe or safer since the windows were fitted.

A number of tenants felt more satisfied with the general condition and overall quality of their home since the windows had been replaced. For several, this was due to the improvement in the internal conditions of their home that the replacement of the windows had made, regarding condensation and damp, cold and drafts, and noise. Comments about the conditions in the home prior to the replacement of the windows included that generally the house felt "ready for a facelift".

The issue of condensation forming on the old windows was raised several times, with tenants stating that:

"The other windows used to have condensation running down them"
"It used to be wet all the time and damp"
"The condensation made you feel the house was dirty".

Tenants also reported feeling cold with the old windows. Tenants at the discussion groups stated the old windows were very drafty, and that the house was hard to keep warm. One tenant found that they could not afford to keep the heating on, because the monthly fuel bills cost over a week's pension.

Comments from the surveys included:

"Previously you could see gaps around the window"
"Before the house was cold"

These themes were mentioned further by tenants when asked an open ended question about the difference the replacement of the windows with new double glazed windows had made to them. Several felt that they were “happier with my home” as a result of the improvements they had seen.

These included:

“Before the house was cold, now it’s warmer”

“It’s made a difference because it’s warmer, probably the heating bills will go down after a bit”

“We can have ventilation without having the windows open.”

“Don’t get condensation – did before”

“Quieter, much quieter”.

The improvements extended to the neighbourhood as a whole, with several tenants stating that they felt it made the neighbourhood look better, as a result of the new windows.

Comments included:

“The estate looks better than it did”

“Looks a lot nicer, better. Looks cleaner”

“I’ve heard remarks, look at our lovely windows now. I walk around the estates, and they do look much much better. And sometimes you don’t know if they’re privately owned or NCH owned – and that’s good for the areas.”

However, an issue raised by several tenants was their concern about their doors. Several recommended that the most important next step in reducing burglary is to replace all the doors. Tenants felt that the traditional wooden doors in place in most properties are not secure, and are an easy target for housebreakers.

Feedback from tenants therefore suggests that for some, the importance of the new windows is the improvement in security that they bring; whilst for others, the emphasis is on the difference it has made inside the house, particularly warmth.

Front line officer interviews

Interviews were conducted with officers working closely with the local neighbourhoods of Bells Lane and Broxtowe, including the local Police Constable (PC) and Police Community Support Officer (PCSO), and the NCH Housing Patch Manager.

This provided additional context to the changes seen on the two estates over the last three years. The Housing Patch Manager explained that the area has traditionally had a reputation for having high crime and burglary rates; however the police confirmed that these have been falling over the last few years, reflecting the pattern across the city.

This has been achieved through strong multi-agency working, for example between NCH, police, Nottingham City Council, caretakers and local Councillors. This was identified as a major strength and factor for change within the area, as agencies worked together to address shared priorities. This is embedded at a strategic and operational level. For example, the 'Street Scene' initiative in the area has been working to address anti-social behaviour and drug issues, which has involved both NCH officers working with tenants and local police officers. The police have carried out operations to improve their visibility, including more time for PCSOs on the streets in the area. The monthly Local Action Group meetings provide an opportunity for the police, residents and local Councillors to raise issues and be updated on progress and action in the area.

Local NCH offices are concentrating on improving the look of the estate, to bring it up to a 'two star' estate standard.¹³ This is being achieved through the Secure, Warm, Modern programme and other environmental improvements by NCH, by working with caretakers in the area, and also with local Councillors who conduct regular 'ward walks'. From this, Councillors have provided feedback to NCH, saying that improvements to the properties from the SWM work, including the new windows, doors and fences, have improved the look of the area.

This view was supported by the police, who felt that the area looks visibly cleaner, which should have an impact on crime and anti-social behaviour as a result of the 'broken windows' theory.¹⁴ This is the idea that if an area looks better, people are less likely to commit minor crimes and anti-social behaviour, which may then lead to a reduction in more significant crimes. The PSCO reported that they had seen cases of families who since the work has been done on their homes, now take significantly more care of their properties and have more pride in their homes. The investment in the fabric of their homes creates a feeling that the community is valued. Local police have noted a change in the community consensus, so that it is no longer acceptable to commit crimes against others within the community; and this has resulted in a lot more information being provided to the police and closer integration between the police and the community in addressing crime.

However, concerns were raised about the door replacement programme, which currently only replaces doors if they are damaged or in need of major repair. The police find that the most common point of entry they encounter is via a door, and that local burglars know that the traditional wooden doors can be easily forced. They therefore expect that where doors are being replaced with new PVC-u doors, this will have a significant effect on the number of burglaries.

Overall, there was a consensus amongst the front line officers that attitudes were changing in the estate, as a result of the various interventions. The windows replacement programme is seen as a contributing factor, as one of the initiatives that has contributed to improving the standard of the area.

13. Star ratings are awarded through regular estate inspections, carried out by Tenant Inspectors. Star ratings are scored between one and three.

14. G. Kelling and C. Cole 'Fixing Broken Windows: Restoring Order and Reducing Crime in our Communities' 1996

Conclusions and recommendations

Impact of the 'Secure' work

Security is a key concern of NCH tenants, as evidenced by their prioritisation of the 'Secure' stream of work during the consultation for the Decent Homes programme. Levels of crime, and particularly burglary, have in the past been high across the city, and in the Bells Lane and Broxtowe area in particular. This area has seen higher burglary rates than the city average, and higher than similar areas (in terms of tenure type and demographic profile) within the city.

However, since 2007 there has been a decrease in the number of burglaries across the city, and notably in Bells Lane and Broxtowe. Burglaries have reduced by 42% in these estates between 2007/08 and 2009/10, compared to a 21% decrease across the city. This is also higher than the reduction seen in the comparator areas of 38%. The proportion of NCH households burgled in Bells Lane and Broxtowe has decreased from 9% to 5%, with 62 fewer burglaries to NCH tenants a year since the Secure work took place.

Consultation with local front line officers and tenants provides the context to this dramatic decrease. Clearly much effort from a number of agencies and initiatives has gone into improving the estates, of which the Secure, Warm, Modern programme is one. Police operations have increased visibility of officers within the area, with PCSOs now closely involved in local communities and dealing with crime in the neighbourhood. At the same time, investment in the estate environment (including the windows) has improved the standard of the estate, contributing to a change in the community whereby anti-social behaviour and crime are less acceptable.

The evidence from the data analysis also points towards improved target hardening as a result of the installation of the new Secured by Design windows in Bells Lane and Broxtowe. This shows that for NCH properties that were burgled before the SBD windows were fitted, 42% of burglaries were via a window, compared to 32% of burglaries to NCH properties after the installation of the SBD windows. Significantly, within this the number of successful forced entries (i.e. excluding cases where the windows were left insecure) via a window has halved, from 30% for NCH non-Secure properties to 15% for Secure NCH properties. Meanwhile the proportion of attempts that failed to gain entry has risen from 4% of burglaries to NCH non-Secure properties, to 7% of burglaries for NCH Secure properties. This indicates that burglars have been less successful in gaining entry by forcing a window with the new SBD windows in NCH properties.

Whilst the new SBD windows have clearly enhanced the security of the house, this research has shown that doors remain the most common point of entry, and therefore represent a significant weak spot in the house's overall security. Both tenants and local police support the widespread replacement of the existing wooden doors with the more secure PVC-u doors which the SWM programme has fitted to a number of properties. This is fully supported by NCH; whilst only those doors that are in need of replacement or repair are currently being replaced, the preference would be for a full door replacement programme if adequate resources were to be made available.

Whilst the new SBD windows have clearly enhanced the security of the house, this research has shown that doors remain the most common point of entry, and therefore represent a significant weak spot in the house's overall security. Both tenants and local police support the widespread replacement of the existing wooden doors with the more secure PVC-u doors which the SWM programme has fitted to a number of properties. This is fully supported by NCH; whilst only those doors that are in need of replacement or repair are currently being replaced, the preference would be for a full door replacement programme if adequate resources were to be made available.

The replacement of the old single glazed windows with the double glazed SBD models has had a positive effect on tenants' perceptions of security within their home, particularly for those where safety was a significant concern. This is therefore likely to have a positive effect on the mental health of these tenants, with reduced concern about their home and personal security.

However the impact on tenants of replacing the windows has been wider than just security, with a significant number of tenants emphasising the difference that the windows have made to internal conditions, particularly warmth and condensation. Tenants have stated that since the replacement of the windows, their homes have been warmer, and less drafty and damp. The programme has therefore made tenants more comfortable in their home, again potentially contributing to improved mental and physical health.

Cost-benefit comparison

The cost of the windows replacement programme for Bells Lane and Broxtowe was just under £3.3m. The findings above indicate that the Decent Homes investment in has contributed to a number of beneficial outcomes.

These outcomes and the beneficial impact include:

- 62 fewer burglaries per year to NCH properties, leading to reduced police costs and lower repair costs for NCH
- Improvement in tenant's perceptions of safety and security, leading to better mental health and potentially lower costs for the health service
- Improvements in internal conditions of home (warmth, ventilation, condensation) and increased satisfaction with standard of property, leading to better mental and physical health, therefore potentially lower costs for the health service.

The comparison of the costs and benefits requires a financial measure to be estimated for the beneficial outcomes. Figures from the Home Office from 2003/04¹⁵ estimated the social and economic cost of a burglary to be £3,268; this includes an estimation of the value of property stolen and cost of damage, emotional and health impact on the victim and health service costs, lost output, and costs to the criminal justice system. Using this figure in 2010 prices, the reduction in the number of burglaries to NCH properties has resulted in a saving of £241,800. Further savings can be expected as the new windows continue to prevent burglaries occurring over the lifetime of the windows.

Also, the overall financial impact of the window replacement programme is likely to be higher, as this does not include the savings that would be generated by improved thermal efficiency and its knock on effect on health.

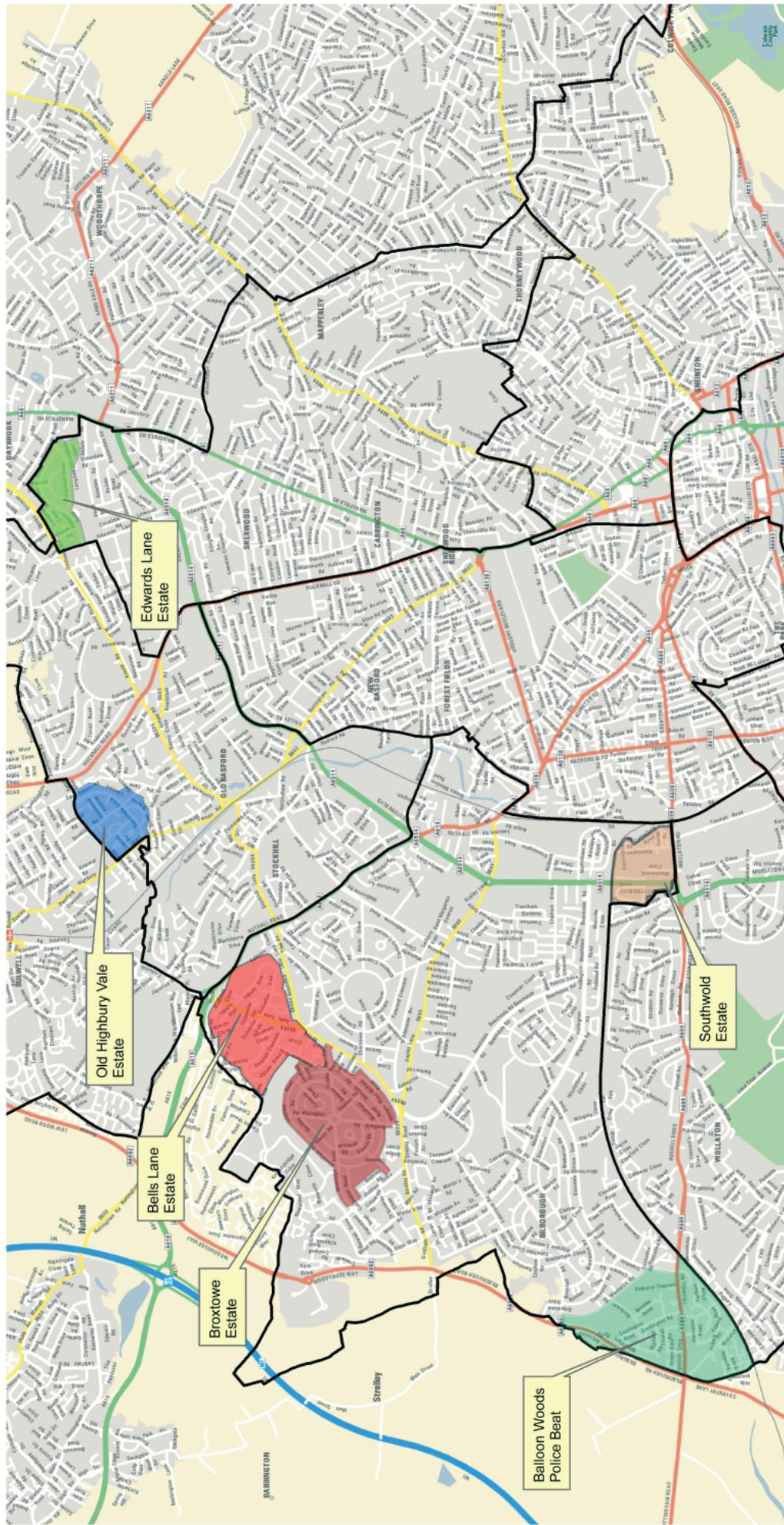
15. Home Office 'The Economic and Social Costs of Crime against Individuals and Households 2003/04'

Recommendations

A number of recommendations have followed from the work on this project:

1. To increase security further, a priority investment for any future resources that may be made available for further housing improvement should be the widespread replacement of the current wooden doors with secured by design PVC-u models.
2. Evidence on the patterns and hotspots for burglary within neighbourhoods and across the city should be used to inform future investment decisions. As an example, a map of burglaries that have occurred via a door between 2007-2010 in the Aspley ward is included in Appendix B, which could be used to pinpoint priority areas to focus a door replacement programme.
3. Further work could be done to raise awareness that the new windows and doors meet the Secured by Design standard, and what this means. This would help to enhance perceptions of security, and therefore improve tenant's emotional wellbeing.
4. Insecurity in NCH properties as a result of behavioural factors (such as leaving windows/doors unsecured) could be addressed through joint awareness raising between police and NCH, for example by sharing burglary hotspot information with tenants through NCH newsletters.
5. Further research should be undertaken to analyse the impact of Secure work undertaken in other areas during 2009/10, once a full year's data is available post intervention. This would enable comparison with other areas, including those that have received a more extensive programme of door replacement. Other areas for further research would be to measure more fully the wider impacts of fitting the new double glazed windows, such as the improvement in internal temperature and humidity, and the impact that this may have on things like health, environmental impact and fuel poverty.

Appendix A: Map of intervention and comparison areas



Title: Intervention & Comparison Areas

□ Area Committees

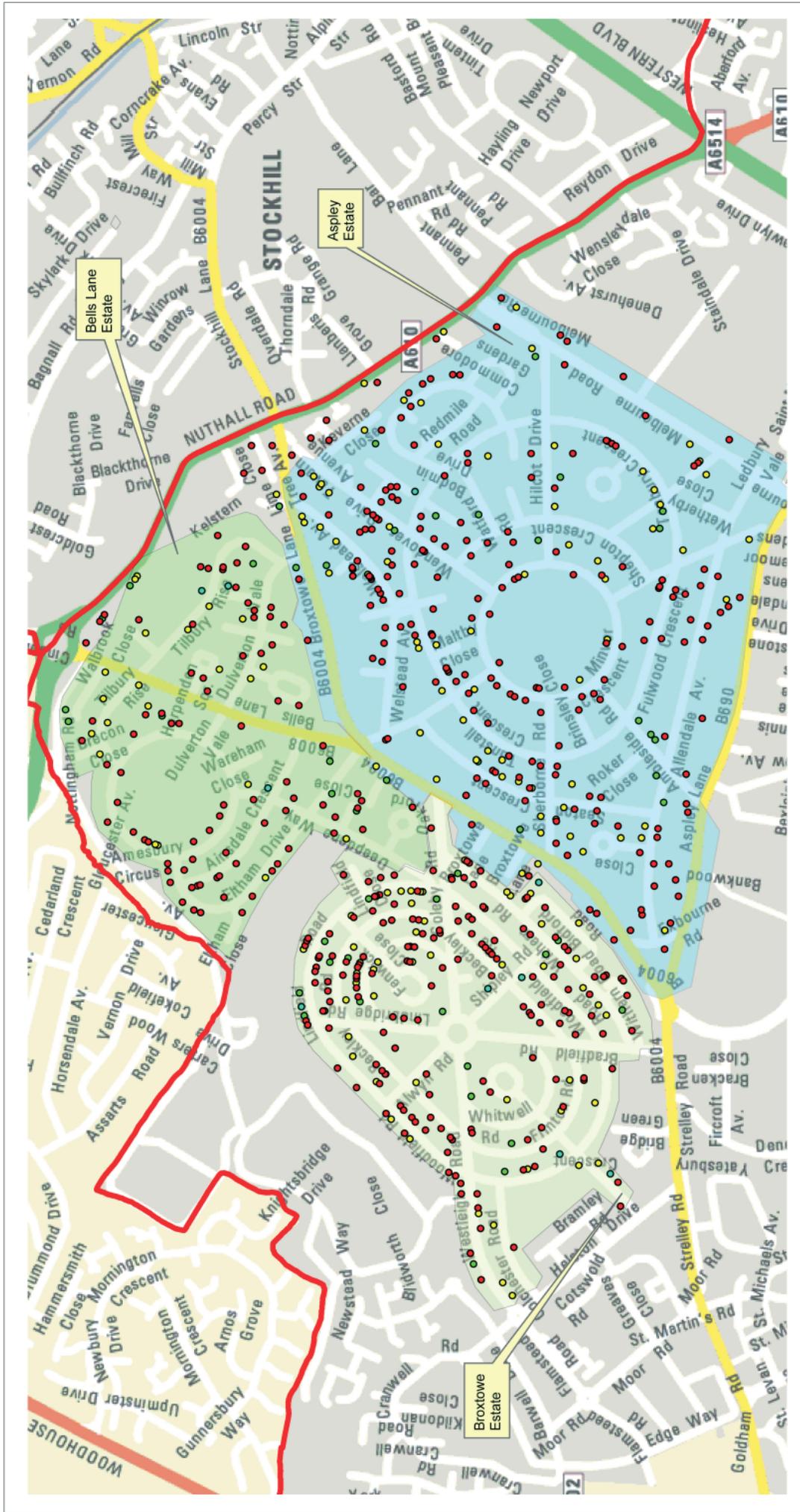
0 875 1,750 3,500 Meters



Scale: 1:30,000

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Appendix B: Map of burglaries via a door 2007-2010



Title: Door Burglaries in Aspley Ward



- Burglary - Back Door (536)
- Burglary - Front Door (186)
- Burglary - Side Door (73)
- Burglary - Other Entrance (16)

Scale: 1:9,235

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Energy efficiency and fuel poverty



Nottingham
City Homes



Chapter summary

Background to the project

Nottingham City Homes, in partnership with Nottingham Trent University, are conducting a two-year impact study on the wider social benefits of the Decent Homes programme, known in Nottingham as the Secure, Warm, Modern programme. This report focuses on the impact of the Secure, Warm, Modern programme on the energy efficiency of the properties, and therefore the effect on the environment and fuel poverty.¹

Nottingham City Homes' (NCH) Secure, Warm, Modern programme aims to bring Nottingham's 28,500 council homes up to and above the national Decent Homes standard. Between 2008 and 2011, NCH has replaced single glazed windows with 'A rated' double glazed windows in 13,700 properties, and upgraded heating to full central heating systems (including 'A-rated' boilers) in 7,380 homes, as well as topping loft insulation up to 200mm.

The concern regarding energy efficiency relates to the twin issues of carbon emissions and climate change, and energy security and fuel poverty. Nottingham has set itself challenging targets in reducing energy use and carbon emissions, even though carbon emissions per capita in Nottingham are already comparatively low compared to other major cities. Work to improve the energy efficiency of council housing stock will play an important role in meeting these targets, as over a third of emissions are from domestic housing, and council stock accounts for a quarter of properties in the city. This will also be important in addressing fuel poverty, as social housing tenants are more likely to be vulnerable to fuel poverty due to low incomes. The elderly, disabled or those in receipt of social security benefits are particularly at risk.

The aim of this research is to measure how the Secure, Warm, Modern (SWM) programme has contributed to these carbon reduction targets, and in doing so how this has impacted on tenants' energy costs and therefore fuel poverty. The data was collected, firstly, from stock condition data relating the energy efficiency of a large proportion of the stock; and secondly, through a detailed case study with tenants receiving SWM work.

Key findings

The average SAP² rating of properties prior to any SWM work was 60 (out of 100), which equates to annual CO₂ emissions of nearly 4 tonnes per property. This is better than the national average rating of 51.8, but is similar to the national average rating for social housing of 59.4.³

Analysis of SAP data from after the SWM work was done shows that:

- On average, the energy efficiency of the properties after the SWM work was 68 out of 100, an increase of 8 points, equating to an average reduction in CO₂ emissions of nearly one tonne per year per property

1. Households are commonly defined as being in fuel poverty if they require 10% or more of their income to attain the recommended minimum temperatures (set by the World Health Organisation) of 21°C in the living room and 18°C in all other rooms.

2. SAP is the Government's Standard Assessment Procedure for Energy Rating of Dwellings, where properties are scored between 1 and 100 based on energy costs associated with space heating, water heating, ventilation and lighting, less cost savings from energy generation technologies. The higher the score, the more energy efficient the dwelling. A score of below 30 is considered very energy inefficient, whilst a score of 70 or more is considered very energy efficient.

3. Department of Energy and Climate Change (2011) 'Annual report on fuel poverty statistics 2010'.

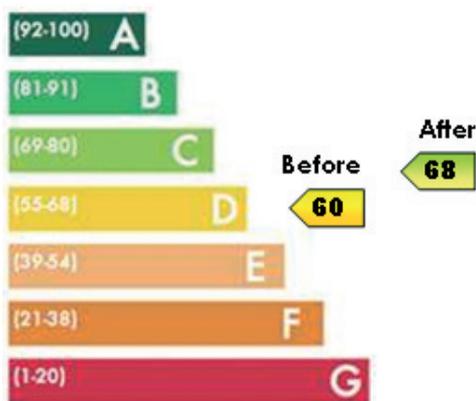


Figure 1: Average SAP rating before and after SWM work

- Installing double glazed windows increased the SAP rating on average by 4 points, reducing CO₂ emissions by nearly half a tonne per year
- Upgrading the heating system improved the SAP rating by over 13 points (placing these properties in the 'very efficient' category), equivalent to reducing CO₂ emissions by over 1.5 tonnes per year.

Applying these findings to the whole SWM programme so far shows that the work completed between 2008-11 has resulted in a saving of 15,445 tonnes of CO₂ per year. This is a 15% decrease in emissions from NCH properties, and is equivalent removing over 2,700 vehicles from the roads in Nottingham each year; or planting over 360,000 tree seedlings each year and growing them for 10 years. Over the whole programme to 2015, it is estimated that the SWM work will result in an estimated CO₂ reduction of 43,500 tonnes per year following the completion of the SWM programme.

These reductions will account for achieving 17% of One Nottingham's 2020 target for reduction of domestic CO₂ emissions, and 9% of the total target for all CO₂ emissions.

Figures supplied from the Energy Saving Trust suggest that each tenant could save between £95 and £223 each year on their fuel bill as a result of fitting double glazed windows, and £225 a year from the replacement an old G-rated boiler with an A-rated boiler. In total, these estimates suggest that tenants will save £3.5m on fuel bills every year amongst those living in properties that have had windows or heating systems upgraded between 2008 and 2011.

Fuel poverty across Nottingham as a whole has decreased over this period from 12% in 2008 (at the start of the SWM programme) to 6.8% in 2010/11. NCH data shows that of those surveyed prior to the SWM work nearly 300 homes had SAP rating of less than 35 (a proxy for fuel poverty); but of those surveyed after the work was done only 23 had a SAP of less than 35.

These figures represent the maximum potential energy and cost savings that can be created as a result of installing energy efficiency measures. However, a recent study showed that customers in a social housing retrofit programme made only around 40% of the expected energy and cost savings. The case study carried out with two properties receiving SWM work therefore gives us an insight into the behavioural elements that have an impact on energy efficiency and therefore on the actual savings made a result of fitting new installations.

The two properties were monitored for four months of the heating season, during which one property had already received a heating upgrade, and the other received the upgrade mid way through this period. The properties were identical build type and both occupied by retired couples.

The main learning points from the case studies were:

- The occupants make a choice based on personal comfort on the temperature of their homes, which can significantly affect the amount of energy they use. However they may be unaware of (a) the actual temperature in the house and (b) the potential health impacts of having the property either too cold or too warm
- The new heating controls may appear to be complicated to the tenant, with many potential options regarding the boiler thermostat, wall thermostat, timing vs. manual controls, and the thermostatic radiator valves. Tenants appear to have been given different advice by the installers on the best/most efficient way to manage the system. Instead of engaging with this technology, tenants may resort to basic measures such as opening windows, leading to inefficient energy use
- With two sides of the ‘fuel poverty triangle’ set to worsen for many NCH tenants in the near future (with rising energy costs and changes to the benefits system), it is all the more important to focus on both aspects of energy efficiency – improving the property infrastructure, and enabling tenants to use energy efficiently – to mitigate the potential increase in fuel poverty.

Conclusions and recommendations

Although significant improvements have been made in the energy efficiency of core elements of the infrastructure under the SWM programme, the choices and behaviour of tenants make a significant difference in the actual energy efficiency gains seen. Comparing the two case study households, this behavioural aspect outweighs the impact of the retrofit work; resulting in the property with an A-rated boiler and full central heating system using more energy than the neighbouring property, with the same build specifications but with a G-rated boiler and partial heating system.

This analysis has demonstrated that work completed under the SWM programme has significantly improved the potential energy efficiency of the stock, but in order to realise these efficiency gains the retrofit work needs to be combined with education and behavioural change amongst the occupants, as well as considering how the technology could be made more user friendly.

Understanding the impact of energy efficiency improvements on actual energy savings and fuel poverty is important as NCH continues to roll out further energy efficiency investments, including internal insulation under Community Energy Savings Programme (CESP) funding and installation of solar photovoltaic panels.

The following recommendations are put forward for the consideration of NCH and partners:

1. Develop a range of communication materials and methods for helping occupants make the most of any energy efficiency improvements in their home, and test their effectiveness with tenants
2. Include energy saving advice and information on support for fuel costs (e.g. winter fuel and cold weather payments) in NCH's Debt Advice Service
3. Continue to monitor the actual impact of energy efficiency programmes delivered by NCH on carbon emission reductions, tenants' energy awareness and fuel bills
4. Develop better data on fuel poverty prevalence (or suitable proxy) to monitor distribution and changes in fuel poverty (accounting for the impact of both changing energy use and changing prices in determining fuel costs) to inform NCH's future financial advice/energy efficiency programmes and initiatives
5. Continue the commitment in current and new contracts to recycle waste and investigate options for items that are currently not recycled or reused to find ways to further reduce landfill deposits.

Introduction

Nottingham City Homes, in partnership with Nottingham Trent University, are conducting a two-year impact study on the wider social benefits of the Decent Homes programme, known in Nottingham as the Secure, Warm, Modern programme. The research investigates the impact of this significant investment in Nottingham's council housing properties on social outcomes such as crime, health and wellbeing, and the local economy and employment. This report focuses on the impact of the Secure, Warm, Modern programme on the energy efficiency of the properties, and therefore the effect on the environment and fuel poverty.

The Secure, Warm, Modern programme

Nottingham City Homes' (NCH) Secure, Warm, Modern programme aims to bring Nottingham's 28,500 council homes up to and above the national Decent Homes standard. The programme reflects tenants' priorities, with tenants stating that making their homes warm was a priority for the work, after making their homes secure.

The Secure and Warm elements of the programme both contribute to increasing the energy efficiency of the properties, with the retrofit work including:

- Replacing all single glazed windows with double glazed windows, all with 'A rated' thermal efficiency standards
- Upgrading heating to full central heating systems, including replacing inadequate boilers with new 'A-rated' boilers and fitting time/temperature controls
- Fitting or improving loft insulation (topping up to 200mm) and wall insulation.

The Secure and Warm streams of work began in 2008/09 and are due to be completed in 2012/13. Up to April 2011, NCH has fitted new windows to 13,700 properties and upgraded 7,380 heating systems. The total investment in the SWM programme from 2008-11 was £84.1m.

NCH is also managing a number of other energy efficiency projects. Around 700 solid wall 'hard to heat' properties in the Aspley ward are having internal wall insulation fitted alongside the Decent Homes work, as part of the Community Energy Savings Programme (CESP). Up to April 2011, 121 properties have been completed with the remainder due to be completed by March 2012. In addition, 1,450 solar photovoltaic panels will be fitted to south-facing properties across the city in 2011/12.

Baseline energy efficiency and fuel poverty context in Nottingham

Nottingham is already a comparatively energy efficient city, but is committed to improving its energy sustainability to address the twin concerns around climate change and reducing carbon emissions, and improving energy security and fuel poverty. In relation to the housing sector, projects to increase energy efficiency and decrease energy use address both of these issues simultaneously. The high levels of deprivation across the city mean that ensuring that the most vulnerable are able to afford necessary energy costs has particular importance.

With rising energy prices, this issue of fuel poverty is a key policy concern. Households are commonly defined as being in fuel poverty if they require 10% or more of their income to attain the recommended minimum temperatures (set by the World Health Organisation) of 21°C in the living room and 18°C in all other rooms. Fuel poverty is therefore affected by three main factors, which are (a) income levels, (b) fuel prices and (c) the energy efficiency of the property- the 'fuel poverty triangle'.

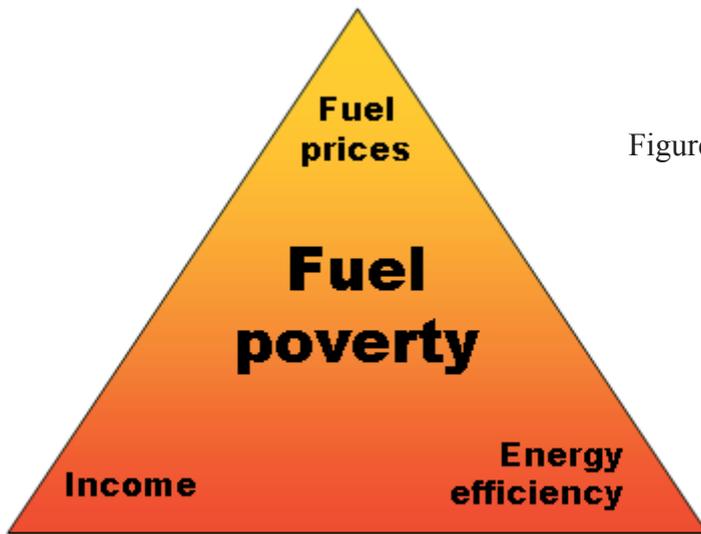


Figure 2: The fuel poverty triangle

Household spends more than 10% of income on fuel to maintain an adequate level of warmth

The number of households in fuel poverty in England has been rising since 2003, from 1.2m households to 3.3m households in 2008.⁴ Baseline data for Nottingham (i.e. prior to the start of the Secure, Warm, Modern programme) shows rising fuel prices were combined with high levels of deprivation, with Nottingham ranked in 2007 as the 13th most deprived Local Authority in the country (Indices of Multiple Deprivation, 2007). In 2008/09 12% of Nottingham's households were considered to be fuel poor (measured by proxy of those living in properties with SAP⁵ rating of less than 35 in receipt of benefits), compared to 11% nationally.

Nottingham City Council's Energy Strategy for 2010-2020 provides an overarching framework for the City's plans, programmes and initiatives relating to sustainable energy supply and use to 2020. The central target for the Energy Strategy is to reduce carbon emissions by 26% from a 2005 baseline level by 2020, aiming for an emissions level of 1,329k tonnes CO₂ per annum by 2020. To achieve this, the target is for a 37.6% reduction in CO₂ emissions from domestic energy use by 2020.

Carbon emissions are relatively low in Nottingham, at 6.3 tonnes per capita in Nottingham (which is amongst the bottom 10% in the country), due to a number of projects to create sustainable energy and lower demand. For example, from 2003-2007 domestic gas consumption in the city fell by 16%; the largest fall of any local authority in the East Midlands and of all the Core Cities. However, the UK and Nottingham's carbon reduction targets still represent a considerable challenge.

Improving the energy efficiency of existing properties in the city will play a vital part in meeting these challenging targets. Domestic properties account for over a third of total energy use in Nottingham (36% in 2006), and the majority of these properties will still be in use by the 2020 deadline. Therefore retrofitting existing properties to make them more energy efficient and therefore reducing carbon emissions is key to meeting Nottingham's and the UK's carbon reduction targets. As well as physical energy efficiency measures in the property, this also needs to be supported by behavioural change and education amongst residents.

4. See www.decc.gov.uk/assets/decc/Statistics/fuelpoverty/610-annual-fuel-poverty-statistics-2010.pdf

5. SAP is the Government's Standard Assessment Procedure for Energy Rating of Dwellings, where properties are scored between 1 and 100 based on energy costs associated with space heating, water heating, ventilation and lighting, less cost savings from energy generation technologies. The higher the score, the more energy efficient the dwelling. A score of below 30 is considered very energy inefficient, whilst a score of 70 or more is considered very energy efficient.

Social housing has an important role in addressing both carbon emissions and fuel poverty. Around a quarter of the housing stock in Nottingham is council-owned social housing, and therefore accounts for a significant proportion of domestic energy use and emissions. Although social housing is on average more efficient than private housing (the average SAP rating for social housing in the UK in 2008 was 59.4, compared to national average of 51.8), the sector accommodates some of the most vulnerable to fuel poverty, such as the elderly, disabled or those in receipt of social security benefits due to low incomes.

As a consequence, NCH has recently developed a 'low carbon roadmap', setting out a long-term plan for low carbon retrofit to the stock, in order to meet the target for domestic energy reduction set out in the Nottingham Energy Strategy (i.e. reduction of 36.7% in CO₂ emissions from domestic energy use). Using the SAP data from surveys to NCH properties, the roadmap estimates that NCH's CO₂ baseline (in 2010/11) is 90,014 tonnes per year. Achieving the target above would result in a reduction to 56,169 tonnes per year by 2020, requiring a reduction each year of 3,761 tonnes per year.

Aims and method

Aim and objectives

The aim of the environment and fuel poverty strand of research is to evaluate the impact of the installations under the Secure, Warm, Modern programme on the energy efficiency of NCH properties, and therefore the effect on carbon emissions and on fuel poverty.

The objectives of the research are to:

- Evaluate the impact on energy efficiency, as measured by SAP ratings, across different housing types and the stock as a whole
- Estimate the resulting impact on carbon emissions, and contribution to city targets
- Estimate the resulting impact on tenants' fuel bills and measures of fuel poverty
- Investigate the effect on internal conditions within the home, such as temperature and humidity.

This is closely linked to concurrent research on the impact of the Decent Homes programme on health and wellbeing. There is considerable evidence that increasing internal temperatures and decreasing humidity are key factors in improving the physical health of residents in these homes, and also that increasing energy efficiency can positively affect mental health, for example from a reduction in concern about the financial impact of heating the home.⁶ The impact on health and wellbeing is explored in a separate, but interlinked, strand of research within the Decent Homes Impact Study.

The research for this part of the Impact Study was supported by a team from Nottingham Trent University's School of Architecture, Design and the Built Environment⁷, who provided expertise and resources in monitoring and analysis of a small sample of properties for the case study.

Method

The approach for identifying the impact of the Secure, Warm, Modern programme is based on the Cabinet Office's Guide to Social Return on Investment (SROI) model. This identifies the main stakeholders who are affected by the change, and sets out the theory of change – starting with the inputs and outputs of the activity, and then measuring the outcomes for each stakeholder using relevant indicators.

The main sources of data for this research were:

- Data from surveys of 16,000 NCH properties, including SAP Energy Efficiency ratings and CO₂ emissions estimates
- A case study comprised of two properties, including property monitoring (energy use, internal and external temperature and humidity, event loggers) and qualitative interviews with tenants.

The surveys were commissioned by NCH from Savills, and use the Reduced Data Standard Assessment Procedure⁸ (RdSAP) to provide data including SAP ratings and CO₂ emissions for the property. The surveys began in 2009, with some completed prior to the installation of SWM elements, and some following the installation. This provides data for a benchmark and comparison following the installation of windows and heating.

6. For example, see Green, Gilbertson (2008) 'Warm Front, Better Health- Health Impact Assessment of the Warm Front Scheme'

7. Contributions to this project were from Professor Steve Goodhew, Associate Dean of Research, and Michelle Cui, PhD student.

8. The RdSAP was developed for existing homes (rather than new build) and uses information on the property type and age to calculate the energy performance information.

The aim of the case study is to collect and compare detailed information on a small sample of properties and their occupants where they have undergone SWM work. The monitoring began with two properties in January 2011: both had double glazed windows; one had the heating upgraded prior to the monitoring; and the other had the heating upgrade in March 2011. This interim report compares these two initial properties. The properties will then be compared over the heating season 2011/12 (October to May) with a further two properties which have not received any SWM work.

Energy efficiency of NCH stock

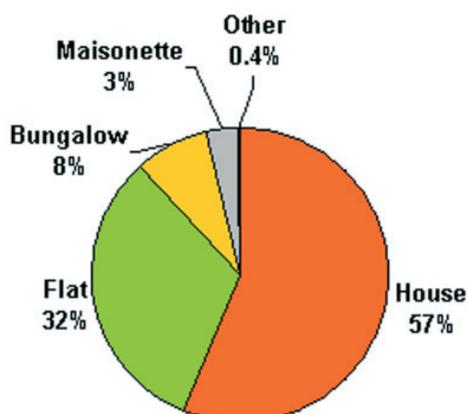
NCH stock description

NCH currently manages around 28,500 properties, of varying types and age. Both the build type and the age of the property impact on its energy efficiency. Around a third of NCH properties are houses built before 1945.

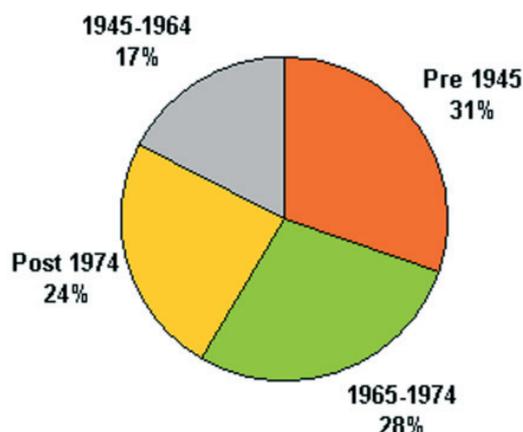
Table 1: Summary of NCH stock type and age

Build date	Archetype							TOTAL
	House	Flat	Bungalow	Maisonette	Bedsit	Chalet	Prefab	
Pre-1945	7,966	414	163	61	54			8,658
1945 - 1964	3,186	1,115	460	183	31		6	4,981
1965 - 1974	2,097	5,054	516	331	2	8		8,008
Post 1974	2,742	2,629	1,142	387				6,900
TOTAL	15,991	9,212	2,281	962	87	8	6	28,547

NCH stock by archetype



NCH stock by build date



The Secure, Warm, Modern programme

Between April 2008 and March 2011, the SWM programme has installed double glazed windows to 13,731 properties and upgraded 7,378 central heating systems. The work required on each property in order to meet Nottingham's Decent Homes standard was identified by a full survey of all NCH properties. Properties may therefore have some or all of the SWM measures.

Between 2008-2011:

- 8,542 properties had double-glazed windows only fitted
- 2,198 properties had heating system upgrades only
- 5,189 properties had double-glazed windows and heating systems upgraded.

Since 2009, NCH has also been carrying out surveys on the energy efficiency of the properties. To date, 15,965 such surveys have been carried out. As these surveys were only carried out once in each property, we are unable to compare data from the same properties before and after the installations; instead we compare the averages from 10,343 surveys that were carried out before any SWM work was completed, with averages from 5,621 surveys conducted after the installation of windows, heating or both. All sample sizes are large enough to be confident in the representativeness of the findings for the wider stock (i.e. within 5% error level and 95% confidence interval).

Impact on energy efficiency

Table 2 shows the average SAP rating and CO₂ emissions for properties receiving windows or heating as part of the SWM programme. This compares the average ratings from surveys carried out in properties before they had the work; with the average ratings from surveys carried out in properties after the work was completed. The SAP rating takes into account the effect on energy used for space and water heating and lighting (but doesn't include energy use, for example from household appliances). A SAP score of less than 30 is considered to be very energy inefficient, whilst a score of 70 or more is considered very energy efficient. In 2008 around 40% of the UK housing stock had a rating of in the range of 50-65, whilst only 18% had a rating of 65 or more.⁹

Table 2: Average SAP and CO₂ emission ratings

SWM work	SAP rating (out of 100)			CO ₂ emissions (tonnes per year)		
	Before	After	Difference	Before	After	Difference
Windows	59.54	63.54	4.00	4.02	3.56	-0.47
Heating	60.81	74.30	13.49	3.81	2.22	-1.59
AVERAGE*	60.37	68.09	7.72	3.91	2.98	-0.93

*Weighted by number of properties in each group

9. Department of Energy and Climate Change (2011) 'Annual report on fuel poverty statistics 2010'

The average SAP rating prior to the SWM work of 60.37 is well above the 2008 national average SAP rating of 51.8, but is similar to the national average of social housing at 59.4.

This indicates that installing either double-glazed windows, upgrading heating systems or both leads to an improvement in the energy efficiency rating of the property and reduces CO₂ emissions. However, upgrading heating systems appears to have a much larger positive effect than just installing double-glazed windows, giving three times the improvement in energy efficiency and CO₂ reduction than the windows. The heating upgrades improve the average energy efficiency rating to over 70, which is considered to be 'very energy efficient'.

The total CO₂ reduction is then estimated by applying these findings from a sample of the properties to the wider stock. Using this approach, it is **estimated that the work completed so far under the SWM programme has resulted in a saving of 15,445 tonnes of CO₂ per year**. This is a 15% decrease in emissions from NCH properties.¹⁰ To provide some context to this figure, to achieve an equivalent level of reduction in emissions to this Nottingham would have to remove over 2,700 vehicles from the roads each year; or to absorb the equivalent amount of carbon would need over 360,000 tree seedlings to be planted each year and grown for 10 years.



Figure 3: Equivalent carbon saving measures

The SWM programme will continue to 2012/13, and applying these carbon savings to the number of elements that will be fitted over the whole programme gives an estimated CO₂ reduction of 43,500 tonnes per year following the completion of the SWM programme. These reductions will account for achieving 17% of One Nottingham's target for reduction of domestic CO₂ emissions, and 9% of the total target for CO₂ emissions.

These improvements are also likely to have an impact on the internal conditions in the properties. For example, data from surveys undertaken for NCH across all the stock prior to the SWM programme showed that there were around 5,000 properties suffering from excess cold conditions, and 200 experiencing significant damp and mould growth.¹¹ These hazards were therefore also addressed as a result of the SWM work undertaken.

Fuel poverty amongst NCH tenants

Prior to the SWM programme the local authority estimated that 12% of Nottingham residents were considered to be in fuel poverty. This was measured as part of the National Indicator set, using the proxy measure for fuel poverty as the proportion of residents in receipt of benefits and living in properties with SAP ratings of less than 35.

An update to this indicator in 2010/11 showed that the level of fuel poverty had reduced to 6.8% of Nottingham residents, exceeding the city's target (of 8% for 2010/11) for reducing fuel poverty.

In terms of NCH tenants, the survey data shows that there were 291 properties with a SAP rating of less than 35 amongst the 10,343 surveys carried out before the SWM work, equating to 2.8% of properties surveyed. Amongst the 5,621 surveys conducted after the SWM work, only 23 returned a SAP rating of less than 35 (less than 0.005%). The SWM works have therefore had a considerable positive effect on reducing potential fuel poverty amongst tenants by increasing the energy efficiency of the properties. However, as outlined earlier, this is only one element of the 'fuel poverty triangle' and there is potential for other tenants to still be in fuel poverty due to low incomes or high fuel costs.

Broad estimations of the cost savings in terms of energy bills can be estimated using indicative figures supplied by the Energy Savings Trust (EST).¹² For the windows, the EST's cost calculator models the savings from replacing timber-framed single glazed windows with A-rated double glazed models, for a range of property types. Table 3 shows the estimated cost savings as applied to NCH properties that received window upgrades. This suggests that each tenant could save between £95 and £223 each year on their fuel bill, giving a total estimated cost saving of just over £1.8m across households¹³ with window upgrades.

Table 3: Estimated fuel cost savings from window upgrades

Property type	Estimated saving per year		Number of NCH properties with new windows	Total saving
	CO ₂ (tonnes)	£		
Detached	1.14	£223.22	28	£6,250
Semi/bungalow/other	0.82	£159.17	7,067	£1,124,854
Terraced	0.61	£119.62	3,805	£455,154
Flat	0.33	£94.72	2,674	£253,281
TOTAL			13,574	£1,839,540

Turning to the heating upgrades, the Energy Savings Trust estimates that a household will save £225 a year from their energy bills (1.1 tonnes of CO₂ a year) as a result of replacing an old G-rated boiler with an A-rated boiler, as was done under the SWM programme. Applying this to the 7,387 properties that had heating upgrades, this equates to a £1.7m cost saving for the tenants.

In total, these estimates suggest that tenants will save £3.5m on fuel bills every year amongst those living in properties that have had windows or heating systems upgraded between 2008 and 2011.

12. See www.energysavingtrust.org.uk/Home-improvements-and-products

13. Some households were excluded from this calculations as the could not be matched with the categories supplied in the cost calculator

Caveats to theoretical energy and cost savings

The calculations given above for energy and cost savings are based on well-recognised modelling assumptions (particularly those incorporated into the SAP calculations). However, there is evidence to suggest differences between these theoretical changes (i.e. the potential for energy efficiency gains) and those actually achieved in properties receiving low-carbon retrofit. A recent study showed the differences between theoretical savings and those achieved in reality in a social housing retrofit programme; this showed that customers made only around 40% of the expected energy and cost savings.¹⁴

The main reasons for the differences between theoretical and actual savings were:

- SAP calculations assume an average of 2.5 occupants per dwelling, and that the home is not occupied during the day; however, some social tenants are more likely to be at home during the day (e.g. if retired or unemployed) and properties may only be occupied by one or two people
- SAP assumes that the heating systems are used efficiently, but customers may not know how to use their systems to best effect
- Local weather conditions may also affect the amount of energy required to heat the home.

Therefore the theoretical energy and cost savings based on SAP ratings show the potential amount of energy and money that could be saved as a result of the measures installed; however, the actual savings will depend on occupancy patterns and behaviours, in particular the choices made in the use of the systems installed. The following case study therefore provides an insight into the actual behaviours and outcomes following the installation of low-carbon retrofit measures.

In addition, the cost savings implied from energy savings will vary with fluctuations in energy prices. Domestic energy prices have been rising since 2001, peaking in 2008. Although costs have stabilised in 2009-10, recent announcements from utility companies indicates a significant rise in energy costs in 2011.¹⁵ As a result of rising prices, savings in energy may not result in cost savings, but only in maintaining energy cost levels. Significant energy savings will be required in order to avoid increases in fuel bills.

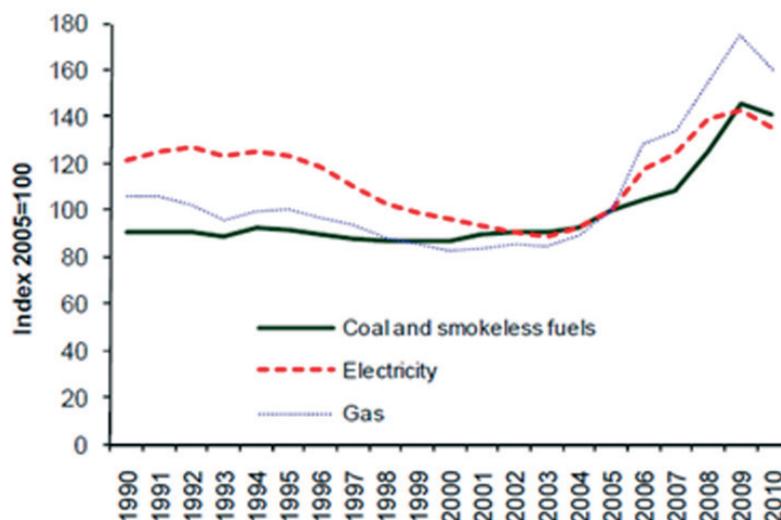


Figure 4: Domestic real fuel prices (Source, DECC Quarterly Energy Prices June 2011)

14. Gentoo (2011) Retrofit Reality report (part 2), see assets.gentoo.com/assets/Downloads/Retrofit%20Reality%203%20final.pdf

15. See www.consumerfocus.org.uk/files/2011/07/Estimated-GB-Average-energy-prices-following-price-change-announcements.pdf

Waste and recycling

A negative environmental side-effect of the refurbishment process is the level of waste created in replacing the old elements. This negative effect is reduced if significant amounts of the waste can be recycled.

NCH and its constructor partners have in place site waste management plans outlining waste minimisation through segregation to reduce this amount of landfill but increase the recycling of materials to be used elsewhere. This has reduced the amount of waste taken to landfill and the SWM programme is currently achieving an average of 95% level of recycling against a target of 80% through the scheme. Other ways are also being considered for items that are currently not recycled or reused to find ways to further reduce landfill deposits.

Therefore, although a large amount of waste is generated from the refurbishment work, a very high proportion of this is recycled and reused in other forms. For example, the main windows contractor produced over 2000 tonnes of waste from 2009-11, but recycled 1850 tonnes of this waste.



Case study – property and tenant monitoring

The above analysis gives an overall picture of the impact of the SWM programme on energy efficiency and fuel poverty, based on the technical specifications of the work undertaken and modelling the theoretical effects of this through the SAP rating methodology and other modelled cost effects. However, this does not take into account the effect of the occupants' activity and response to the measures installed, which is likely to result in variation in the effectiveness of the measures in reducing energy use.

The case study therefore provide an alternative perspective, looking in depth at the impact on a small number of households to explore the actual effects on the conditions in their home, and their activities and energy behaviour.

The case study is based on two NCH properties and their tenants. Building on the learning from this, a further two further properties will be selected for monitoring over the next heating season from October 2011 – May 2012. The properties selected will not have new windows or heating, to enable comparison with the initial case study properties (with new heating and double glazed windows) over the same period.

Both properties are identical build type, and are occupied by retired couples and therefore the house is occupied for a large part throughout the day. Property B is also occupied intermittently by the couple's adult granddaughter. Both couples have lived in the properties since they were built over 30 years ago, and therefore have a long term perspective on the conditions within the house.

The original heating in both properties comprised of a partial heating system, with a gas fire and back boiler located in the living room, providing hot water and heating for a single radiator in the main hallway. As part of the Secure, Warm, Modern programme both properties received a heating upgrade to a full central heating system, including A-rated boiler, independent heating and hot water controls, central thermostat and timer, wall thermostat, and radiators (with thermostatic valves) in the living room, kitchen, hallway, bathroom and bedrooms.

Table 4: Case study properties and occupants

	Property A	Property B
Archetype	Mid terrace house 3 bedrooms Built 1977 Timber frame walls, external tile cladding	Mid terrace house 3 bedrooms Built 1977 Timber frame walls, external tile cladding
Occupants	Retired couple	Retired couple and granddaughter
SWM work	Heating (Jan 2011)	Heating (March 2011)
Other features	Double glazed windows (replaced 2002, C-rated) Loft insulation (275mm)	Double glazed windows (replaced 2002, C-rated) Loft insulation (275mm)

Property A received this upgrade in January 2011, as the case study monitoring period began. Property B received the upgrade in March 2011, thus allowing two months comparison of the new versus old heating systems in the identical properties (the 'before' period), and two months comparison of the two properties both with the new heating system (the 'after' period). See Figure 5.

At the start of the monitoring period in January, the properties were fitted with data loggers to continuously record data over the whole period. This included:

- A temperature and humidity logger, placed in the living room, bedroom, bathroom and kitchen of each property
- An external weather monitoring station
- Electricity Smartmeter
- Event loggers on the living room and bedroom windows (registering opening and closing of windows)
- Pressure mat at the front door, logging entry/exit of the property

In addition, the tenants took part in a number of other data collection tasks:

- In-depth interviews at the start of the monitoring period in January, and repeated in March (after Property B had the heating upgrade)
- An appliance audit (number and energy use)
- A daily activity log (for two days)
- Monthly gas and electricity meter readings

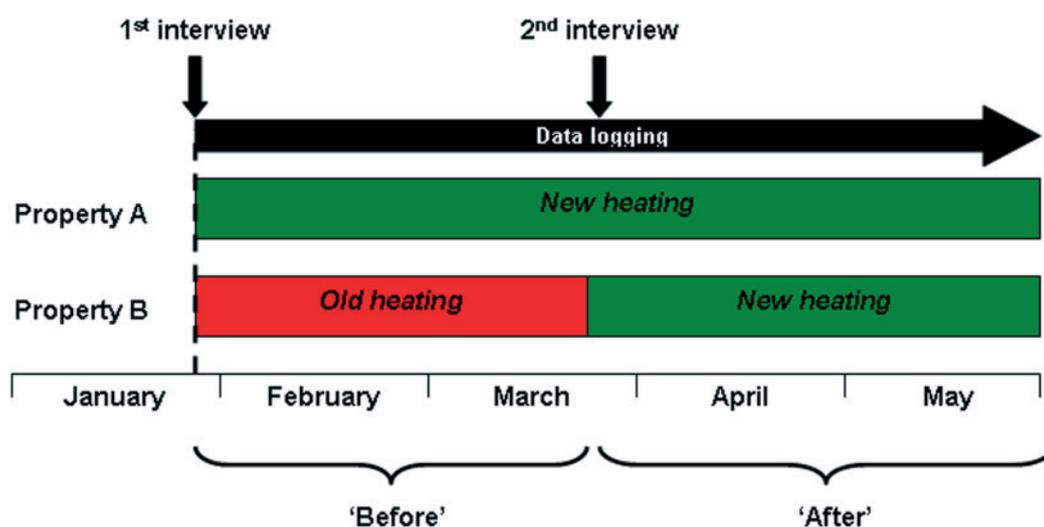


Figure 5: Timescales for case study data collection

Monitoring data

Internal conditions

The data from the temperature/humidity data loggers gives an indication of the physical conditions in the two properties. Table 5 shows the average temperatures in the two properties for the period before the heating was upgraded in Property B (27th January – 21st March) and after (22nd March – 11th April). Property A had the new heating system throughout this period. This data is also displayed in Figures 6 and 7, also showing the recommended temperature for each room and the outside temperature over the same period.

Table 5: Average temperatures before and after heating upgrade (in Property B)

Average temperature (°C)		Property A	Property B	Difference (A-B)
Living room	Before	23.6	19.0	4.6
	After	23.6	19.2	4.4
Bedroom	Before	20.5	15.3	5.2
	After	21.8	17.3	4.5
Bathroom	Before	23.2	15.9	7.3
	After	23.4	17.2	6.2
Kitchen	Before	23.3	19.8	3.5
	After	24	20.5	3.5
External	Before	6.2		
	After	11.7		

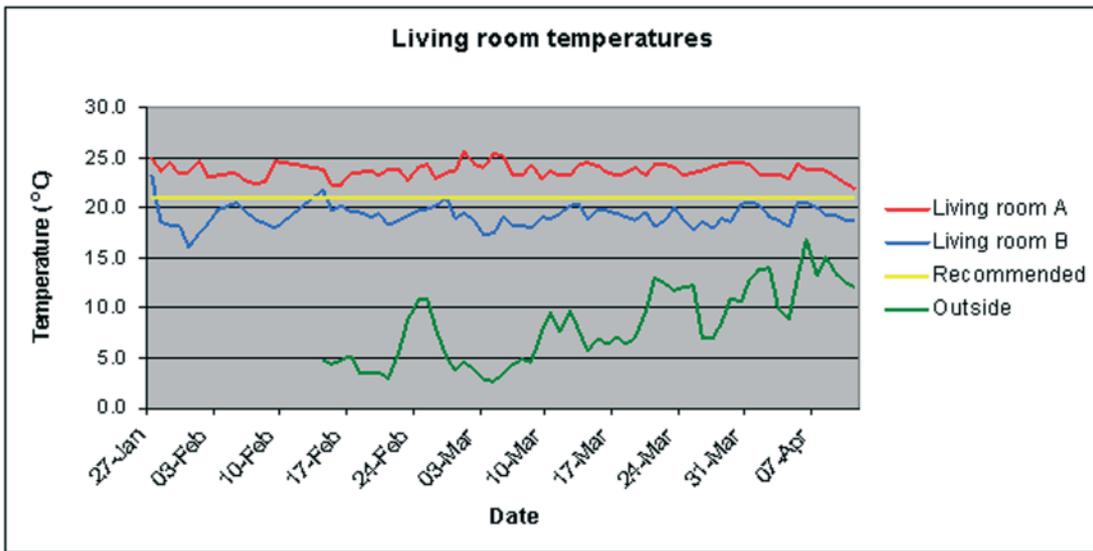


Figure 6: Living room temperatures in Property A and B

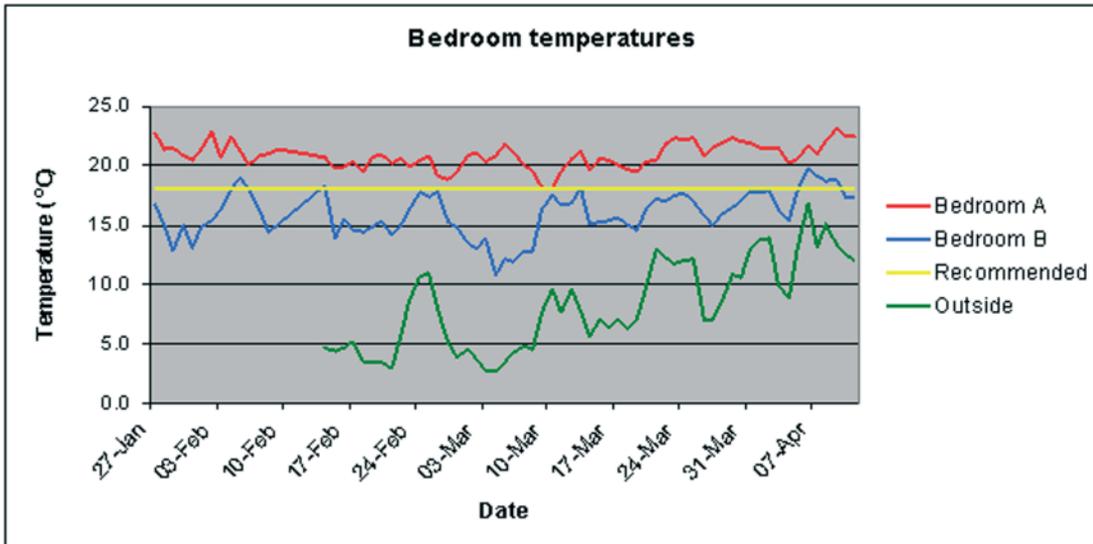


Figure 7: Bedroom temperatures in Property A and B

The table and figures on page 20 show that the temperature in Property A is consistently above the World Health Organisation’s recommended living temperature of 21 °C, averaging 23.4 °C during the day and 23.8 °C during the night.¹⁶ The temperature never dropped below 21.7 °C during this period, and reached a maximum of 26.5 °C.

In comparison, Property B is consistently below the recommended living room temperature, averaging 17.5 °C during the day and 20.6 °C during the night in the period prior to the heating upgrade, and 18.3 °C during the day and 20.1 °C during the night in the period after the upgrade. The temperature reached a minimum of 14.3 °C and maximum of 23.1 °C.

Both properties are warmer during the night than the day, generally by around 0.5 °C; but the living room in Property B shows slightly more variation with the night-time average temperature before the heating upgrade around 3 °C warmer than the day-time temperature.

A similar pattern is seen in bedroom temperatures, with Property A consistently above the recommended bedroom temperature of 18 °C and Property B consistently below this. In Property B the bedroom temperature reached a minimum of 10.4 °C, reflecting the cold external weather conditions (between 2-3 °C for a couple of days) at the time. Looking at the correlation between the internal and external temperatures, the bedroom in Property B is the only area in the two properties to show a significant level of correlation ($r=0.6$). This correlation can be seen in Figure 7, with the bedroom temperatures in Property B closely reflecting the outside temperatures.

This is to be expected, as the bedroom in Property B (prior to the heating upgrade) did not have any form of heating, and is therefore more susceptible to variation in response to changing outside temperatures.

Table 6 shows the relative humidity (as a percentage) in the two properties, again comparing the period before and after the heating upgrade in Property B.

Table 6: Average relative humidity before and after heating upgrade (in Property B)

Average relative humidity (%)		Property A	Property B	Difference (A-B)
Living room	Before	33.5	43.5	-10.0
	After	38.2	49.8	-11.6
Bedroom	Before	39.8	53.4	-13.6
	After	42.0	54.3	-12.3
Bathroom	Before	36.2	57.3	-21.1
	After	40.0	59.4	-19.4
Kitchen	Before	35.2	47.4	-12.3
	After	38.5	49.3	-10.9

16. ‘Day’ is defined as between 7am and 6pm, and ‘night’ after 6pm and before 7am, based on local average sunrise/set times over this period.

This indicates that Property A (with the new heating system) is considerably less humid than Property B, averaging 14.2 percentage points less before the heating replacement in Property B, and 13.6 percentage points less after the work. The biggest difference can be seen in the bathroom, which in Property A is fitted with a radiator, and in Property B has no heating prior to the upgrade.

This reflects the inverse relationship between temperature and relative humidity, i.e. as the temperature goes up, the relative humidity decreases. There are health implications of internal conditions being too humid (e.g. increased condensation, damp and mould exacerbating respiratory conditions) and too dry (leading to dry skin and nasal passages, and increased potential for respiratory illness and viral infection). The recommended range for healthy indoor humidity is between 30-60%.¹⁷ Therefore, despite the difference between the properties, both are within the range considered to be healthy.

Loggers monitoring when windows are open/closed in each property show that the occupants in Property B open the windows more frequently than in Property A, but that both open the windows frequently (every few days) during the monitoring period.

Energy use

Both properties were fitted with Smartmeters to measure electricity use, and gas and electricity meter readings were taken. The tenants were also asked about their energy bills, and some data from previous bills were supplied.

Gas meter readings show the total amount of gas used over the period. Both properties have gas heating systems, and Property A has a gas cooker (hob and oven), whilst Property B has a gas hob but electric oven. Similarly, electricity meter readings show usage over the period. Figure 8 and Figure 9 show the energy use averaged over the number of days between each reading, giving an average daily use figure for each month.

Date	Gas meter readings * (Kilowatt Hours)		Electricity meter readings * (Kilowatt Hours)	
	Property A	Property B	Property A	Property B
27/01/11	0	0		
14/02/11	1143	857		
04/03/11	2445	1842	0	0
16/03/11	3143	2445	207	102
11/04/11	4318	3112	588	265
09/05/11	5461	3493	1001	456

Table 7: Gas and electricity meter readings (*normalised to start at zero on first reading)

17. See ezinearticles.com/?Maintaining-Optimal-Humidity-For-a-Healthy-Home&id=3378803

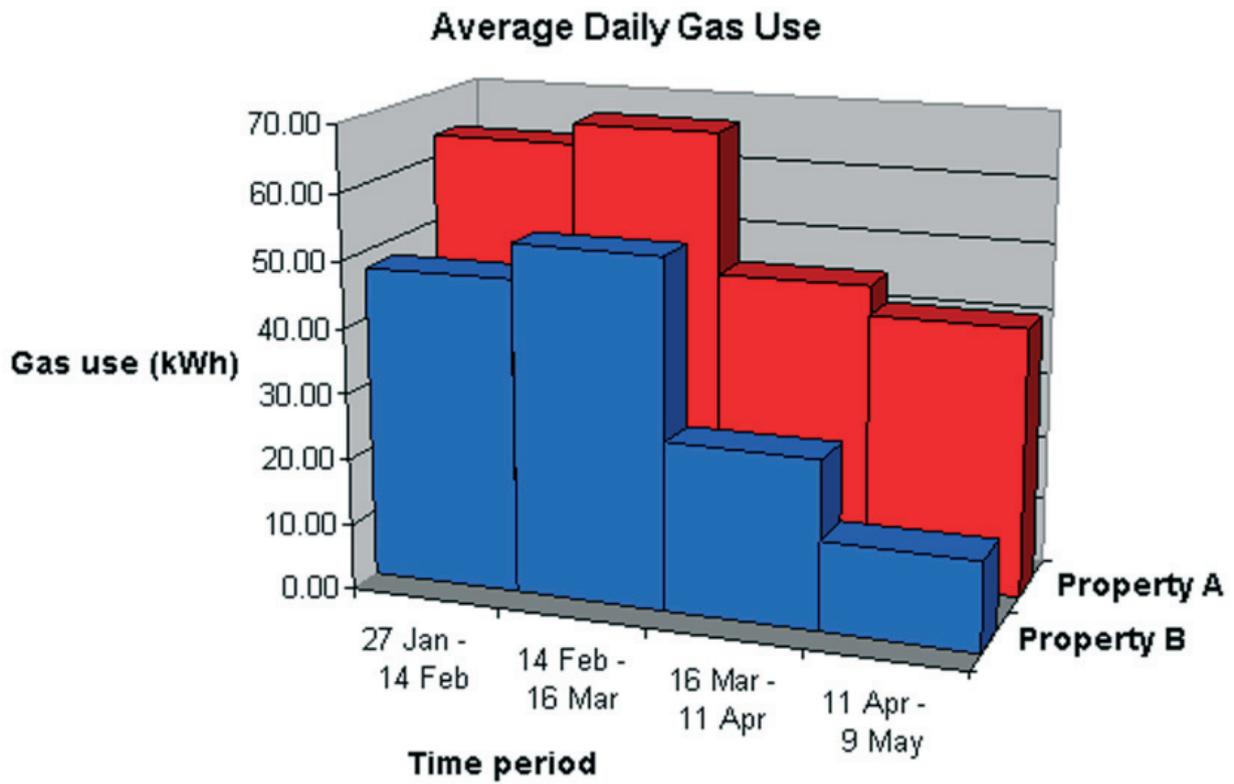


Figure 8: Average daily gas use (Source, monthly meter readings)

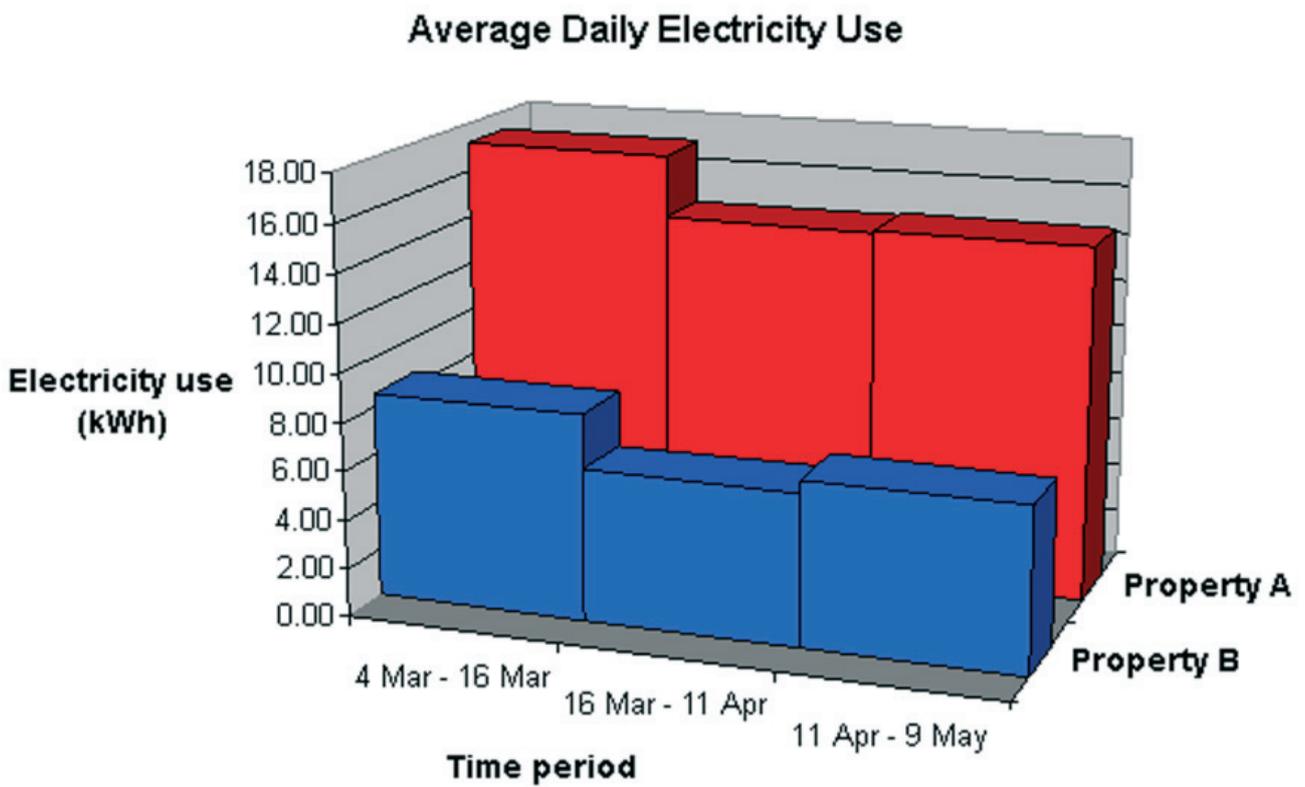


Figure 9: Average daily electricity use (Source, monthly meter readings)

The tenants in Property A pay their energy bills by cash on a weekly basis, and in Property B they pay the electricity on a monthly Direct Debit and the gas by cash on a quarterly basis. Both tenants pay regular amounts, and are in credit with their suppliers. Table 8 displays information collected from utility bills supplied by the tenants from both properties, showing energy usage for the last quarter (covering the same period as the monitoring i.e. between the installation of the new heating in Property A (January) and Property B (March)) and total usage for the last year.

	Property A	Property B	Natonal average*
Gas usage (kWh)			
Jan - Apr 2011	5,969 (£217)	3,587 (£141)	
Annual (Mar 2010 - Apr 2011)	19,483 (£762)	11,989 (£511)	18,000 (£658)
Electricity usage (kWh)			
Jan - Apr 2011	1,303 (£157)	574 (£87)	
Annual (Mar 2010 - Apr 2011)	5,213 (£626)	2,295 (£346)	3,300 (£417)

Table 8: Gas and electricity usage data from utility bills

* National average energy usage and cost for 2010 (Source, DECC)

This data shows that, even with the new energy efficient boiler over this period, Property A uses considerably more gas than Property B. Property A's energy use is higher than the national average for the year, whilst Property B's usage is lower than average. This corresponds with the higher internal temperature that is maintained in Property A compared to Property B. However, comparing Property A's gas consumption against the same period the previous year (i.e. same occupancy pattern but prior to the heating upgrade), gas usage has declined (Figure 10). This indicates that the new heating system may have reduced gas usage year on year for the same property. Gas usage has also decreased in Property B year on year, despite the same heating system remaining; however, the reduction is smaller than that seen in Property A.

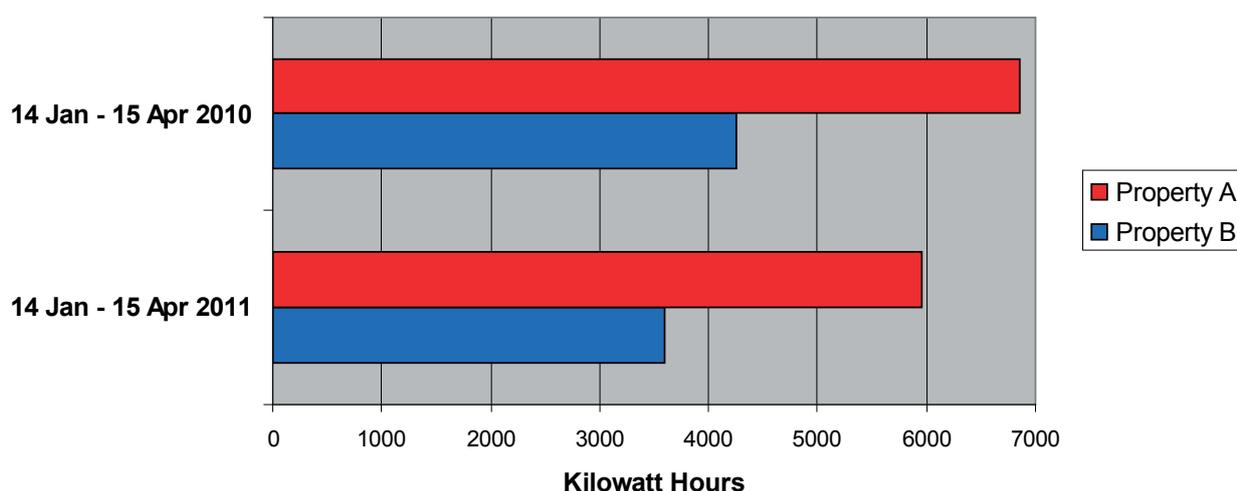


Figure 10: Gas usage in Property A and B – kilowatt hours per quarter (Source: utility bill)

Data collection issues

During the data collection period, a number of lessons were learned on the practical considerations of collecting reliable data. Firstly, due to an apparent fault during installation of one of the Smartmeters, the data collected for Property A was inaccurate and couldn't be used. Instead, data from electricity meter readings was used. In the future, the installation and data from the Smartmeters should be checked at an early stage to identify any problems.

Secondly, pressure mats were fitted under the front door mat which aimed to log when tenants left and re-entered the property, therefore showing the periods when the property was empty. However, by using this method it was not possible to distinguish between events where both occupants left the property (i.e. when the property was empty) and where one occupant left, or made a short trip outside (rather than for a sustained period). Therefore an additional data logger was introduced, where tenants were asked to push a button by the door when they were leaving the property empty, and on their return.

However, the tenants' feedback was that they did not always remember to do this, and so the data was not accurate. This indicates the difficulties of non-automated data collection, and that asking occupants to record their own activity regularly can prove to be too intrusive and onerous in the routines of daily life.

The tenants' perspective

Both sets of tenants were interviewed at the beginning of the monitoring period and again at the interim point, after Property B received the heating upgrade. The tenants were asked to think about their homes prior to the installation of the new heating system and following the installation.

Conditions before the SWM work

Prior to the heating upgrade, both tenants reported that they heated the house by having the back-boiler on to power the radiator in the hallway, leaving the doors open to the bedrooms and bathrooms upstairs so that the heat rose up to these rooms as well. During cold periods, the tenants in Property A left the boiler on a medium setting overnight, whilst in Property B the boiler was turned off during the night. Both tenants used the gas fire in the living room to heat the room whilst it was occupied, turning it on until the room was warm, and then turning it off.

Both sets of tenants expressed the view that they were used to the old heating system and conditions in the house, and weren't unhappy with it at the time. In the interview with tenants in Property B prior to their heating upgrade, they were generally happy with the existing heating conditions:

“Really and truly, it's not that bad – we have one radiator, but it warms all through the house, except [the living room], where we have the fire. ... It's nice – it's not a cold house.”

“We've been fine. We didn't want to have the new heating, actually, but we've got to have it.”

Recalling the conditions in the house before the heating upgrade, the tenants in Property A were similarly happy with the heating system at the time, but did recall periods when the house was cold:

“The last two years have been extraordinary – the weather – I’ve never known it like this. You don’t know what you’re missing until it’s been put in... we always thought the heating was adequate.”

“Looking back, I remember it being somewhat chilly in the bedroom – but we were tougher people, when you’re younger you don’t mind! When you’re older, you don’t move so much so you don’t have that body warmth.”

“It’d been really cold – the windows were shut but the cold was still coming through because there’s no heating upstairs.”

Neither properties suffered from damp or mould, with only slight condensation in the bathroom and kitchen whilst bathing/cooking etc. Both properties were fitted with a vent to the outside in the living room, which was installed as a safety feature for the gas fires as protection against carbon monoxide poisoning. However both tenants reported that this vent caused a considerable draft in the living room, making it colder.

Neither of the tenants had significant concerns about their energy bills, but both tried to save energy (for example by turning off lights). Both tenants reported that they always put the heating on when it was cold, despite the potential cost.

However, they were both aware of rising energy costs:

Property B:

“The thing is, you’ve got to have [the heating] so there’s no point arguing. Can’t manage without heating – can’t be cold.”

Property A:

“If you need the heating on, I have it on... With gas going up, it’s kind of in the orange now – if it goes up any more we’ll have to cut back, if it gets any dearer.”

Both sets of tenants like to have fresh air in their homes, and open the windows daily in the bedroom (and sometimes through the night) and bathroom. They also regularly open the windows in the living room and kitchen.

Health and wellbeing

In terms of health, one of the tenants in Property A is treated for diabetes and high blood pressure, and also has arthritis. They reported that the arthritis is “worse in the cold. It starts it off when it’s really cold”. The tenant was also admitted to hospital the previous year with pneumonia and a chest infection. In Property B, again one of the tenants is treated for diabetes and high blood pressure.

Previous research on the health impact of housing improvements shows that cold internal temperatures are associated with increased risk of cardiovascular illness, particularly for those with pre-existing cardiovascular conditions. There is also evidence of a relationship between the energy efficiency of housing and winter respiratory disease (such as flu and pneumonia) among older people.¹⁸ The tenants in Properties A and B therefore have health conditions that make them more at risk of ill-health as a result of exposure to cold internal temperatures; therefore the increased indoor temperatures in the home as a result of the SWM work could result in potential health improvements.

Property A were particularly aware of the risk of cold temperatures on health:

“This winter – the duration of the low temperatures – you’ve only got to slip up once and you’ll get the flu. You’ve got to keep warm.”

“But now we’ve got better heating, and we’ve got a very slight temperature in the bedroom – that pleases me because of my wife’s arthritis”

However, at this stage it is difficult to detect any change in health conditions, and the tenants did not report any changes.

In terms of other health concerns, the tenant in Property A identified that the old gas fire and back boiler caused concern because of the potential of carbon monoxide poisoning:

“Gas is a danger – you’re thinking about carbon monoxide – I’m on standby, checking my boiler, checking the flame’s blue or yellow. We’re not worrying so much... the pressure’s taken off, and you realise you were worrying about it.”

The installation process

The general process for heating upgrades is that, following the initial stock condition survey of the house, tenants are notified what work they are due under the Secure, Warm, Modern programme, and have the opportunity to refuse the work. If they go ahead, they are notified by the contractors three weeks ahead of the due date for installation, and again a week before. The heating system upgrade is scheduled to take between one to three days.

In these cases, the heating upgrade required that the old gas fire, back boiler and radiator were taken out, and replaced with a new boiler in the kitchen, electric fire in the sitting room (mainly for aesthetic purposes), new radiators around the house and necessary pipe work.

18. Further details on the health impact can be found in the Decent Homes Impact Study: Health Report

Both sets of tenants had some concerns about the work prior to the installation. In Property A, the tenant commented that it was a “necessary stress”. Both were concerned about the disruption and upheaval caused by the work.

However, both sets of tenants were very happy with the process when it took place. In both cases the work was completed in one day. Both tenants commented on how hard the contractor team worked and that they were well-mannered and polite.

Property A:

“I was amazed, because they put the heating in in one day – I was absolutely flabbergasted. And the quality of the workmanship, pipe work is very good. They really worked hard and were simply well mannered.”

Property B:

“They’re really good – they did the plumbing all in one day, and the next day the electrician came and the builders to fill in where they’d drilled... And they did exactly what I asked. ...It was great – we couldn’t fault those lads at all.”

There was some effort for the tenants to move furniture and take up the carpets, and put things back afterwards- but generally they felt that this was manageable.

Experience with the new heating system

Property A has been using the new heating system since it was fitted in January. Over this period they have had the main boiler thermostat on a low setting, and the heating on constantly, controlled by the wall thermostat. They have found that they get “a constant temperature around the house” and that “the beneficial effect is the radiator in the bathroom”. It has also been beneficial in warming the bedrooms.

There is mixed understanding of the heating controls, with the tenants in Property A commenting that the wall thermostat is “easy to manage, very easy. [For the old gas fire] you had to get down on the floor, take the door off”. However, the tenant felt that they “haven’t mastered it yet”; for example, they commented:

“All the radiators have a thermostatic valve – I’ve not got used to that yet. [The contractor] says if you’ve got the doors shut, it will work – but if it’s open, it gets confused.”

The tenants in Property B have had limited experience with the new heating system, since it was fitted in March and external temperatures began to improve, lessening the need to use the heating. They haven’t used the timer or the thermostat controls, but manually turn the heating on and off as required. They have had the heating on occasionally in the evenings to heat the living room and bedroom, and have also put the heating on in the bathroom. They have found that:

“And it’s better with [the radiator in the living room], even with the sofa in front, we still feel the difference in the atmosphere – you know, it’s warm. It’s quite warm enough... But it does make a big difference in the bathroom – to walk in, and it’s warm”

Speaking about the heating system controls, the tenants stated that *“it’s simple to use”*.

Both sets of tenants commented that one of the major changes was to the hot water heating; firstly, the hot water is independently controlled from the heating, so that the water and heating can be controlled separately (unlike the old boiler system). Secondly, both tenants commented that it was much quicker now to heat a tank of water for the day, requiring only 30 minutes whereas previously the back boiler *“took hours to heat the water tank up”*.

Expectations for the new system

Now that both properties have had the new heating system installed, they were asked about their expectations for the future regarding the heating:

Property A:

“I think we’re going to save money – one of the heating guys said that when you burn gas on the old boiler you get 55p worth from the gas [from every £1], and with the new one you get 95p.”

Property B:

“We’re not used to all the heat. But no doubt when it gets cold we’ll be glad of it.”

Conclusions from the case study

Despite limited expectations from the heating upgrade, tenants have noticed the difference the new heating system has made:

Both sets of tenants were at the time happy with the old heating system, having had the same heating system for the 30 years that they’ve lived in the property, and felt some trepidation at the prospect of having the heating replaced and the upheaval this would cause. However, in both properties the process of having the heating fitted went smoothly, and they are happy with the results.

In Property A they have noticed the difference with the new system, with the particular benefits being the increased warmth in the bedroom and bathroom. The house is kept warm at a constant temperature, even through periods of cold weather outside. In Property B, the tenants have used the system intermittently since the new heating has been installed (as the weather has got warmer), but have found the main aspect they have noticed is that it is warmer in the bathroom.

The level of heating and therefore internal temperature depends on the occupant’s personal choice, but is also affected by tenants’ interaction with the heating controls:

In Property A, the new heating system is switched on constantly, using the wall thermostat in the hallway to control the temperature. The house is kept at a high internal temperature, between 2-3°C over the recommended temperature for the living room and bedroom. This appears to be partly from personal choice, with the tenants preferring to keep warm and aware of the risk of cold temperatures on their health.

However, it may also be due to incomplete understanding of how to best use the controls on the new system, such as the wall thermostat and the thermostatic radiator valves. As well as having the heating turned on, at the same time the windows are regularly open in the bedroom, bathroom, living room and kitchen. In the face of the apparent complexity of the heating controls, the tenants instead use basic means of temperature control, such as opening the windows. However, this allows the heat to escape and means that the boiler will have to be working hard to maintain the temperature at the level set on the thermostat, resulting in wasted energy use.

In Property B, the house is colder than the recommended temperatures, with the bedroom in particular dropping to low temperatures when the weather is cold outside. This is partially due to tenant choice in choosing a temperature that is comfortable to them, but also reflects the lack of heating options in several of the rooms, such as the bedroom.

In this case study, the energy efficiency effects from way the heating system is used outweighs the impact of infrastructure improvements:

With the internal temperature kept high, Property A has higher gas use and costs than Property B (and higher than the national average), despite the higher efficiency boiler. The upgrade from a partial to a full central heating system means that there is a potential for higher energy use overall, as the system has to heat radiators in all the main living areas, rather than just the one radiator in the old system. However, Property A has seen a decrease in its gas use since the same period the previous year, when they had the old heating system.

Although the old boiler was relatively inefficient, their limited use of the heating means that Property B's total gas use is lower than Property A's. This demonstrates the important factor of occupant choice and behaviour in achieving energy efficiency savings. Due to limited use of the new system since it has been installed (as the weather has got warmer), it is difficult to tell at this point whether the new heating system has made a difference to energy use in Property B so far. This will become clearer over the next heating season (October 2011 – May 2012) when Property B's energy use with the new system can be compared to the previous year's use with the old boiler.

To tackle fuel poverty, the energy efficiency element of the 'fuel poverty triangle' needs to take into account both the physical condition of the property and the energy behaviour of the occupants:

The case study has demonstrated the importance of the relationship between the actions of the occupants and the installations fitted on the actual efficiency gains seen. This widens our understanding of the fuel poverty triangle, adding a further dimension to the 'energy efficiency' factor which needs to account for both the physical changes made to the property and the occupants' interaction with the technology; both of which affect the efficiency with which energy is used in the home.

Conclusions and recommendations

Summary of findings

NCH's Secure, Warm, Modern programme aims to bring Nottingham's council-owned stock up to the Decent Homes standard, which includes the responsibility to ensure that all properties provide a reasonable degree of thermal comfort. Up to April 2011, NCH has fitted new A-rated double-glazed windows to 13,700 properties and upgraded 7,380 heating systems to full central heating systems, including replacing inefficient boilers with new A-rated boilers.

The property survey data collected by NCH allows us to model the impact of the work on the improved energy efficiency of the properties, based on the SAP ratings taken. This analysis shows that both the new windows and boilers increase the energy efficiency of the properties. The heating upgrade has a larger impact, increasing the SAP rating on average by 13.5 points (on 100 point scale) placing these properties in the 'very energy efficient' category, compared to the windows alone which increase the SAP rating by 4 points. On average, therefore, the heating upgrade leads to a decrease in CO₂ emissions of 1.6 tonnes per year per property, and the windows upgrade to a decrease of 0.5 tonnes per year for each property.¹⁹

Across the properties surveyed, the SWM programme to date has cumulatively raised the energy efficiency of the properties from an average SAP rating of 60 prior to the work, to an average rating of 68 following the work, leading to a total reduction in CO₂ emissions of 15,445 tonnes of CO₂ per year. This is a 15% decrease in emissions from NCH properties. Applying this to the remaining work planned under the SWM programme, it is estimated that the total CO₂ savings will amount to 43,500 tonnes per year from 2013 onwards. These reductions will account for achieving 17% of One Nottingham's target for reduction of domestic CO₂ emissions, and 9% of the total target for CO₂ emissions.

This is likely to have an impact not only on carbon emissions and the environment, but also on tenants' fuel bills and fuel poverty levels. Following the SWM work, only 23 properties had a SAP rating of less than 35 (part of the local authority's definition of fuel poverty), compared to 291 prior to the work. Across the city, fuel poverty decreased from 12% of the population to 6.8% over the same period as the SWM was carried out.

Estimations based on the type of work carried out under the SWM programme show that tenants could save between £95 and £223 each year on their fuel bill as a result of the new double-glazed windows, and £225 a year from their energy bills as a result of replacing an old G-rated boiler with an A-rated boiler. Totalling these savings up across the properties that have received SWM work to date, it is estimated that tenants will cumulatively save £3.5m a year on fuel bills.

19. Although upgrading the windows delivers less carbon savings than heating upgrades, there are other benefits to the window replacements such as increased security, decreased noise and less condensation and damp. See NCH's Decent Homes Impact Study: Crime Report. Available online at: www.nottinghamcityhomes.org.uk/improving_your_home/secure_warm_modern/impact_study.aspx

The above analysis is based on typical energy efficiency improvements and cost savings based on the basic property features. However, it does not take into account the effect of the occupants' behaviour and activity on the efficiency of the installations and the property overall. There is evidence to suggest that actual energy and cost savings made by social housing tenants do not match the theoretical gains as modelled above. The case study provides a detailed insight into a small number of properties, to understand how the occupants may effect the energy efficiency changes modelled above.

The main learning points from the case studies were:

- The occupants make a choice based on personal comfort on the temperature of their homes, which can significantly affect the amount of energy they use. However they may be unaware of (a) the actual temperature in the house and (b) the potential health impacts of having the property either too cold or too warm
- The new heating controls may appear to be complicated to the tenant, with many potential options regarding the boiler thermostat, wall thermostat, timing vs. manual controls, and the thermostatic radiator valves. Tenants appear to have been given different advice by the installers on the best/most efficient way to manage the system. Instead of engaging with this technology, tenants may resort to basic measures such as opening windows, leading to inefficient energy use
- With two sides of the 'fuel poverty triangle' set to worsen for many NCH tenants in the near future (with rising energy costs and changes to the benefits system), it is all the more important to focus on both aspects of energy efficiency – improving the property infrastructure, and enabling tenants to use energy efficiently – to mitigate the potential increase in fuel poverty.

Therefore although significant improvements have been made in the energy efficiency of core elements of the infrastructure under the SWM programme, the choices and behaviour of tenants make a significant difference in the actual energy efficiency gains seen. Comparing the two case study households, this behavioural aspect outweighs the impact of the retrofit work; resulting in the property with an A-rated boiler and full central heating system using more energy than the neighbouring property, with the same build specifications but with a G-rated boiler and partial heating system.

Learning points and recommendations

This analysis has demonstrated that work completed under the SWM programme has significantly improved the potential energy efficiency of the stock, but in order to realise these efficiency gains the retrofit work needs to be combined with education and behavioural change amongst the occupants so that they can make the most out of the potential savings.

The key points that would need to be included in an education/communication programme with tenants are as follows:

- Information on healthy indoor temperatures (21°C in the living area and 18°C in the bedroom) and the detrimental health impacts of maintaining temperatures below or above this
- Instructions on the best way to use heating controls, including boiler and wall thermostat, heating timer controls, water heating controls, and thermostatic radiator valves
- Other behavioural aspects e.g. ventilation, choice and use of appliances
- Implications for energy use and cost.

However, as well as making the tenant more aware of the technology, there is also a case for making the technology more user-friendly. Consideration could be made of how to translate the technical 'language' of the operational system into something that has everyday meaning. For example, the current thermostat dial simply displays a range of temperature settings in degrees Celsius, but gives no reference point to any average or recommended range (such as 18-21°C) for tenants to 'translate' the wide range of temperature options into a setting that is considered normal/ideal. Therefore helping the technology to communicate better with the tenant would be a complementary step to the tenant education described above.

The case studies will continue over the next heating season (October 2011 – May 2012), with the addition of two further properties which will not yet have received SWM work for comparison. So far, the case studies have focused on monitoring current conditions and tenant behaviours, without any attempt to influence this. There may be the potential to introduce an element of education / behavioural change to the case studies, and to monitor the impact of this on energy efficiency.

Recommendation 1: Develop a range of communication materials and methods for helping occupants make the most of any energy efficiency improvements in their home, and test their effectiveness with tenants.

NCH's role in reducing fuel poverty of its tenants could also be enhanced by building on the Debt Advice Service that it already operates. This service could also include advice and information relating to reducing fuel poverty, such as energy saving advice, support in comparing and potentially switching energy tariffs, and advice on relevant benefits such as the Winter Fuel Payment and the Cold Weather Payment.

Recommendation 2: Include energy saving advice and information on support for fuel costs (e.g. winter fuel and cold weather payments) in NCH's Debt Advice Service

NCH has developed a Low Carbon Roadmap for future investments in the housing stock to improve energy efficiency. This is based on modelling of the potential energy improvements that could result from the investments; however, this research has shown that actual energy savings may differ from those predicted by theoretical models. This may be due to inefficient use of the new installations by tenants (as discussed above), or due to tenants taking the efficiency savings in the form of increased indoor temperature, instead of reduced costs.

There is potential to investigate these issues in an extension of this research which has been initiated in partnership with Nottingham Energy Partnership and Nottingham University, looking at properties that are receiving SWM work and internal insulation as part of the CESP programme in Aspley. The approach is similar, starting with four case study properties that will be monitored (e.g. for energy use, internal temperature and humidity, and thermal imaging) before and after the low carbon retrofit work. However, an additional focus will be on gaining a wider understanding of tenants' knowledge and motivations for energy behaviour, and to test a number of information/communication strategies for their effectiveness in achieving behavioural change. This will be evaluated and monitored through a larger sample of questionnaires administered to tenants in the area.

Recommendation 3: Continue to monitor the actual impact of energy efficiency programmes delivered by NCH on carbon emission reductions, tenants' energy awareness and fuel bills



Whilst the research has shown that the SWM programme has improved the energy efficiency of the property, this is only one side of the 'fuel poverty triangle'. To establish the impact on fuel poverty overall, further data is needed on energy prices and income levels. At present, there is a lack of up to date²⁰ detailed data (for example by area within Nottingham city) on fuel poverty prevalence, and Local Authorities are no longer required to collect data on National Indicators of fuel poverty.²¹

As fuel prices are set to increase considerably in the near future, it will be important for NCH to understand the distribution of fuel poverty across the city, including understanding how changes in energy use versus changes in energy costs contribute to this. This information is of value to NCH as this may impact on: firstly, tenants' financial capacity and ability to pay rent; and secondly, the design and priority areas to target for future energy improvement initiatives.

Recommendation 4: Develop better data on fuel poverty prevalence (or suitable proxy) to monitor distribution and changes in fuel poverty (accounting for the impact of both changing energy use and changing prices in determining fuel costs) to inform NCH's future financial advice/energy efficiency programmes and initiatives

A potential negative environmental effect of the SWM programme is the creation of large amounts of construction waste. This is mitigated to some extent by the level of recycling of these materials. There is currently a high level of recycling, which should be maintained.

Recommendation 5: Continue the commitment in current and new contracts to recycle waste and investigate options for items that are currently not recycled or reused to find ways to further reduce landfill deposits



20. The Centre for Sustainable Energy created the Fuel Poverty Indicator for all Lower Super Output Areas (LSOAs) in England in 2003, but advises that increases in energy prices since then mean that fuel poverty has at least doubled and that the increase in fuel poverty has been uneven. See www.fuelpovertyindicator.org.uk/
21. Such as NI 187: Tackling fuel poverty - % of people receiving income based benefits living in homes with a low energy efficiency rating

Health and wellbeing



**Nottingham
City Homes**



Chapter summary

Social inequalities and health

The inequalities in health seen in the UK – in terms of mortality, life expectancy or health status – are closely related to disparities in social and economic circumstances.

In Nottingham, those living in the wealthiest neighbourhoods live on average 10 years longer than those from the most deprived neighbourhoods.

Tackling inequality in health is now one of the primary objectives for the NHS, but the core argument of the Marmot Review (2010) is that *“Action on health inequalities requires action across all the social determinants of health... Action taken by the Department of Health and the NHS alone will not reduce health inequalities.”*¹

Some of the poorest health outcomes in Nottingham are seen in estates with a high proportion of social housing. This is because of the way social housing is prioritised for the most disadvantaged, including those with medical needs.

As a result, many of the Nottingham City Homes estates are in areas scoring amongst the worst 10 percent in England on the national health indices. Because of this, NCH is committed to its role helping improve the health of our tenants.

Housing is one of the factors that determines health outcomes. Evidence shows that poor housing leads to poor health. Poor housing quality, including cold, damp and insecure conditions, has a negative impact on both physical and mental health.

The Secure, Warm, Modern programme in Nottingham

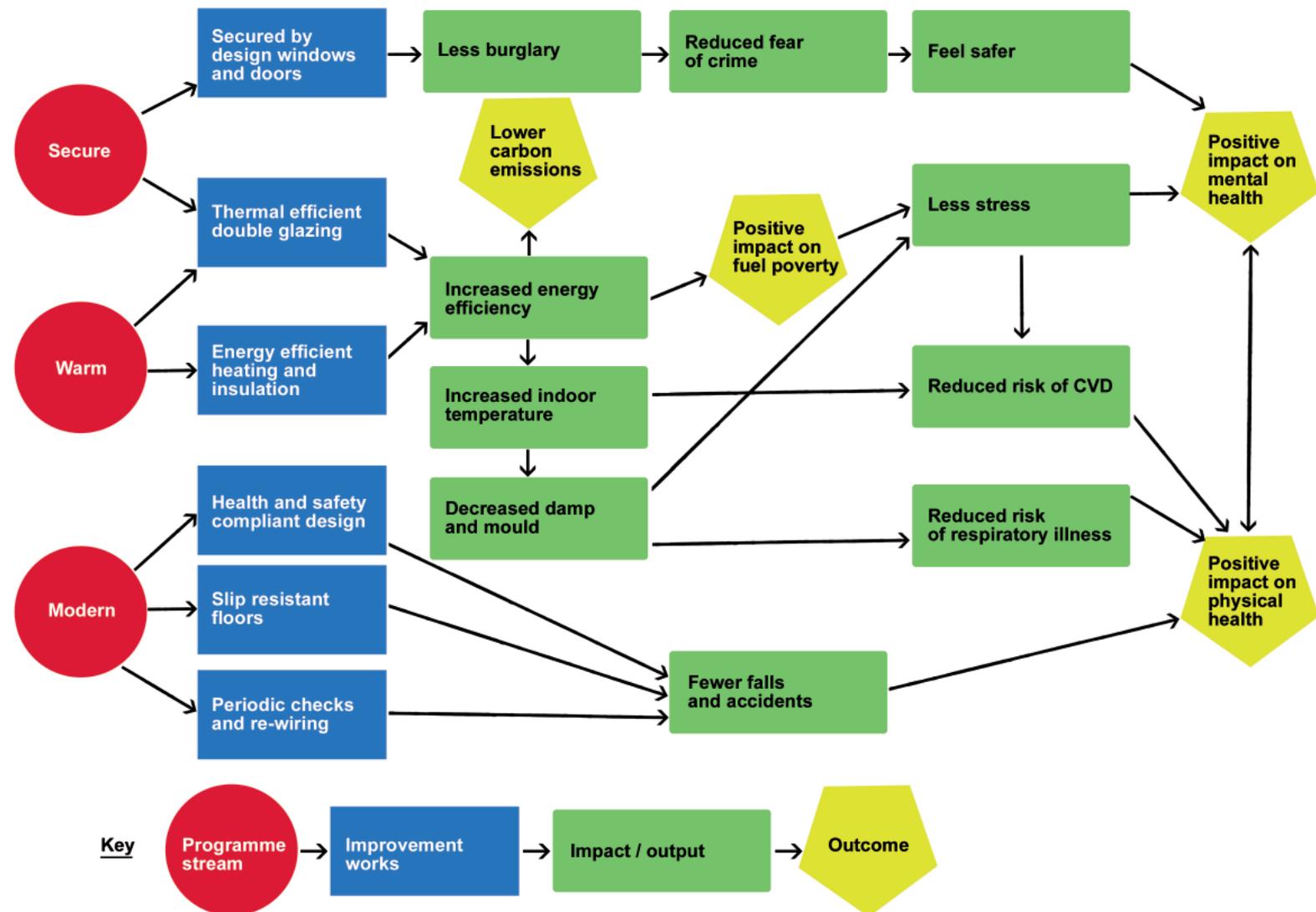
Nottingham City Homes' Secure, Warm, Modern programme aims to bring Nottingham's 28,500 council homes up to and above the national Decent Homes standard. The work began in 2008, with a total planned investment of £187 million between 2008 and 2015, delivered under the following streams:

- Nottingham Secure – replacing all single-glazed windows with 'Secured by Design' double-glazed units in around 15,300 properties
- Warmth for Nottingham – improving heating systems for 19,700 properties
- Modern Living – making internal improvements including new kitchens for 17,000 homes and new bathrooms in 12,700 homes.

NCH wanted to understand what the impact of this significant investment in the quality of council housing. In partnership with Nottingham Trent University and Nottingham City NHS, a Health Impact Assessment has been carried out to understand the health impact of the Secure, Warm, Modern programme.

Health impact map

The health impact map was developed to show the anticipated causal mechanisms and expected health outcomes as a result of the housing improvements carried out under the Secure, Warm, Modern programme:



The evidence for the HIA was gathered through:

- A review of previous studies relating to the health impact of housing
- Analysis of local demographic and hospital admissions data for relevant health conditions
- Modelling of the health impacts of removing identified health and safety hazards
- Interviews with NCH tenants and local health professionals.

Impact on physical health

Cardio-vascular disease

Cold temperatures cause raised blood pressure and increased viscosity, and has been shown to cause hypertension, ischemic heart disease and strokes.

Around a third of all Excess Winter Deaths are caused by cardio-vascular disease.

Falls and accidents

45 percent of people aged 80 and over are at risk of falling, and between 10-25 percent will sustain a serious injury as a result. Hazards for trips and falls in the home are a causal factor.

Over 2 million injuries from accidents occur in the home each year. Fatal accidents are more common in the winter, as cold reduces body temperature and so mental function, dexterity, strength and sensation.

Respiratory illness

At temperatures below 16°C resistance to respiratory infections is reduced.

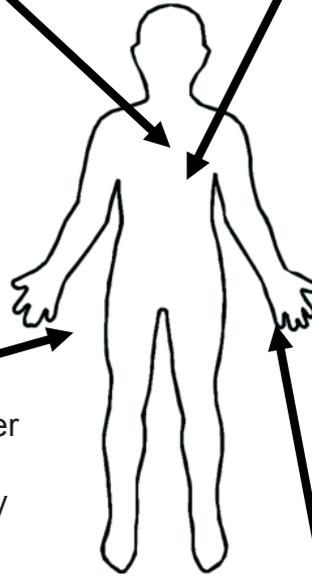
Cold conditions also impair lung function and can trigger bronchoconstriction in asthma and COPD.

Damp and mouldy conditions can also cause asthma symptoms and contribute to respiratory infections.

Respiratory disease accounts for over a third of all Excess Winter Deaths.

Joints and mobility

Cold conditions are thought to worsen pain associated with arthritis and rheumatism.



Estimated improvements in physical health after Secure, Warm, Modern:

- The World Health Organization found that children living in homes with low quality heating systems showed double prevalence for respiratory problems. By improving heating systems, SWM is therefore estimated to have reduced 1,039 cases of respiratory illness in children living in NCH properties
- NCH identified 235 serious fall hazards in NCH properties prior to SWM; by removing these hazards, it is estimated that this has avoided 12 hospital admissions a year
- NCH identified over 2,000 hazards that could cause accidents, such as electrical and fire hazards. By removing these hazards, it is estimated this has avoided 144 hospital admissions a year. This could save the NHS around £175,000 each year in treatment costs
- It is estimated that SWM has saved two lives a year by reducing excess cold conditions in the home through SWM. There are a total of 128 Excess Winter Deaths each year across the whole of Nottingham (2002-08).

Impact on mental health

Security and fear of crime

A lack of a sense of safety in the home can lead to anxiety and problems with nerves, whilst improvements in safety and security have led to a significant reduction in self-reported mental health problems, for example reducing self-reporting mental health problems from 52 percent to 41 percent of adults.

Fitting 'Secured by Design' windows in NCH properties reduced burglary by 42 percent on two sample estates where the windows were fitted, compared to a 21 percent reduction city-wide over the same period.

"I had been burgled, and every night I checked everything, it was like an obsessive thing... So from the day I had my windows I felt 100 percent safe".

Damp and mould

Damp and mould may have a large negative affect on mental health. The WHO found that extensive exposure to dampness and mould increased the chance of depression by 60 percent.

NCH found that around 200 homes had severe damp and mould prior to the Decent Homes work. Based on the prevalence of depression in Nottingham and the findings from the WHO above, it is estimated that removing this damp and mould could lead to a reduction of 38 cases of depression amongst NCH tenants.

"I was just miserable, you know, because it was cold and damp and then you'd have to be putting on loads of clothing and things like that, you know, it was like miserable and gloomy I should say."

Excess cold and fuel poverty

Nottingham City 2011 Joint Strategic Needs Assessment on adult mental health reported that those with cold homes or experiencing fuel poverty have a four-fold increased risk of depression or anxiety. NCH found that over 5,000 homes were suffering from excess cold prior to the Decent Homes work; it is estimated that remedying this excess cold (and potential fuel poverty) could lead to a reduction of around 1,400 cases of depression amongst NCH tenants. This could save the NHS almost £200,000 in treatment costs.

The Energy Savings Trust estimates that fitting double-glazed windows can save between £95 and £223 a year, and upgrading the central heating to an A-rated boiler could save £225 a year in fuel cost. Across all NCH tenants that have received new windows or boilers, this amounts to a potential collective saving of £3.5m a year on fuel bills.

"You'd have to put more money in just to keep it warm... so obviously you're trying to save as much as you can, so that was a big hole in my pocket... The [gas payment] reduced down from £30 to £15, so I just top up every week and it has saved me a lot of money"

Conclusions and recommendations

There is a clear social gradient in health in Nottingham, with those living in the most deprived areas having worse outcomes across a number of health conditions and overall life expectancy. Housing conditions are one of the multiple factors of deprivation that can impact negatively on health outcomes.

Addressing housing conditions alone has a moderate impact in improving the health of adults, due to the complexity of the multiple causes of ill-health. However, the cumulative and long-term effect may well be significant; for example, addressing housing conditions has a more significant impact on children, thus potentially resulting in a life-time of savings in terms of health costs.

A number of national studies have calculated the cost implications of poor housing that falls on the NHS as treatment costs; these estimates range from £1.5 billion to £2.5 billion a year. In this research, a small number of examples were selected for which a measurable change and cost impact for the NHS in Nottingham could be calculated; the costs saved as result of addressing serious hazards in the home, reducing asthma in children, and relieving depression from damp and mould, excess cold and fuel poverty total almost £700,000. Just this small number of examples account for 1 percent of Nottingham City PCT's cost of provision for 2010/11 (totaling £56.5m). In addition, the improvements made to the NCH properties will make a long-term difference to these homes (for example, the anticipated life-span of a new boiler is 15 years) and so the health benefits will accumulate over this time.

The core recommendations, and a number of examples of how this could be applied based on the evidence outlined throughout the HIA, are as follows:

1. Maximise opportunities to continue to lever in health benefits through improvements to the quality of council housing stock, through NCH's Asset Management Strategy. Examples include:
 - Supporting the neighbourhood renewal project to build 500 'lifetime homes' and minimise the negative wellbeing impact of the moving process
 - Building cost-effective health and safety features into ongoing asset management programmes, e.g., hard-wired smoke detectors, thermostatic mixer valves.
2. Develop understanding and integrate delivery of public health outcomes through wider services such as housing, by engaging with the Health and Wellbeing Board and Clinical Commissioning Groups. For example:
 - Contributing to local strategies, such as the Joint Strategic Needs Assessment (JSNA) and Joint Health and Wellbeing Strategy (JHWS)
 - Engaging with GPs and Clinical Commissioning Groups through information sharing and building relationships at a neighbourhood level.
3. Consider how NCH's engagement with tenants through existing services could potentially complement or support public health initiatives. Examples include:
 - Facilitating tenants' engagement with public health services, such as smoking cessation, weight loss, Occupational Therapists, etc
 - Supporting the continued delivery of the Nottingham On Call telecare alarm service.

Introduction

Nottingham City Homes, in partnership with Nottingham Trent University, are conducting a two-year impact study on the wider social benefits of the Decent Homes programme, known in Nottingham as the Secure Warm Modern (SWM) programme. The research investigates the impact of this significant investment in Nottingham’s council housing properties on social outcomes such as crime, energy efficiency and fuel poverty, and on the local economy and employment. This report focuses on the impact of the SWM programme on the health and wellbeing of council tenants in Nottingham.

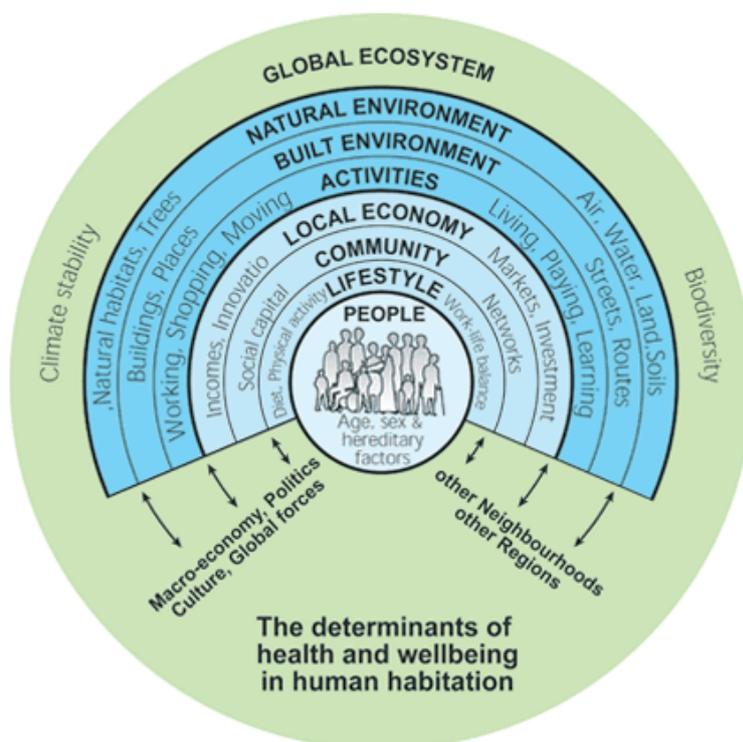
This health impact report has been produced in partnership with the Directorate of Health Equality at Nottingham City NHS. It shows the important relationship between housing and health; it is therefore an initial platform from which to shape ongoing partnerships between housing providers and health service providers. Furthermore, it acts as a guide to future investment decisions that will ensure that housing services are able to contribute to reducing health inequalities in Nottingham.

Social determinants of health inequalities

Marmot’s (2010) Strategic Review of Health Inequalities highlighted that the inequalities in health seen in the UK – in terms of mortality, life expectancy or health status – are closely related to disparities in social and economic circumstances. Those living in the richest neighbourhoods in England live, on average, seven years longer than those living in the poorest neighbourhoods in England. The difference in disability-free life expectancy is even greater at seventeen years.²

The Marmot Review emphasises the importance of a wider model of health, including the impact of socio-economic factors (Figure 1). It shows that there is a graded relationship between the level of deprivation, in terms of education, employment and working environment, and housing and neighbourhood conditions, and health outcomes; Marmot refers to this as the ‘social gradient in health’. The central message is therefore that: “Taking action to reduce inequalities in health does not require a separate health agenda, but action across the whole of society”³

Figure 1: Model of the wider social determinants of health (Dahlgren and Whitehead, 1991)



The recognition of the issue of health inequality in the UK is not new; following the Acheson Independent Inquiry into Inequalities in Health in 1998, the then government pledged to reduce the inequality gap (measured by infant mortality and life expectancy) by 10 percent between 1997 and 2010. However, a recent report by Sheffield and Bristol Universities⁴ showed that the health gap between those from deprived areas and those from the most well-off areas is increasing, despite government interventions. Tackling health inequalities has become a core policy objective for the NHS, and is an important feature of plans set out for the Health Service under the recent white paper.⁵

In its Outcomes Framework the NHS states:

*Tackling health inequalities and promoting equality is central if the NHS is to deliver health outcomes that are among the best in the world. The social gradient in many health outcomes for people in disadvantaged groups and areas is a major driver of England’s poor health outcomes in comparison to other similar countries.*⁶

However, the Government has also been receptive to the message of the Marmot Review, that an approach is required that addresses all social inequalities as a route to reducing inequality in health. The Minister for Public Health, Anne Milton, stated that: *“We need a new approach to improve the health of the poorest, fastest. One that works across government to include factors that affect health that lie outside the NHS, such as poverty, housing, education and the environment.”*⁷

Health inequalities in Nottingham

In Nottingham, health inequalities are even greater than the national average, with a difference in life expectancy of ten years between the most deprived and the most affluent areas within the city (Figure 2).

Figure 2: Life expectancies across Nottingham wards (Source: Nottingham City PCT)

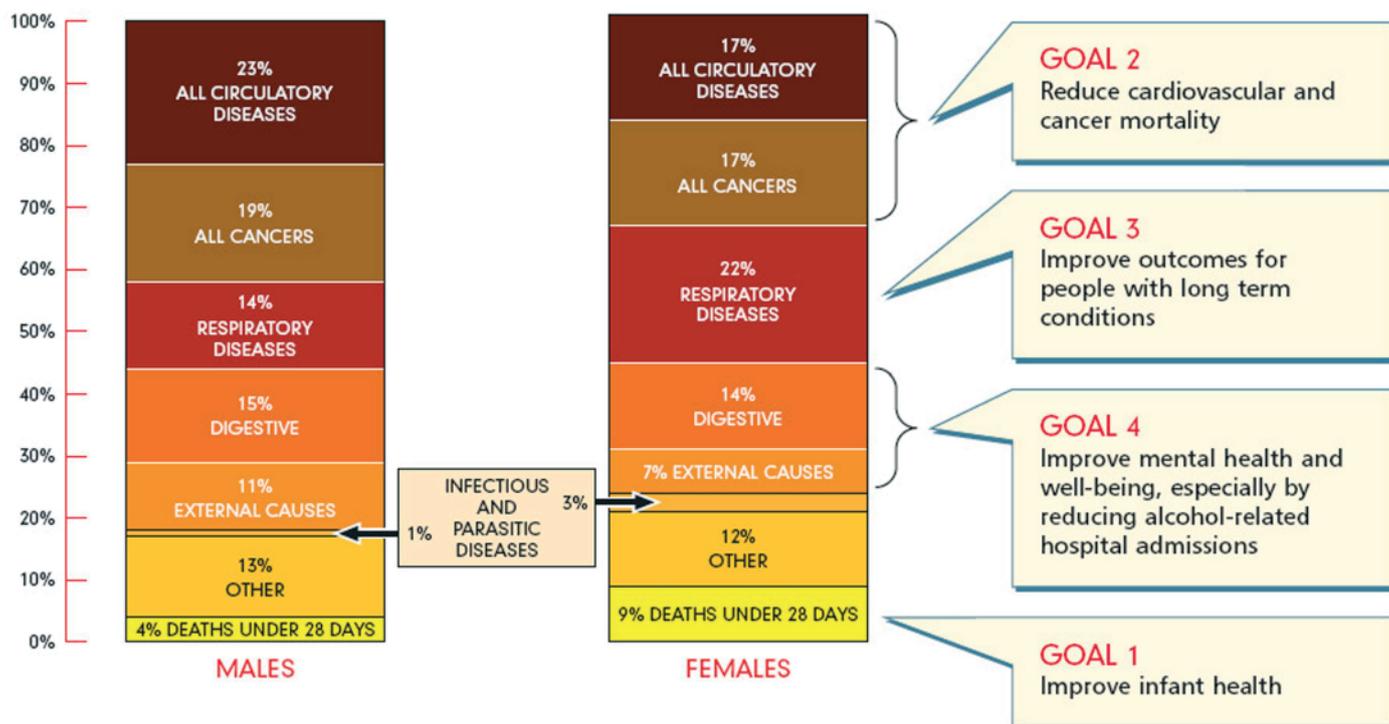
Catching the tram and bus through the health inequalities across the city - where a few miles down the road can mean a significant changes in years of life expectancy.



The figures against each ‘stop’ show average life expectancy at birth for males in Nottingham living in that city ward area. The average across the city is 73.5, compared with the English national average of 76.9, the worst average city rate in England of 72.5 and the best rate of 82.2.

Nottingham City NHS's plan for addressing these inequalities is set out in its World Class Commissioning: Five-Year Strategy 2009/10-2013/14 document. This identifies the health conditions that contribute to differences in life expectancy (Figure 3), and therefore towards the relevant goals for reducing inequality.

Figure 3: Causes of health inequalities in Nottingham (NHS's World Class Commissioning)

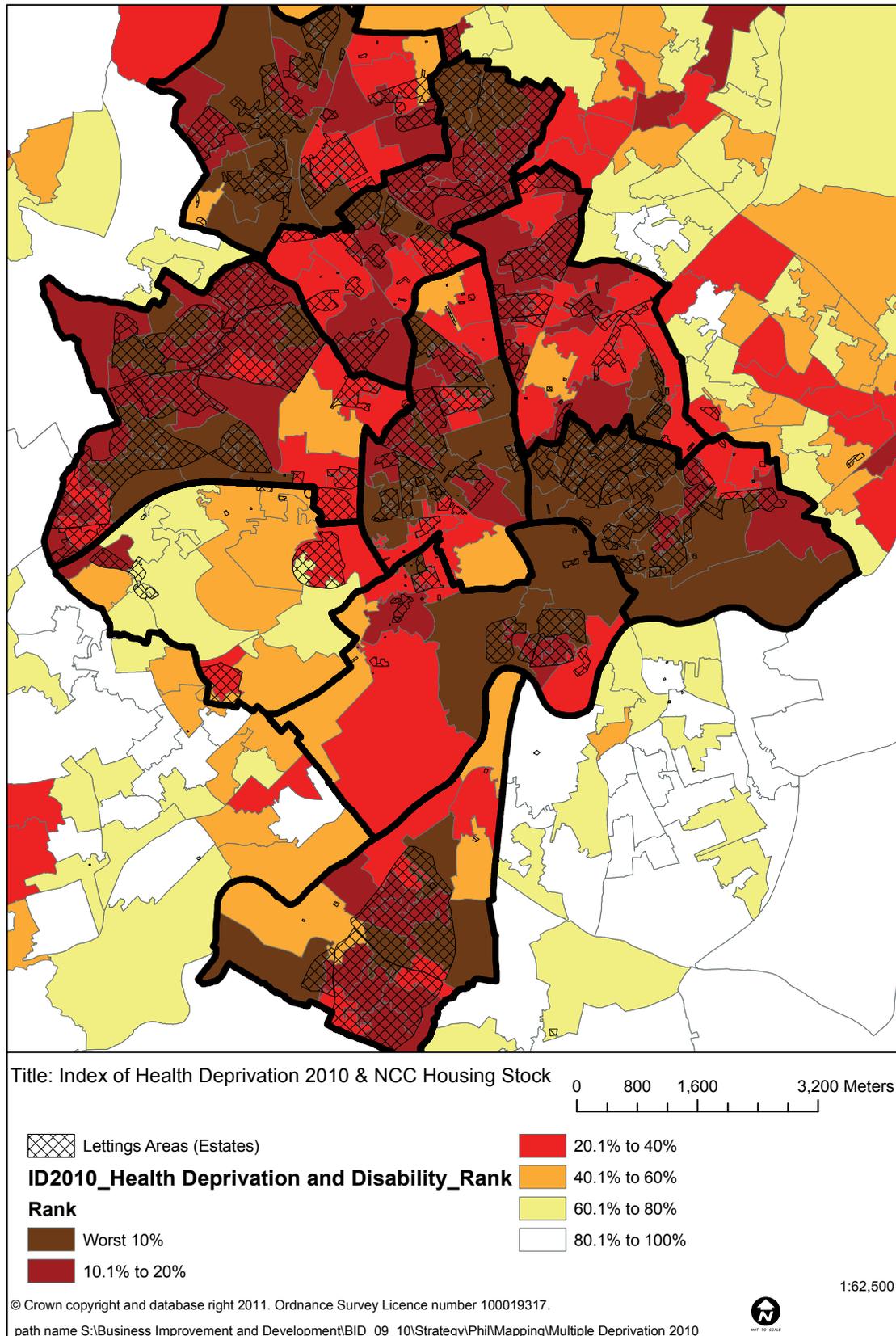


The social gradient in health can be clearly seen in Nottingham, with those living in social housing amongst the worst off. Occupants of NCH housing are likely to be affected by many of the social determinants of health identified in the Marmot Review, such as low educational attainment, unemployment and low incomes, which have a negative impact on the health outcomes of these tenants. The areas that are managed by NCH cover some of the most deprived areas in Nottingham (and indeed in England), across all of the Indices of Multiple Deprivation including income, employment, education and skills, crime and disorder, and health and disability.ⁱ

For example, currently 67 percent of NCH tenants meet the criteria for and receive Housing Benefit, which is specifically to support those on the lowest incomes and includes those who are unemployed. The correlation with poor health outcomes is also clearly seen; many of the NCH estates are in areas scoring amongst the worst 10 percent in England on the health indices (Figure 4). The ward with the lowest life expectancy in Nottingham is Bilborough ward, in which 41 percent of the properties are council houses; this is compared to Wollaton ward, where only 14 percent of properties are council housing and which has the longest life expectancy, with Wollaton residents living on average 10 years longer than those in nearby Bilborough.

i. The Index of Multiple Deprivation (IMD), produced by the Department for Communities and Local Government, measures seven dimensions of deprivation for every Lower Super Output Area (LSOA) in England and provides an overall index score and ranking.

Figure 4: Index of Health Deprivation (2010) and NCH estates



This relationship between council housing, deprivation and poor health is partly explained by the allocations system for council housing, which prioritises those most in need according to set criteria. In particular, the allocations system prioritises those who have no other housing options (who are therefore deemed to be 'statutory homeless'), and also those with medical housing needs (including on the grounds of disability or ill-health, or those ready for discharge from hospital whose current home is inappropriate).

The high demand for council housing means that individuals with these priority needs are likely to be awarded housing before those with a less immediate financial or health need. Therefore, the allocation system is likely to create a concentration of the most deprived, in terms of income and health, living in council housing.

In addition to socio-economic factors, there are a number of lifestyle factors that contribute to poor health in Nottingham, particularly among social housing tenants. Nottingham City NHS's Five-Year Strategy World-Class Commissioning identifies smoking, poor diet, low physical activity and heavy drinking as significant causes of poor health outcomes in Nottingham, particularly identified with those living in social housing.⁸

The impact of housing conditions on health

Another implication of this wider model of health is that housing and neighbourhood conditions have a direct impact on health and wellbeing (Figure 1). Therefore, NCH's housing management may have a direct implication for health outcomes, as a result of the conditions of both the houses and the neighbourhoods in which our tenants live.

The present report investigates more closely the impact of this second area: the impact on health outcomes of improvements in housing conditions as a result of the SWM programme. However, these findings are always in the context of the social gradient of health described above, in which many NCH tenants are already disadvantaged by the wider socio-economic determinants of health, as well as by lifestyle factors.

The Secure Warm Modern (SWM) programme

Nottingham City Homes' (NCH) SWM programme aims to bring Nottingham's 28,500 council homes up to and above the national Decent Homes standard.⁹ The work began in 2008, with a total planned investment of £186 million between 2008 and 2015.

The programme reflects tenants' priorities for the investment, and is therefore delivered under the following streams of work:

- **Nottingham Secure** – replacing all single-glazed windows with 'Secured by Design' double-glazed units in around 15,300 properties
- **Warmth for Nottingham** – improving heating systems for 19,700 properties and topping up loft insulation
- **Modern Living** – making internal improvements including new kitchens for 17,000 homes and new bathrooms in 12,700 homes.

The programme also aims to ensure that electrical wiring, external doors and loft insulation are adequate to meet the Decent Homes standard.

In addition, if a tenant identifies and indicates that they may have special requirements, a referral is made to an Occupational Therapist (OT), who then assesses the property and the needs of the tenant. The OT then recommends any special aids and adaptations required, which are undertaken alongside the SWM work. This has identified over 500 special adaptations, such as specifically adapting bathrooms or replacing baths with a wet-room, to be made over the course of the programme.

The SWM programme is now well under way. Between April 2008 – September 2011:

- 15,000 properties have had their windows upgraded and 3,000 doors have been replaced
- 9,500 heating systems have been upgraded, and 2,500 lofts topped up with insulation
- 8,000 kitchens and 6,400 bathrooms have been replaced
- 284 aids and adaptations have been made to properties.

Individual properties may have had some or all of these improvements. This is determined by a survey carried out on each property, which identifies what is required to bring the property up to the 'Nottingham Plus' Decent Homes standard. Each house is assessed against the Housing Health and Safety Rating System (HHSRS), designed to identify and then ensure that any potential health and safety hazards within homes are avoided. A 'hazard' is defined as any risk of harm to the health or safety of an actual or potential occupier that is attributable to the condition of the dwelling.

The HHSRS identifies 29 possible hazards, categorised in four groups: Physiological, Psychological, Infection, and Accidents.¹⁰ Each hazard is given a score based on the likelihood and severity of harm resulting from a particular hazard; those scoring above a certain level are classified as 'category 1' hazards, and are required to be addressed under the Decent Homes programme.

Housing and health – uncovering the evidence

The research was undertaken along the lines of a Health Impact Assessment (HIA), as presented by the World Health Organisation (WHO) and the NHS in the UK.¹¹ The stages of the HIA are:

Screening: assessing the potential for the programme to affect the population's health.



Scoping: setting out the foundations for the appraisal, including the potential health impacts.



Appraisal: gathering the evidence, both quantitative and qualitative.



Making recommendations: including reporting findings, and further engagement with stakeholders to influence future decisions.



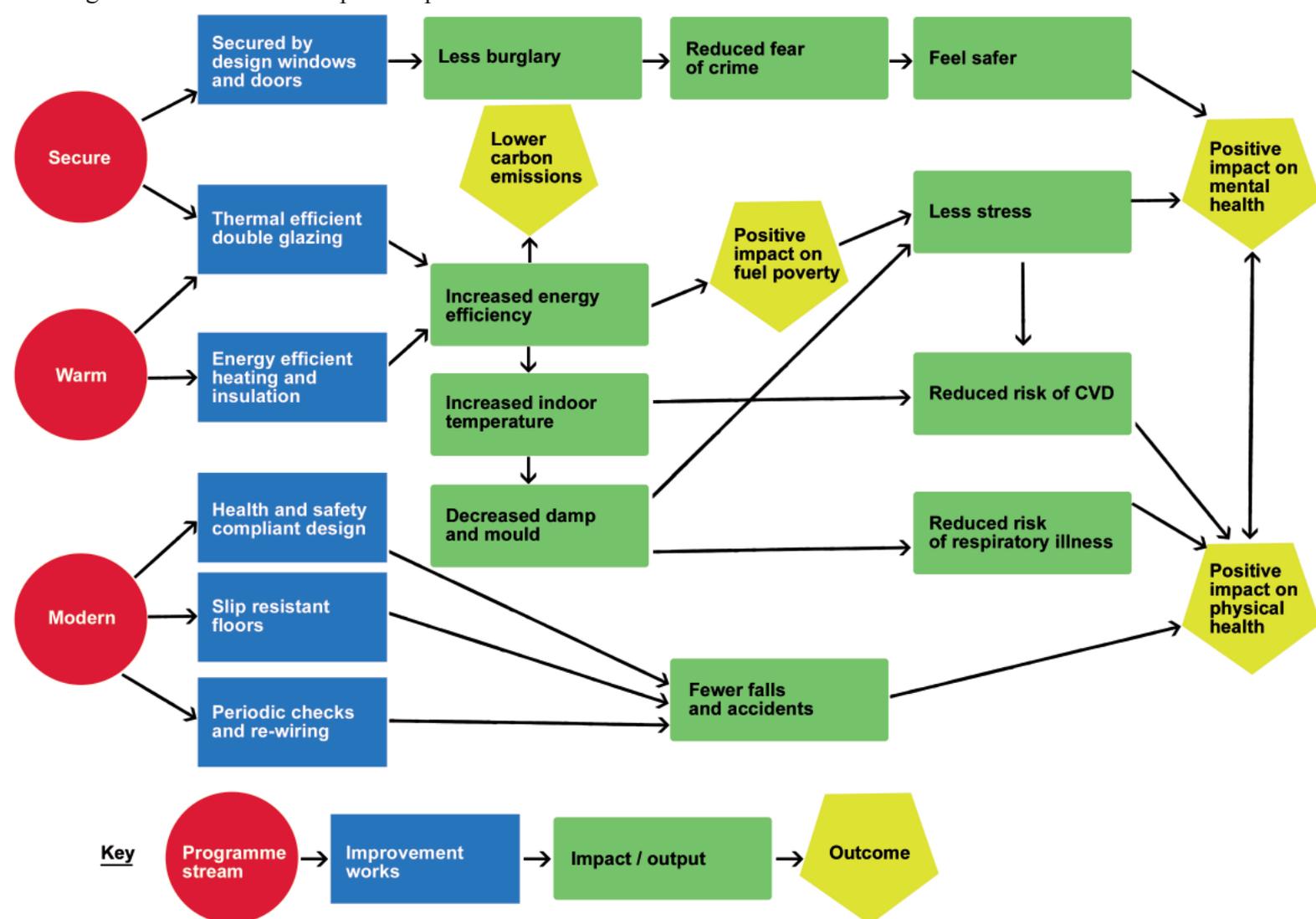
Ongoing monitoring and evaluation: to measure changes / improvements.

The health impact map

The screening stage identified that there was a large body of literature relating to the impact of housing on the population's health. This was further explored in the scoping stage, during which a health impact map was developed showing the anticipated causal mechanisms and expected health outcomes as a result of the housing improvements carried out under the SWM programme (Figure 5). This was developed from the initial review of the literature, where the relationship between housing and health is well recognised; there is a growing body of evidence supporting this relationship and the different mechanisms through which housing and the broader built environment affect health.

This impact map forms the basis of the appraisal stage, setting out the health outcomes and indicators further investigated during the evidence collection stage.

Figure 5: SWM health impact map



Appraisal methods

The appraisal has been carried out concurrently with the housing improvement programme, with three years of the SWM work having been completed and a further three years remaining. This provides a sample of properties that have had work completed, against a sample which have not yet had any improvements. It also allows any findings from the HIA to influence the remaining programme delivery.

However, there are a number of methodological difficulties in isolating the impact on health of the housing improvements:

- As outlined above, the relationship between health and housing is complex and there are many confounding variables involved. Poor housing conditions often co-exist with other forms of deprivation, such as poor education, unemployment, ill health, etc., making it difficult to isolate and assess the impact of housing alone on health
- Health impacts following housing improvement can sometimes take time to unfold, making the true effect of housing improvement impossible to assess in the short to medium terms. For example poor health in adulthood may be a result of poor housing conditions in childhood¹²
- The sample of properties available to compare outcomes either before/after the work or between intervention/control groups is limited by the time the programme has been running and the number of properties that have received the work. The small sample size makes it difficult to find statistically significant differences.

In light of this, the appraisal aims mainly to characterise and, where possible, quantify the health impact of the SWM programme. It therefore includes a variety of data collection techniques in order to attempt to triangulate the findings from each to reach a more robust conclusion.

The methods for data collection included:

1. Evidence from a rapid review of the literature describing the qualitative and quantitative health impacts following housing improvements, then applied to local demographic data
2. Local data analysis to identify the extent of relevant health conditions in council housing estates,ⁱⁱ and evaluate any potential effect of housing improvements on the rate of hospital admissions/deaths, before and after comparing intervention and non-intervention areas
3. Review of data from surveys of NCH properties using the Housing Health and Safety Rating System. Further modeling provides estimations of the health benefits from addressing serious hazards through the Decent Homes programme
4. Qualitative in-depth interviews with six sets of tenants who have received the work, two local GPs, a Respiratory Consultant and a Medical Housing Referrals Officer.

ii. Local health data were identified by using NCH property postcodes or housing estate boundaries; however, this is likely to include a number of neighbouring houses of other tenures, e.g., due to 'right to buy' sales.

Appendix A gives further detail on the data collection and analysis methods used.

The findings from each of the methods above are brought together under the following thematic headings:

1. Impact on physical health
 - General health and wellbeing
 - Cardio-vascular disease
 - Respiratory illness
 - Excess winter deaths
 - Falls and other accidental injuries

2. Mental health impacts
 - Security and fear of crime
 - Damp and mould
 - Fuel poverty
 - The refurbishment process.

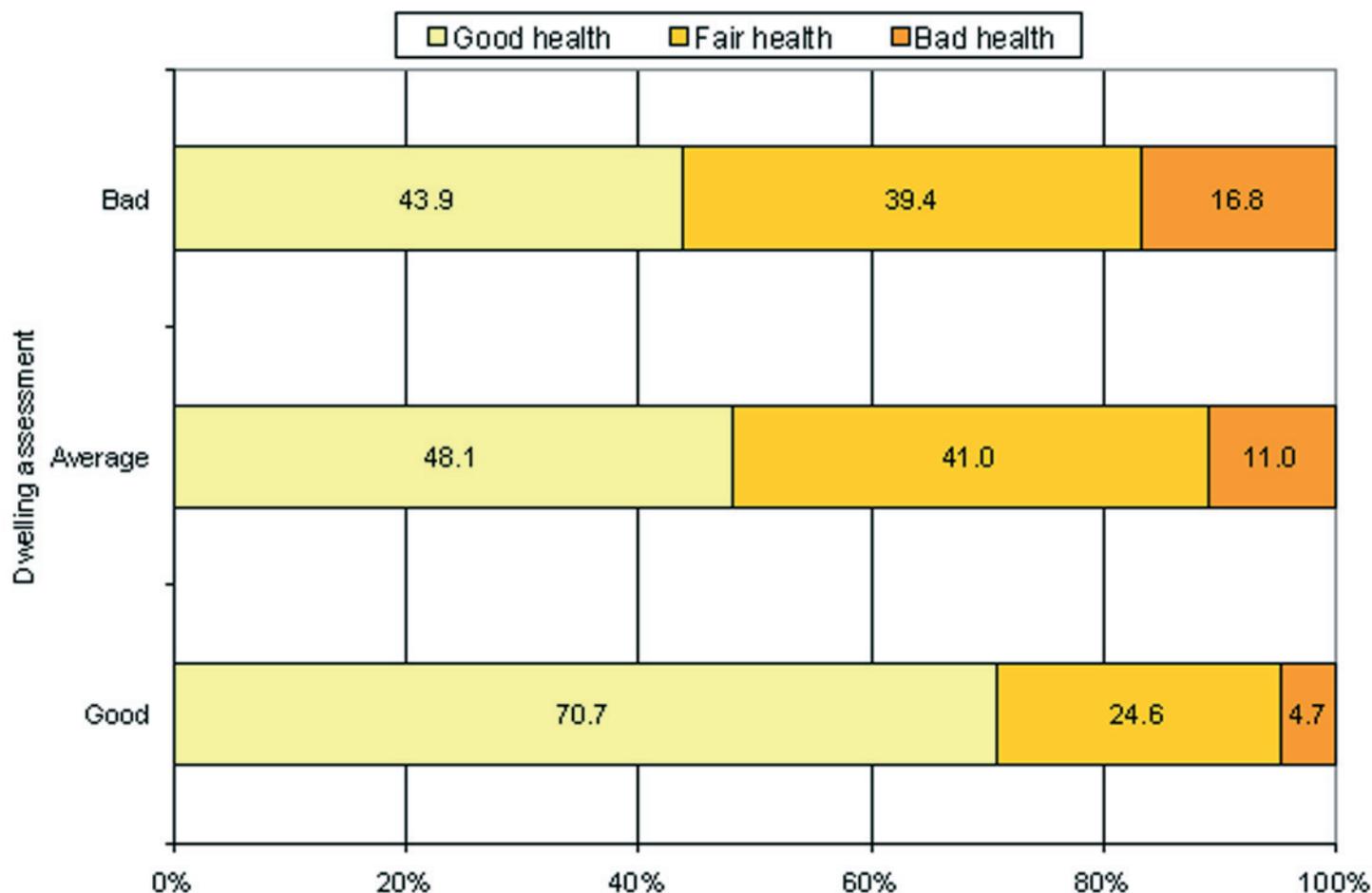
Findings on the health impacts of housing

Impact on physical health

General health and wellbeing

In confirmation of the wider model of health in Figure 1, the evidence suggests that housing quality and conditions are related to general evaluations of health, and resulting use of health services. This is illustrated by a large-scale study carried out by the World Health Organisation on European housing and health status in 2007, which shows that decreased dwelling quality is associated with decreased health.¹³

Figure 6: Self-reported housing conditions and health status (Source: WHO, 2007)



In this study, almost a quarter of residents living in the lowest quality dwellings reported their health status as bad or very bad, compared to 6.2 percent of residents living in good quality dwellings. In high quality dwellings the proportion of “very healthy” residents was more than three times that of residents in low-quality dwellings. This relationship is also supported by the observation made in a number of smaller studies, including other studies of social housing, which concluded that self-reported health improves with housing quality.^{14, 15, 16, 17, 18}

The causal mechanisms explaining this relationship between poor housing and ill health are many and varied, and the strength of evidence also varies widely. Poor housing can affect specific conditions, such as cardio-vascular or respiratory diseases, as set out in the sections below. In addition, there are a number of more general ways that poor housing can affect health, which would result in a lower assessment of general health.

For example, cold conditions are thought to worsen pain associated with arthritis and rheumatism.¹⁹ Damp and mould are strongly linked with symptoms such as nausea, breathlessness, backache, fainting, headaches, fever and vomiting in children. They are also linked to allergies, infections (other than respiratory), toxic reactions and some cancers, although the level of mould spores that would lead to these reactions is uncertain.²⁰

During interviews with two local GPs, they identified that poor or inappropriate housing, combined with other issues relating to deprivation, has an impact on their patients’ general health, and therefore on GPs’ workload:

“I think within the inner city the deprivation has such an impact on health that it actually makes our workload really hard... the amount of work that we have to do to support that patient will be completely different to [someone from] a leafy suburb.”

“Housing issues do have an impact, specifically if you’re looking at things like large families in small accommodation... patients who are in inappropriate accommodation, perhaps because as they’ve got older they’ve stayed in the same place and can’t manage the stairs... some of the housing stock where it has been quite run-down, where there’s been damp... the noise impact and issues with neighbours. That has an impact on their mental health and their physical health.”

The evidence on housing and health is dominated by studies showing the relationship between poor housing and poor health, while there is less extensive evidence to show the relationship between housing improvements and improved health.

Some of the different health benefits that have been reported following housing improvements include fewer mobility problems,²¹ fewer aches and pains, and fewer runny noses.²² Two individual studies and one systematic review found that housing improvements led to a reduction in GP attendances.²³ One study showed that the percentage of people having GP visits in the previous two weeks dropped from 35.6 percent to 24.6 percent. A second study showed that the number of residents attending the GP more than six times in six months dropped from 54 percent to 45 percent of a very small sample size. There is therefore some evidence of a beneficial impact of housing improvements on demand for health services.

Application to Nottingham City Homes population: Number of children missing school

A randomised trial of housing insulation showed that an increase in indoor temperature was associated with a statistically significant reduction in the number of children missing school.²⁴ In both the intervention and control groups, before the interventions took place 71 percent of children had missed at least one school day in the preceding year. In the year after the home improvements had taken place, 75 percent of the control group missed some school, compared to 61 percent of the intervention group. The relative risk reduction of 14.1 percent was statistically significant.

By applying these figures to NCH's population the potential benefit of housing improvements of school days missed can be estimated.

There are currently 14,443 NCH residents aged under 18 years old. Applying the findings above, it may be expected that before the intervention 10,255 (71 percent) children will have missed at least one day of school due to illness. After the housing improvements this may reduce to 8,810 (61 percent) children. Therefore, an estimated 1,445 children who would have missed school due to illness will not do so following the improvement of their homes.

This not only reflects a potential improvement in health amongst the children; it is also encouraging, as it may benefit the education and social development of children whose absence from school had previously hindered their progress.

This evidence is supported by the findings from interviews with both tenants and health professionals. All of the tenants interviewed felt that the housing conditions prior to the improvements impacted negatively on them and made their general health or existing health conditions worse.

A common issue was cold indoor temperatures, due to draughts and poor insulation (particularly from single-glazed windows) and inadequate (or too expensive to run) heating. Other issues included condensation and damp, causing mouldy conditions on the windows and walls. For some tenants, their housing quality caused them to worry: particularly about security and vulnerability to break-ins, and also about the gas fires and the possibility of accidents or carbon monoxide poisoning.

Nearly all of the tenants interviewed felt that their general health was better since they had the SWM work completed. In the majority of cases, the tenants felt that the housing conditions did not directly cause poor health, but exacerbated existing conditions.

For example, a number had conditions made worse by the cold conditions, causing pain or discomfort, such as arthritis or asthma (examples can be found in each of the four case studies below). In a small number of cases, the tenants felt that housing conditions had contributed to causing illness, such as cold, damp and mouldy conditions contributing to respiratory infections such as colds or flu; since the work was completed they had had fewer or no bouts of cold or flu.

Case study 1

Janeⁱⁱⁱ has a disability that affects her mobility, so she lives in a bungalow where the bathroom has also been especially adapted to a wet-room. The bungalow has also had the windows replaced with double-glazing and a new central heating system fitted under the SWM programme.

Before the windows and heating were done, Jane described the bungalow as “cold, freezing. Draughty everywhere”. She could feel the cold draughts around the old single-glazed windows, and all areas of the property were cold. She used to put the gas fire on in the sitting room all the time when she was in, and stay mainly in this room as it was warm and she had to heat only the one room. Despite this, Jane found that she was paying more on fuel bills for the bungalow than when she used to live in a two-bedroom house.

Jane’s disability causes her significant pain, so she is prescribed morphine pills that she can take to control the pain. When it gets cold, this causes her limbs and body to shake, which makes her very tired as it uses up all her energy. When it was cold she would find she was taking more morphine pills to deal with the pain.

She was also concerned that the door and windows were not secure, especially as there had been a number of burglaries in the area.

When she found out the work was being done, the main feeling was “joy”. She wasn’t worried about the work, just looking forward to having it done. The windows were done in one day and the heating was done in a day and a half; she used the ‘Helping Hands’ service to help move things and give her any support needed.

Since the windows have been replaced, Jane has noticed the difference – it is now “much better”. The main difference is that it is much warmer in the whole house. For example, it is a lot less draughty and she no longer has to have the radiator on in the bedroom.

Jane feels much safer with the new door. She has also noticed that it is much quieter in the house because of the new windows, with much less noise from the traffic outside.

It has also made a difference to her health – Jane has noticed that her health has improved, as she does not experience the shakiness as much and so does not have to take as many painkillers.

Now she’s happy with the house, and likes living there.

ⁱⁱⁱ Tenants’ names have been changed in all the case studies to maintain their personal privacy

Cardio-vascular disease

There is a growing body of research linking cold temperatures with cardio-vascular disease. Mortality from ischaemic heart disease and cerebro-vascular disease together count for over a third of all excess cold-related mortality in England and Wales²⁵ (see Excess Winter Death section, below). When the indoor temperature is below 12°C blood pressure and viscosity rise, both risk factors for cardio-vascular disease. For each 1°C drop in living room temperature, there is a rise in blood pressure of 1.3mmHg.²⁶ Individual studies have shown some associations between poor temperature control and ischaemic heart disease and stroke,²⁷ and that residents in dwellings with non-tight roofs and non-tight or single-glazed windows showed an increased association with hypertension.²⁸

The WHO lists the following implications of temperatures below the recommended indoor temperature:

Indoor temperature	Effect on body
18-24°C	No risk to sedentary, healthy people
Below 16°C	Diminished resistance to respiratory infections
Below 12°C	Increased blood pressure and viscosity
Below 9°C	After two or more hours, deep body temperature falls

Table 1: WHO assessment on the effect of indoor temperature on the body

As well as these direct impacts of cold homes on cardio-vascular health, there are a number of potential indirect effects as a result of deprivation that have a negative impact on cardio-vascular health and may interact with the effects of cold housing. For example, those with poor incomes, who are unemployed or who have a lower level of education experience higher levels of stress as a product of deprivation; increased stress alone is a risk factor for cardio-vascular disease. Those living in social rented properties are more likely than average to be burgled or a victim of violent crime;²⁹ also, there is some evidence to support that fear of crime reduces physical exercise,³⁰ another risk factor for cardio-vascular disease. Lack of education, understanding or enthusiasm to engage in healthy living could also be factors contributing to the increased prevalence of cardio-vascular disease in those living in poor housing.

Local hospital admissions data for circulatory disease shows that the highest levels of admissions are in Bilborough, Bulwell, city centre (Arboretum) and Clifton North areas. Figure 7 shows admissions per 1,000 for each Lower Super Output Area (LSOA), overlaid with council housing estate boundaries. This shows that the areas with highest circulatory disease admissions coincide with areas of council housing estates.

It indicates that, as anticipated, circulatory disease is more prevalent in areas of council housing due to the social gradient in this health condition. However, the evidence on the link between temperature and cardio-vascular events suggests that it is therefore likely that housing improvements, as part of a holistic approach with health education and healthy opportunities, will contribute to an improvement in cardio-vascular health.

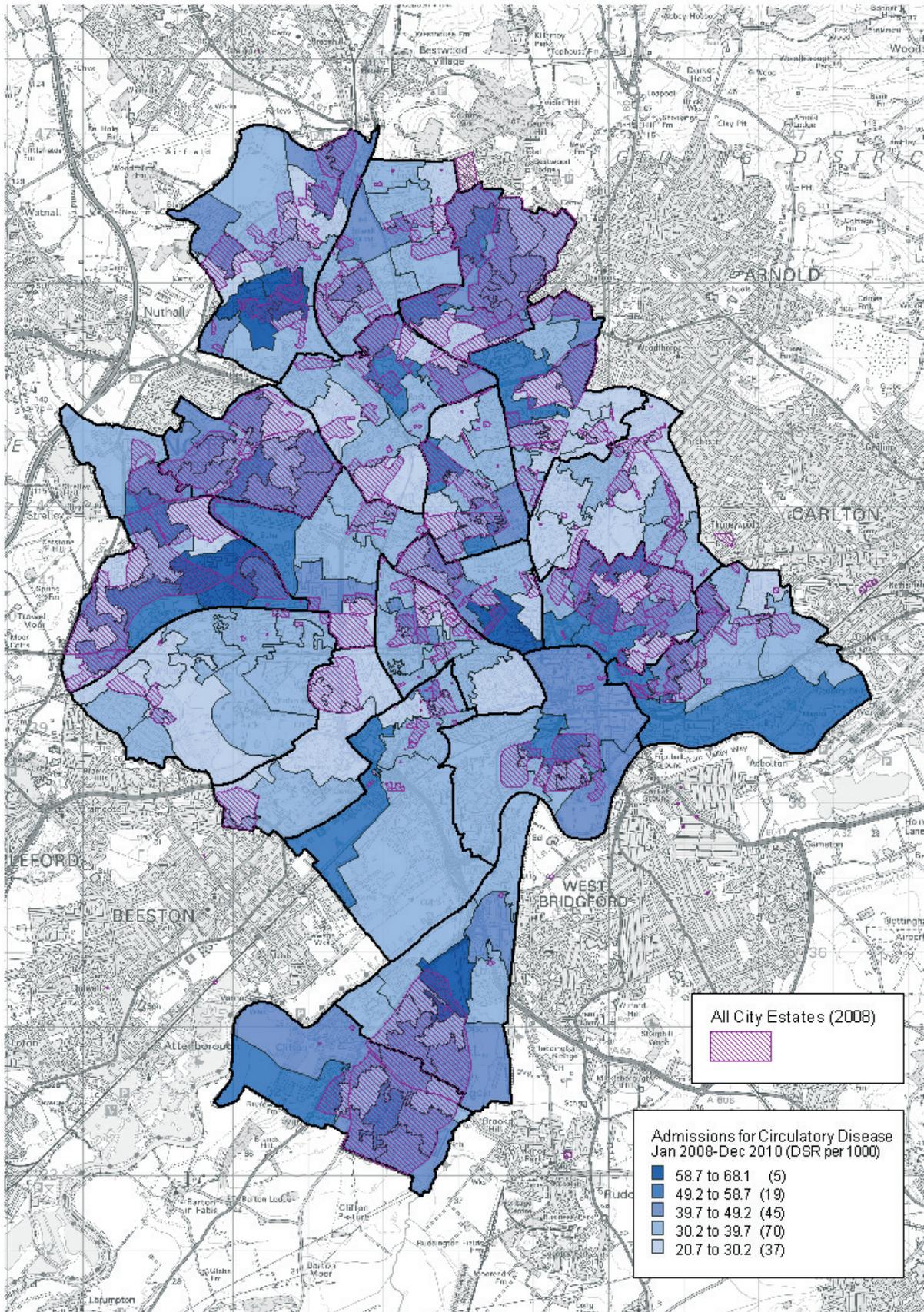


Figure 7: Circulatory disease admissions and NCH estates

Respiratory illness

The relationship between respiratory illness and housing conditions is more complex, with potential interacting effects of temperature, humidity conditions and prevalence of infections such as influenza. For example, respiratory disease accounts for over one third of all excess cold-related mortality (see section on Excess Winter Deaths, below). This is generally attributable to cross-infection from indoor crowding; the adverse effects of cold on the immune system (as shown in Table 1, below 16°C individuals have diminished resistance to respiratory infections) and to the fact that lower temperatures assist the survival of bacterial droplets.^{31, 32} However, as well as the factor of temperature, excess winter deaths from respiratory illness are affected by the prevalence of influenza strains.³³

Cold conditions also impair lung function and can trigger broncho-constriction in asthma and Chronic Obstructive Pulmonary Disease (COPD). Damp and mouldy conditions can also cause asthma symptoms and contribute to respiratory infections;³⁴ mould has been found to be more prevalent in the least energy-efficient homes.

These effects were confirmed in an interview with a local Respiratory Consultant, who stated that COPD is the biggest cause of admissions in relation to respiratory conditions in Nottingham, and that the level of admissions tends to surge during cold periods. The Consultant observed that their *“Patients with COPD will actually do badly based in a very cold and very hot temperatures, winters in particular”*. The advice literature given out to patients with COPD in Nottingham includes a section that emphasises the importance of keeping warm.

The Consultant’s experience also supported the evidence in the literature of a social gradient in health; he stated that *“There are huge numbers [of admissions for COPD] from Nottingham City PCT - this is one of the worst areas... It’s because of deprivation and higher smoking rates, but mainly social deprivation... even if you allow for smoking the people in more deprived areas get worse COPD – and it’s not clear why that is”*. This relationship is seen in the local data for respiratory disease admissions, which shows that areas with high levels of respiratory disease again tend to overlap with council housing estates. The NCH estates overlapping with the areas with the highest rates of admissions for respiratory disease are Old Highbury Vale, Bilborough, Beechdale, and Bulwell Hall (Figure 8).

Improving the heating systems and the energy efficiency of homes leads to an increase in living temperatures and a decrease in the amount of time that the temperature within the home is below dangerous levels, alongside a decrease in mould and spore growth. This would suggest that improved heating and energy efficiency following housing improvements lead to a significant reduction in respiratory morbidity. A recent review of energy efficiency improvement interventions and health found a modest measurable improvement in physical health in adults.³⁵

The surveys to NCH properties prior to SWM found 202 category 1 cases of damp and mould. The HHSRS model assumes the main health impact of their occurrence is respiratory disease, including asthma, coughs and wheezes, and also infections such as rhinitis, conjunctivitis and eczema. It is estimated that addressing these cases of damp and mould could have led to a reduction of 15 cases of harm, including 1.5 serious and 13.5 moderate cases. This will have an estimated cost saving to the NHS of £6,670 in the first year.

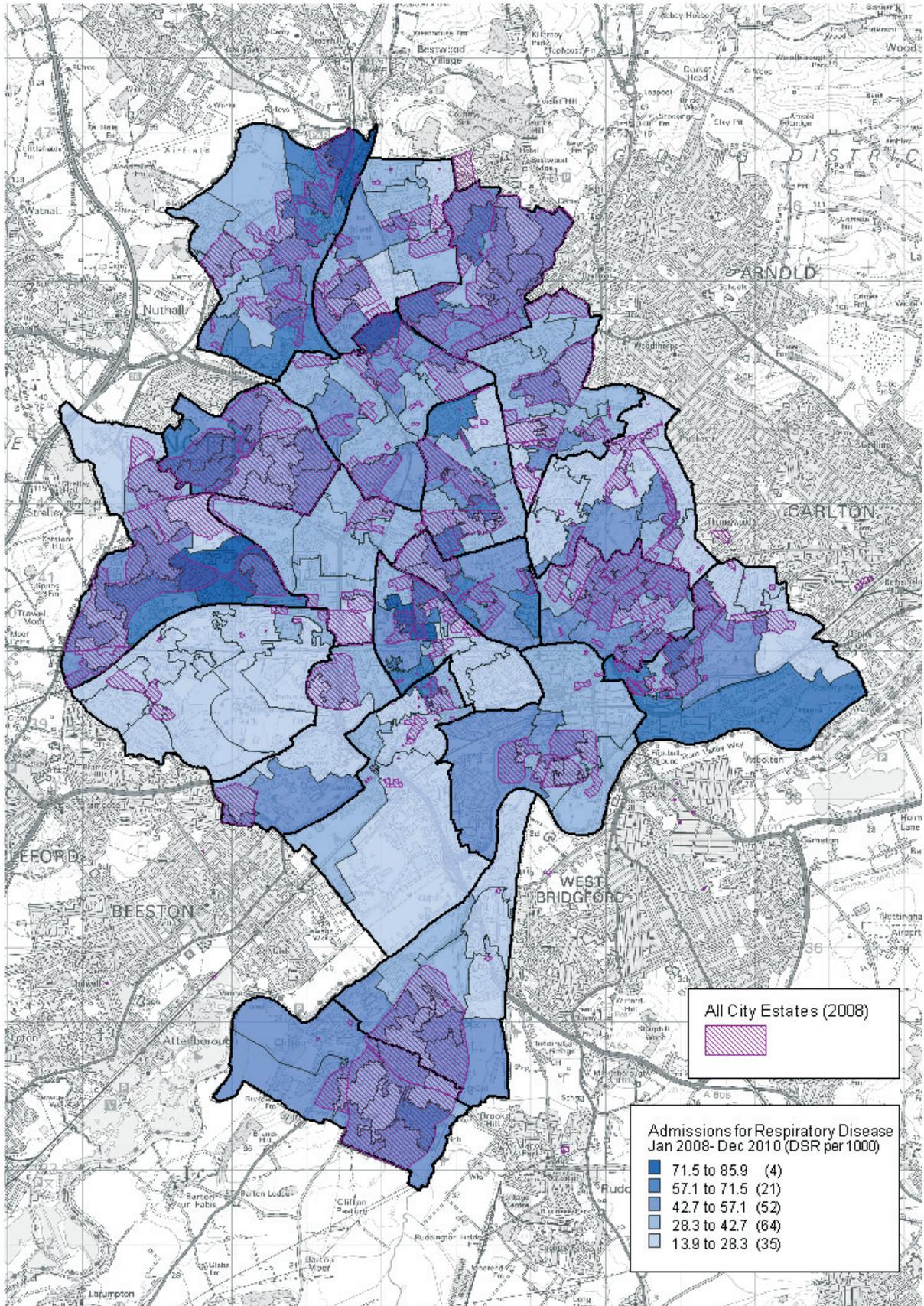


Figure 8: Respiratory disease admissions and NCH estates

Other studies found that housing improvements led to a reduction in smokers.^{36, 37} Any reduction in smoking benefits not only the individual, but the whole household, the community and wider community through the reduction in demand on the NHS.

While the impact on adults' health of housing improvements is modest, a repeated finding in the literature is a significant improvement in childhood asthma following such improvements. Several studies have shown that with an improved indoor temperature and reduced mould, housing improvements have led to a reduction in asthma symptoms in children, resulting in a significant reduction in asthma-related school days missed.^{38, 39, 40} SEPHO reported that home improvements decreased school sickness by 80 percent in children with asthma or recurrent respiratory infections.⁴¹ This corresponds to the evidence given by a local GP, who found that *"we have patients who would come in saying their child perhaps is getting recurrent chest infections and things like that, and they wonder if it's linked to the damp. Sometimes patients have shown us pictures of the damp in their houses."*

Application to Nottingham City Homes population: Prevalence of respiratory disease in children

A WHO study in 2007 found that children (aged 0-17 years) showed double prevalence for respiratory problems in homes with low-quality heating systems. This is potentially a large impact, as asthma accounts for the majority of respiratory symptoms in children. The prevalence of asthma is increasing, with the UK having one of the highest prevalences of asthma⁴² and central England (which includes Nottingham) having the highest prevalence within the UK at 21 percent.⁴³

Using these prevalence rates of the effect of low-quality heating on the prevalence of respiratory symptoms, it is possible to estimate the effect on NCH residents:

Around 28 percent of NCH residents (including all household members registered on NCH records) are aged under-18, accounting for 21 percent of Nottingham City's under-18-year-olds. 10,600 heating systems have been replaced, affecting around 21,200 residents, of whom 5,936 (28 percent) are likely to be under 18 years old.

Working from the WHO finding that the prevalence of childhood respiratory disease is doubled for those living in homes with low-quality heating, the prevalence among the 5,936 under 18 year olds living in NCH properties, who have had their heating systems replaced will have been twice that of the other children in Nottingham City. If the prevalence for the whole of Nottingham City is 21 percent, the prevalence in those 5,936 children is 35 percent compared to a prevalence of 17 percent in the rest of Nottingham City. Therefore, in the homes that have already had their heating systems replaced, there could have been around 2,078 children with respiratory illness. By replacing heating systems this figure could be halved, reducing 1,039 cases of respiratory disease in children.

The average treatment cost for a child with asthma is £181 according to the National Asthma Campaign;⁴⁴ therefore, these housing improvements could save the NHS £188,059.

While improving the warmth of the home has positive effects on health, there is some evidence of certain unintended negative effects from housing improvements. There are several small studies that show a worsening in respiratory symptoms and illness following housing improvements. One review suggests that warmer homes create optimal conditions for dust mites, which may then contribute to a worsening in asthma symptoms. Further studies attribute a possible worsening in respiratory symptoms to exposure to indoor painting (exposure to volatile organic compounds and hydrocarbons) causing clinically verified asthma, bronchial hyper-responsiveness and nocturnal breathlessness.^{45, 46, 47} However, the increase in respiratory symptoms in this case would be short-lived.

Excess winter deaths

In the UK there is greater mortality and morbidity in the winter months compared to the non-winter months. This excess winter mortality is higher in the UK than in many other European countries that experience colder winters. 'Excess Winter Deaths' (EWDs) refers to the number of deaths that occur during the winter months (December to March) over and above those that occur in the summer months:

$$\text{EWDs} = \text{Deaths in Dec-Mar} \left(\frac{\text{Deaths in previous Aug-Nov} + \text{deaths in current Apr-Jul}}{2} \right)$$

In 2009-2010 there were an estimated 25,400 EWDs in England and Wales. Only a minority of these EWDs were a direct result of the cold itself, e.g., hypothermia, or as a result of accidents on icy surfaces. The majority of EWDs are due to circulatory disease such as heart attacks and strokes, as well as respiratory disease, including influenza and pneumonia.⁴⁸

Contrary to the social gradient seen in other health conditions, excess winter mortality is widely distributed across socio-economic groups with similar rates across both affluent and less affluent groups.⁴⁹ However, some groups are more vulnerable to EWD, primarily the elderly; over 80 percent of all EWDs in England and Wales in 2009/10 were among those aged 75 or over.⁵⁰ As a higher proportion of NCH tenants are aged 75 or over compared to the city average (10.6 percent of NCH tenants compared to 5.8 percent of the overall city population), there is therefore a higher level of risk of excess winter mortality amongst council housing tenants in Nottingham due to the age profile. In addition, those with pre-existing conditions, such as heart disease or respiratory disease, have been shown to be at increased risk of winter mortality.⁵¹ These links could be important in tackling the issue of EWD, particularly in Nottingham City where cardio-vascular disease is the main cause of death and where rates of premature death from COPD are approximately twice that of the County.^{52, 53}

A study of Excess Winter Deaths in Nottingham found that there were on average 128 EWDs each winter in Nottingham City between 2002 and 2008. This equates to 15.9 percent more deaths in the winter months compared to the non-winter months. In line with national evidence, this was predominantly among older people, with 89 percent of these EWDs occurring among people aged 65 and over. The annual variation in the rate of EWDs reflects the national average, suggesting that rates for EWDs are higher in years with colder temperatures.⁵⁴

Vulnerability to excess winter mortality has been shown to be related to the temperature conditions inside the home. A number of studies show that poorly-insulated or low energy-efficient homes are correlated with winter respiratory disease among older people⁵⁵ and with excess winter mortality.⁵⁶

This suggests that improvements to housing that increase energy efficiency should be included in public health strategies and interventions. The Joseph Rowntree Trust (2001) concluded that:

“The findings suggest that people in poorly heated homes are indeed more vulnerable to winter death than those living in well-heated homes. This suggests that substantial public health benefits can be expected from measures that improve the thermal efficiency of dwellings and the affordability of heating them.”⁵⁷

Application to Nottingham City Homes population: Prevalence of mortality and morbidity from excess cold

NCH recorded 5,114 category 1 hazards for excess cold during the HHSRS surveys completed prior to the SWM programme, indicating that tenants in these properties would be more vulnerable to colder temperatures in their homes during the winter months. By addressing these hazards, through installing efficient central heating systems and double-glazed windows, it is estimated that this will have avoided one death as a result of the cold conditions, and one incident of moderate harm. This is equivalent to a cost saving of £45,793 to the NHS in the first year.

These are conservative estimates, as only properties that previously had both an inefficient heating system and single-glazed windows were included under a category 1 hazard. An additional 8,700 properties have also had single-glazed windows replaced with double-glazing, and these properties would have been likely to be just under or potentially within the category 1 hazard band. If these properties are also included as excess cold hazards, then a total of two deaths, one serious and three moderate incidents of harm have been avoided, giving a total savings cost to the NHS from removing excess cold hazards of £125,221.

Falls

All NCH properties are assessed for health and safety hazards as part of the initial survey, including hazards for trips and falls, and electrical and fire risks. Each home has an individual design for the new kitchen and bathroom, ensuring the safe positioning of amenities and appliances.^{iv} Where the survey identifies special requirements, the property and tenant are in addition assessed by an Occupational Therapist, who recommends any aids and adaptations that are then undertaken as part of the SWM work.

The risk of falling increases with age, particularly in those 65 and over. Thirty-five percent of over-65s are at risk of falling each year, rising to 45 percent of people aged 80 and over. Between 10 percent and 25 percent of these fallers will sustain a serious injury. The incidence of falls is rising nationally; in Nottingham the rate of admissions for serious accidental injury is higher than the national average.⁵⁸

Applying these proportions to NCH tenants, of whom 6,811 are 65 years or older, it is therefore estimated that 2,384 NCH residents are at risk of falling each year, and between 238 and 596 of these residents would sustain a serious injury as a result of their fall.

Local admissions data for falls shows that council housing estates in Bestwood Park, Top Valley East, Radford (St Peters) and Bilborough are included in areas with the highest rates of admissions per 1,000 for falls.

Falls at home have many contributing factors, some of which are unavoidable, such as increasing age and frailty. However, many factors contributing to a fall, such as a potentially hazardous home environment, can be avoided. A number of studies have supported this by showing that hazard modification and housing improvements, such as grab rails and encouraging practices to remove objects left on stairs, does help to reduce falls.^{58, 59, 60, 61, 62, 63} In addition, cold environments reduce mobility and lead to an increase in falls,⁶⁴ thus increasing energy efficiency could also have positive effects by increasing mobility.

Application to Nottingham City Homes population: Number of fall hazards remedied and influence on number of falls

The HHSRS surveys identified 235 category 1 fall hazards in NCH properties, including those between levels, on the same level, on stairs and in the bath, affecting 226 properties and the 581 tenants living in these properties.

It is estimated remedying these hazards could have prevented 12 incidents of harm per year, including one severe, three serious and seven moderate incidents of harm. It is estimated that this could have saved the NHS £32,000 in the first year alone.

- iv. For example, cookers are positioned so that they are not behind a door, and have two surfaces on either side on which to place hot objects.

Housing improvements may therefore have a role in reducing fall incidence, yet the multi-factorial causes of falls means that a wider approach is required to address the problem. For example, the World Health Organisation concluded that home assessment and modification as part of a multi-factorial programme can reduce falls in frail people; however, the assessment and modification of the home on its own appears, although feasible, ineffective in reducing falls or fall injuries among older people.⁶⁵ It is therefore positive that the SWM programme encourages the involvement of an Occupational Therapist, who is able not only to determine suitable adaptations to the home, but also works with the tenant to modify the latter's activities in order to enhance their day-to-day safety.

Accidents

In 2005, unintentional injuries accounted for nearly two percent of all deaths in England and Wales. When considering non-fatal injuries, 45 percent result from accidents in the home, totalling around 2,701,326 accidents occurring in the home each year.⁶⁶

About 50 percent of injuries in pre-school children occur in the home.⁶⁷ Despite improvements, avoidable injuries are still the largest cause of death in children aged between 1 and 14 years; as such, they are a major public health issue in the East Midlands. During the five-year period 2001-2005, 25 percent of deaths of East Midlands residents in this age group were the result of avoidable injuries – injury and poisoning.

Avoidable injury has links with deprivation.⁶⁸ This is supported by the finding in Nottingham City's Joint Strategic Needs Assessment on avoidable injury: local authorities within the East Midlands with higher levels of childhood poverty tend to have higher hospital admission rates for accidental injury in children. Also, children whose parents have never worked, or are long-term unemployed, are thirteen times more likely to die from avoidable injury than are children of parents in higher managerial and professional occupations.

Fatal accidents in the home are more common in winter. The effect of the cold on reducing body temperature and thus mental function, dexterity, strength and sensation is thought to contribute to this.⁶⁹

Fire is another potential cause of harm in the home. Data from Nottingham Fire and Rescue Service indicate that there were 107 casualties (i.e., persons requiring medical attention) as a result of domestic fires in 2008-2010 in Nottingham city, of which 47 were in NCH properties. This is in line with national evidence that fires, and injuries from fires, increase with levels of deprivation, and in older housing.⁷⁰ Currently, 50 percent of NCH properties are fitted with hard-wired smoke alarms, as properties that undergo electrical rewiring as part of SWM are at the same time fitted with a smoke alarm. A programme is in place to fit hard-wired smoke detectors to all remaining NCH properties by 2014. Evidence in the literature indicates that fitting smoke alarms has been shown to reduce accidents,^{71, 72} with one study reporting an 80 percent reduction in the annual injury rate over a four-year period following the installation of smoke alarms.⁷³

Accidents in the home are, like falls, multi-factorial. The home environment itself is one modifiable contributing factor. In light of the significance of the number of accidents at home, home improvements aiming to provide primary prevention of accidents are very important. For example, following recent research with Glasgow Housing Association, the University of Nottingham advocates that all social landlords fit thermostatic mixer valves in new bathrooms, which limit the maximum temperature of bath water and therefore reduce the number of scalds to children, the elderly and disabled.⁷⁴

Application to Nottingham City Homes population: Number of health and safety hazards remedied and influence on number of accidents

The HHSRS includes a number of hazards under the prevention of accidents, including electrical hazards, fire, flames and hot surfaces, collision and entrapment, position and operability of amenities, and structural collapse and falling elements.

The HHSRS data for NCH found 2,394 category 1 hazards under these headings, with the majority of potential accidents relating to flames and hot surfaces (1,226 category 1 hazards) and electrical hazards (822 category 1 hazards).

It is estimated that addressing these hazards could have reduced the incidents of harm by 144 a year, including five severe, 37 serious, and 103 moderate incidents of harm. It is estimated that this could save £175,000 in NHS treatment costs in the first year.

Case study 2

Emma and David live in a bungalow which, as well as having new windows, heating and kitchen under the SWM programme, has also been specially adapted to provide access for David's wheelchair.

Before they had the adaptations, David's access into and around the house was limited. Now, the doors have been widened, and the bathroom converted into a wheelchair-accessible wet-room. This has made a major difference in terms of the freedom he now has to move about the house: *"with this wheelchair I can go out, I can see on the path, I can go through the door... It's nice just to sit at the back door and feel you can see people and you can do what you want to do."*

David's blood-pressure medication (Warfarin) means that he is very sensitive to the cold, and he found that he used to get cold very easily and frequently. This meant that the gas fire had to be on much of the time, a cause of concern for Emma as David suffers from sleep apnoea; this could result in his falling asleep suddenly and the associated risk of his falling onto the gas fire. With the new heating system, the room can be warmed either by radiators or the electric fire. Also, Emma and David have noticed that with the double-glazed windows, the heat is retained more effectively and it is a lot less draughty. Emma found *"I don't have to worry about him actually getting too hurt like I would with the gas fire... That's a lot of help towards your health because at the end of the day you are not stressing out over it"*.

The couple also have the 'Nottingham On Call' service, which is a home safety and personal security system managed by NCH. The system provides a 24-hour telecare emergency service, linked to personal alarms and a telephone system in the home. This service has made a big difference to them: *"That's the best system I've ever known in years. That's the biggest [difference], Nottingham On Call... Because it means if he falls or anything I don't have to worry about picking my phone up, I can just ring them and they sort it out and get in touch with whoever needs to come out"*.

All the adaptations and improvements on the property have positively impacted on the couple's lives, in terms of their health and mental wellbeing: *"This place is absolute spot on... Just how I wanted it"*

Mental health impacts

From the literature it is clear that housing affects mental health. It is easy to appreciate that poor quality housing, low temperatures, damp and mouldy conditions, security concerns and overcrowding can have a negative effect on mental health. However, the literature shows that reversing any negative impacts on mental health of housing circumstances is not as simple as improving housing conditions, due to the complex nature and multi-factorial causes of mental ill health.

There are a number of studies that support the causal linkages in our health impact map between housing conditions and mental health. These studies repeatedly show that poor housing conditions such as mould, damp, cold temperatures and the perceived lack of safety (as well as occupancy issues such as overcrowding and cramped room space) damage the mental health of inhabitants.^{75, 76, 77}

Security and fear of crime

A lack of a sense of safety in the home can lead to anxiety and problems with nerves, while improvements in safety and security have led to a significant reduction in self-reported mental health problems. In one study, those self-reporting mental health problems were reduced from 52 percent to 41 percent of adults following work to increase the security of the area.⁷⁸ Several other studies have shown that as home improvements are made to increase security, residents feel safer inside their homes,⁷⁹ and that this sense of safety can extend to outside the home.⁸⁰ This increased sense of safety could lead to reduced levels of stress, thus have a positive impact on mental health and possibly improve social and physical functioning.⁸¹

A previous strand of this Decent Homes Impact Study looked at the impact of fitting 'Secured by Design' windows to NCH estates.⁸² This found that burglary was reduced by 42 percent on two sample estates where the windows were fitted, compared to a 21 percent reduction city-wide over the same period. Prior to the work, 46 percent of the tenants surveyed in that area said that burglary/theft was a 'very' or 'fairly' big problem; the year after the programme was completed, the proportion of tenants thinking this had decreased to 37 percent. This has resulted in an improvement in tenants' mental wellbeing; the proportion of tenants surveyed in the sample areas who felt a little or very unsafe in their homes alone after dark decreased from 37 percent to 31 percent.

Therefore, given the evidence that burglary has been reduced as a result of the SWM programme and that this has positively affected tenants' perception of safety in their respective area, it is anticipated that such a measure will have the same positive effect on mental health as is reported in similar studies (see case studies 3 and 4).

Damp and mould

Damp and mould may have a considerable negative effect on mental health. Baker (2001) highlights the negative psychological effects arising from the constant sight of fungal growth, the unpleasant smell sometimes associated with it, and the difficulty of getting rid of mould. There is also the associated stigma of being unclean, which may in itself cause depression and stress.⁸³ A large study by the WHO found that various aspects of housing were found to be associated with, and potentially reinforced or enhanced, social pathologies such as depression, isolation and anxiety; also, that extensive exposure to dampness and mould increased the chance of depression by 60 percent.

Application to Nottingham City Homes population: Prevalence of depression affected by damp and mould

It is possible to estimate the potential effect of damp and mouldy conditions on the prevalence of depression of the Nottingham City Homes population by applying the finding of a 60 percent increased risk of depression from the WHO study.

The background prevalence of depression across England is 10.9 percent. Some general practitioners in Nottingham City have a recorded prevalence of depression as high as 21.5 percent.

According to the HHSRS records there were 202 NCH properties with a category 1 hazard for mould or damp, and 473 residents living in these homes. It is likely that the majority of NCH properties significantly affected by mould or damp are included in these results; however, it is possible that a few houses affected to a lesser degree by mould and damp are not included, making the following calculations conservative.

If the prevalence of depression in Nottingham City were equal to the national average of 10.9 percent, then by remedying the problem of mould and dampness this would reduce the number of NCH residents with depression from 52 to 32, a reduction of 20 cases.

Considering the level of deprivation in Nottingham city it is likely the prevalence of depression is higher than the national average. Since adverse housing conditions and depression are linked, it could be expected that at least some of the incidents of depression in areas with highest rates of depression would be attributable to housing conditions. Using the 21.5 percent rate of prevalence, the number of incidents of depression may have fallen from 102 to 64, avoiding 38 cases of depression.

The average direct cost to the NHS of treating depression is taken from Thomas and Morris (2000), at £142 per case.⁸⁴ Applying this to the figures above, reducing damp and mould could save the NHS between £2,845 and £5,406 in direct treatment costs for resulting mental health issues.

These simple calculations give an indication of the size of the impact of housing improvements on the mental health of the residents and suggest it is significant, even when considering the relatively small numbers of residents who have been helped: 1 in 12 tenants who previously had damp and mould would see an improvement in their mental health.

Case study 3

Lisa lives in a mid-terrace house built in the early 1930s. The single-glazed windows were replaced with double-glazing under the SWM programme, and the property is also due to be fitted with a full central heating system (replacing the current gas fire and back boiler), as well as a new kitchen and bathroom.

Lisa found that before the windows were replaced, the house was very cold and draughty. There were also problems with condensation, which had twice caused a damp black patch of mould on the living-room wall.

“Oh, it was really cold... You had to have the heat on – even sometimes even in the summertime you’d have to put the heating on just to keep it just a normal temperature... You could see the curtains just moving by themselves – I used to say “Jack Frost is on his way!” ... and you could see your breath, so that’s how bad it was.

“You’d have to be putting more money in just to keep it warm... so obviously you’re trying to save as much as you can, so that was like a big hole in my pocket... it just used to burn a lot of money all the time having it on every week.”

The cold, damp and concerns about gas and security affected the whole family:

“All of us used to have lots of colds... health-wise it was really bad I’d say – I was in bed one time for a week with my daughter had to look after me and that was just due to the cold... Because I have lower back pain anyway, so with it being cold it’s like my bones couldn’t get warm and I was constantly at the doctor’s and on medication and things like that, so I felt it really bad.

“I think I had a little gas leak at one time, I had to go to the doctor’s and what it was, it was a little gas leak... It does worry me because sometimes you’d be round there thinking ‘Can I smell gas?’ So it is a big worry.

“You could take the window out, so the security – when I used to go out I used to be thinking ‘Oh God, I hope everything’s alright.’

“I was just miserable, you know, because it was cold and damp and then you’d have to be putting on loads of clothing and things like that, you know, it was like miserable and gloomy I should say.

“When they wrote to me and said that they were going to come and do the windows I was over the moon; well I was thinking about more of the bill, saving on the electricity, gas, and more secure as well.”





Just having the new windows has made a big difference both to Lisa's worries about heating costs and security and to her health conditions:

"The [gas payment] reduced down from £30 to £15, so I just top up every week and it has saved me a lot of money, I'm not just saying that, it's saved me a lot of money.... If I went out I'd know that nobody could get in there or anything, so that was a comfort as well"

"I can feel the difference, even though I know I can feel the pain but it hasn't been as bad as before I had the windows done... If it's anything to do with colds or flu I haven't been to the doctor's for that and the children haven't been to the doctor's for that"

"The gas fire's not on... we're not all in one room ...fantastic!"

Fuel poverty

Fuel poverty has also been linked to mental health. A household is said to be in fuel poverty if it needs to spend more than 10 percent of its total income on fuel to heat the home to an adequate level; 21°C in the main living area, and 18°C in other occupied rooms.

Nottingham City 2011 Joint Strategic Needs Assessment on adult mental health reported that those with a cold home or experiencing fuel poverty have a four-fold increased risk of depression or anxiety. This is supported by a study that found how reducing fuel poverty improved mental health through a reduction in stress.⁸⁵ In his review of fuel poverty and ill health, Baker (2001) concluded that there is likely to be a strong correlation between indebtedness relating to fuel poverty, and mental stress.⁸⁶ It is also possible that a cold home can contribute to social isolation, as people are reluctant to invite friends round to a cold house.⁸⁷

The Decent Homes Impact Study has also analysed the effect of the SWM programme on the energy efficiency of the properties and therefore the impact on the fuel poverty of tenants.⁸⁸ This research found that the energy efficiency of the properties has increased, with resulting savings in fuel costs for the tenants. The Energy Savings Trust estimates that fitting double-glazed windows can save between £95 and £223 a year, and upgrading the central heating to an A-rated boiler could save £225 a year from fuel bills. Across all NCH tenants who have received new windows or boilers, this amounts to a potential collective saving of £3.5m a year on fuel bills.

Application to Nottingham City Homes population: Prevalence of depression affected by excess cold and fuel poverty

Using similar methods to those above, it is possible to estimate the potential effect of excess cold on the prevalence of depression amongst the Nottingham City homes population by applying the ratio of 1:4 stated in the Nottingham JSNA.

NCH's HHSRS data shows all of the NCH properties that were affected by excess cold: a total of 5,114 homes with 8,694 residents. There may be other NCH tenants who are affected by fuel poverty yet are not included in these figures and therefore the estimates below are conservative.

If the prevalence of depression in Nottingham City were that of the national average, the number of cases of depression would be reduced from 948 to 237 through the Decent Homes programme removing the problem of excess cold, avoiding 711 cases of depression.

Using the more realistic prevalence of depression of 21.5 percent, through the Decent Homes programme the number of cases of depression would be reduced from 1,869 to 467, a reduction of 1,402 cases.

Applying the same average cost to the NHS of £142 per case for treating depression as before, this would save the NHS in Nottingham between £100,962 and £199,084 in treatment costs as a result of the SWM programme's reducing excess cold and fuel poverty.

These calculations give an indication of the size of positive health impact that would result from removing excess cold; 1 in 6 of those tenants who previously experienced excess cold would see significant improvement in mental health as a result of this programme.

Case study 4

Sheila lives in a three-bedroomed mid-terraced house, classified as a 'hard to heat' home because of its solid walls – this means that the house has one single solid wall and no cavity to insert wall insulation, making it very energy-inefficient. Sheila's home was therefore fitted with internal insulation under the Community Energy Saving Programme (CESP), as well as with a new kitchen, bathroom, central heating system and double-glazed windows under the SWM programme.

Talking about the house before the work, Sheila said:

"The house has always been cold, very, very, very cold because we have only got one layer of bricks... The gas fire was old. I did have to keep [the radiators] on all the time in winter, at night and that... Sometimes I came into the house and it was cold and I didn't want to go into a cold kitchen to prepare a meal... I tended to live more in one room just to keep the heat in that room because I was so worried about the bills... It seems with having the single-glazed windows they didn't keep the warmth in and to me that was the most important thing, the warmth as well as the security... I had been burgled, and every night I checked everything, it was like an obsessive thing."

Sheila has been diagnosed with the brittle-bone condition osteoporosis. Regarding her health, Sheila said:

"I got awful backache... I always felt worse in winter... If I was having trouble walking and it was hurting, I would perhaps fill a kettle and make a flask of coffee and watch television in my bedroom where it was nice and warm... And I seemed to have more coughs and colds... And I think it was depressing because it was cold and I actually used to sit on the floor with my back to the fire because I was that cold."

Sheila underwent a six-week renovation to carry out the refurbishment works and fit the internal insulation, as well as a special adaptation to the bath to help her get in and out. This process was quite a strain, as many of the household facilities such as the cooker and washing machine were out of action for some of the time. Sheila used the 'Helping Hands' service from NCH to help prepare the home for the work, such as packing up areas and moving furniture.





Since the work has been completed, Sheila has noticed a big difference in her health and general wellbeing, as a result of being warmer and less worried about heating costs and security concerns:

“I love everything, everything about it... my house is lovely and warm... I used to have my bedroom radiator on all the time, I have not had it on once even in the winter, it is off 24-hours a day, turned off... I pay [my fuel bills] by direct debit monthly, I am in credit... So once we had the new windows that started to keep some heat in and it cut a lot of the noise out as well which was very good. So from the day I had my windows I felt a 100 percent safe... It makes me feel glad to get up in the morning and come down to my lovely house. I love having people round. I'm proud of it. I think if you've got a nice house it makes you happy.”

The refurbishment process

It is possible that the benefits in mental health following housing improvements are proportional to the extent of the improvements themselves – the worse the state of the repair before the improvements and the better the house on completion of the improvements, the greater the impact on mental health.⁸⁹

However, housing improvements can be intrusive and cause stress through the disruption that they cause. An example at the most extreme end of the spectrum is given in an evaluation of a regeneration project in Liverpool, in which residents had to be re-housed during the process; a report concluded that the stress associated with the redevelopment process was significantly associated with poorer mental health and in the short term acted to counterbalance the benefits of improved living conditions.⁹⁰ However, in cases more directly comparable to the situation in Nottingham, other studies found that the mental stress of the renewal process, although considerable, did not counteract the overall positive affect on general wellbeing, and suggested that the effect may prove to be increasingly positive over time once the effects and memory of the redevelopment process itself are forgotten.⁹¹

Stress caused by the renovation process itself is closely linked to the amount of personal control each tenant feels that they have over the redevelopment process. The original government guidelines first to describe the concept of Decent Homes and subsequent studies highlight the importance of giving residents as much awareness and control as possible over the housing improvements.⁹² It is recognised the negative mental health impacts of the improvements can be limited by ensuring that the residents feel involved and, to some degree, in control of the process.^{93, 94}

Tenant consultation has been an important part of Nottingham's SWM programme, with tenants able to choose among design options for new installations and consulted on the design. The 'Helping Hands' scheme provides additional support for those who need it, such as moving furniture, support during the work, etc. Ultimately, tenants are able to refuse to allow the work to be done if they feel unable to cope with the disruption; however, the refusal rate is low, at 2.2 percent. Also, tenants surveyed regarding their satisfaction with the process and works following the installation gave an average score in 2009/10 of 8.31 out of 10, indicating a high level of customer satisfaction with the process and completed works.

These findings are supported by the evidence gained from interviews with tenants and GPs. The level of stress or anxiety during the refurbishment process varies, depending on the extent of the work to be completed and the ability of the tenant to cope with the potential disruption. For example, the tenants interviewed who had their windows replaced did not find the process at all stressful, as it is completed within one day and the benefits are felt immediately. However, the more extensive works – such as kitchens, bathrooms and internal insulation – cause greater disruption to daily life and take between three and six weeks to complete.

The causes of stress identified through the interviews include: delays and faults in the installation process; lack of privacy due to workmen in the home; facilities such as cookers and washing machines being out of use; communications issues, such as missed appointments, and having to persevere before obtaining a response to a problem.

This had varying impact on the tenants; some felt able to cope, despite the difficulties, because of the positive differences that the refurbishment would deliver:

“While the majority of the horrible work was being done, and it was horrible, I kept thinking ‘At the end of it you are going to have something beautiful’ and that was what kept me going.”

However, evidence from a local GP suggests that some tenants did find it hard to cope with:

“I’ve had at least two or three households of people coming in with stress, needing sleeping tablets, needing anti-depressants because they can’t cope with the kitchen and bathroom... just really frazzled and disrupted by it all.”

Therefore, the installation process itself can have a negative impact on the mental wellbeing of tenants, with a small number requiring additional support during the process. The evidence of high overall customer satisfaction with the SWM programme suggests that this affects a small minority; however, for those who are less well able to cope, this may have a significant, if temporary, negative impact on their wellbeing.

Appraisal summary

Firstly, this appraisal has shown that there is a clear social gradient in health in Nottingham, with those living in the most deprived areas having worse outcomes across a number of health conditions and overall life expectancy. Council housing estates tend to house the most deprived people, in terms of income and health, as a result of the allocation system, which focuses on providing housing to those most in need. Therefore, the multiple factors of deprivation faced by NCH tenants are likely to impact negatively on their health, and housing conditions are one of these many factors.

Secondly, the evidence reviewed in this appraisal – including a review of studies on housing and health, hospital admissions data for Nottingham, stock condition data from NCH and interviews with tenants and health professionals – all point towards a convincing conclusion that poor housing has a negative impact on health. Cold and damp housing can worsen pre-existing health conditions, including cardio-vascular and respiratory disease, and these particular conditions are more prevalent in areas of the city that include council housing estates.

Poor housing conditions may also be a cause of ill-health, for example, by lowering resistance to respiratory infections. There is evidence for a number of other ways in which poor housing can have an impact on health, such as causing aches and pains, infections, and mobility problems. All factors taken together, this creates a convincing picture of why those living in poor housing have generally poorer health. The impact on health outcomes and use of health services varies in severity, from more general illness treated by GPs to the worse case possible when people's lives are at risk, as demonstrated by the 128 Excess Winter Deaths that occur in Nottingham each year.

In addition to the physical health impact, there is a clear interaction between housing, on the one hand, and mental health and general wellbeing on the other. The case studies support wider evidence that suggests how issues such as cold, damp, fuel poverty and insecurity can lead to low mood, or even depression.

Again, this coincides with the more general negative effects of deprivation on mental health, as summarised by a local GP during our interviews:

“If you’ve been in desperate circumstances, your mental health is going to be vulnerable, and I think being somewhere that’s dank and dreary will play into your tendency to have a low mood... it’s not the whole story, but I think it’s part of the equation.”

Finally, it appears that improving housing conditions can therefore have a positive impact on both physical and mental health. A number of studies have shown that this effect is moderate in adults, which is likely to be the case given the complexity of the multiple causes of ill-health; addressing housing conditions alone will not negate the many other factors that contribute to health conditions. However, the cumulative and long-term effect may well be significant; for example, addressing housing conditions has a more significant impact on children, thus potentially resulting in a life-time of savings in terms of health costs.

A number of national studies have calculated the cost implications of poor housing that falls on the NHS as treatment costs; these estimates range from £1.5 billion to £2.5 billion a year.^{95, 96}

Throughout the present appraisal, a number of examples were selected for which a measurable change and cost impact for the NHS in Nottingham could be calculated. The examples account for only a small number of the potential avenues through which housing improvements could positively impact on health and treatment costs. Even with these conservative estimates, the costs saved as result of addressing serious hazards in the home, reducing asthma in children, and relieving depression from damp and mould, excess cold and fuel poverty could total almost £700,000.

This small number of examples alone account for one percent of Nottingham City PCT's cost of provision for 2010/11 (totaling £56.5m⁹⁷). In addition, the improvements made to the NCH properties will make a long-term difference to these homes (for example, the anticipated life-span of a new boiler is 15 years) and thus the health benefits will accumulate over this time.

Housing and health – taking the findings further

Following the HIA model, this section sets out some of the discussion points and recommendations for stakeholders to consider as a result of the appraisal. It reflects on how such evidence could inform both housing and health delivery, taking into account the current context of limited resources in the public sector and significant changes within the health system. This also includes more broader consideration of the wider potential impact of housing services – beyond the bricks and mortar issues of the Decent Homes programme – in addressing health inequalities.

Informing future housing investments

The evidence collected points to the ways in which future housing investments, including refurbishment programmes and new-build projects, provide an opportunity to lever in the maximum health benefits alongside NCH's aims for asset management. Clearly, ensuring that homes are as energy efficient as possible (thereby reducing cold, damp and fuel poverty) is one of the main ways of improving a range of physical health conditions, and mental health and wellbeing. The SWM programme has made an initial impact on this, improving the average energy efficiency (SAP^v) rating from 60 to 68 points out of 100. This is estimated to save NCH tenants a cumulative total of £3.5m from their fuel bills each year. However, there are further opportunities for future energy efficiency improvements as a result of, for example, funding through the Energy Company Obligation. These have been identified in NCH's Low Carbon Roadmap, which sets out NCH's long-term plans for energy efficiency improvements for the stock to 2020.

NCH has a further opportunity to influence health outcomes through the recently announced neighbourhood renewal programme. Around 1,000 of the poorest quality council housing properties in Nottingham have been identified for decommissioning and demolition, to be replaced by around 500 new family houses. A health impact evaluation of a very similar project in Liverpool showed that there were significant positive effects from moving residents out of poor quality homes into highly energy efficient newly-built properties.⁹⁸ This raises a number of considerations for NCH in the design of the new properties and the process for achieving this, and the resulting impact on tenants' health. For example, estate and property design has implications for security (as demonstrated in the Secured by Design⁹⁹ scheme), healthy lifestyles (for example, safe routes for walking and cycling, and access to local amenities such as sports facilities and shops with healthy food options), and access to green space (which has been shown to have a positive impact on wellbeing¹⁰⁰).

The 'lifetime homes' principles also help ensure that the design takes into account the long-term needs of current and future residents, to provide flexibility and adaptation to accommodate the needs of any occupants.¹⁰¹ In designing the process for removing and re-housing tenants, NCH should also be aware of the potential negative effect on mental health of moving people from their homes, and how to mitigate this during the process – for example, learning from relevant case study examples such as the Liverpool Housing Action Trust programme mentioned above.

v. SAP is the Government's Standard Assessment Procedure for Energy Rating of Dwellings, where properties are scored between 1 and 100 based on energy costs associated with space heating, water heating, ventilation and lighting, minus cost savings from energy generation technologies. A score of below 30 is considered very energy inefficient, while a score of 70 or more is considered very energy efficient.

NCH's long-term plan for the management of housing quality, set out in its Asset Management Strategy, is planned in a 30-year timeframe. The strategy therefore needs to take into account future, as well as current, population needs – including health needs. For example, the issues associated with the ageing population will have an impact on the type of housing and refurbishment work needed to make sure that people can stay safely in their homes for as long as possible, to relieve the pressure on the NHS. The Asset Management Strategy will be affected by the forthcoming changes to the way that council housing is funded under the Housing Revenue Account (HRA). From April 2012, each housing organisation will directly fund all housing management costs from the rent it collects, rather than receiving a subsidy from central government. In line with the Government's localism agenda, this will give NCH greater flexibility to plan and prioritise the way in which it manages the housing stock, including the potential to take local health considerations into account.

As shown in the present report, the Decent Homes programme has provided the opportunity to deliver housing improvements on a significant scale within the social housing sector, supported by a substantial injection of funding from national government, allowing some of the worst housing conditions and their impact on residents' health to be addressed. However, the standard of housing in the private sector still remains of concern, with the highest rates of non-decency in the private rented sector (41 percent of the private-rented sector failed the Decent Homes standard in 2009) yet the highest numbers of non-decent homes in the owner-occupied sector (accounting for two-thirds of all non-decent homes).¹⁰²

With much of this work left to do, it may be that social housing providers such as NCH are best equipped to manage such programmes in other tenures, were funding to be made available. For example, NCH has already achieved significant efficiency savings in the unit costs and delivery of their own Decent Homes programme, and has an established infrastructure to manage such a programme effectively. If the cost implications on the public purse of poor housing are taken seriously, there is a case for funding or subsidising such improvements from health or other public sector budgets in the private sector, with housing providers such as NCH well placed to deliver a cost-effective delivery option.

Informing local health strategy and delivery

The health system is currently undergoing a significant period of change, altering the way that health services are commissioned at the local level. In summary, the proposed changes are:

- Primary Care Trusts and Strategic Health Authorities will be abolished by 2013, and the responsibility for local health commissioning will instead be managed by Clinical Commissioning Groups (CCGs), led by local General Practitioners
- Responsibility for public health will move to Local Authorities, with a duty for local health improvement and reduction in health inequalities
- Health and Wellbeing Boards (HWB) will be established within the Local Authority, with the remit to improve local health and social care and reduce health inequalities. Their responsibilities will include: delivering the Joint Strategic Needs Assessment (JNSA) and Joint Health and Wellbeing Strategy (JHWS) with the aim of joining up commissioning between health, public health, social care and wider services relating to health and wellbeing; and delivering value for money.

Therefore, in the local context, the two main points of engagement between the health service and other providers of services that impact on health and wellbeing, such as housing, will be the HWB at the strategic level and CCGs at the delivery level.

Health and Wellbeing Board

Nottingham's HWB was established in October 2011, and includes a position on the Board for NCH. This provides NCH with the opportunity to inform the development of the JNSA and JHWS, to help the move towards a more integrated understanding and delivery of public health outcomes through wider services such as housing.

There are a number of ways in which NCH could contribute to the development of an integrated strategy:

- Providing the evidence of the impact of housing on health and wellbeing to support its inclusion in public health strategies (the JNSA and JHWS), for example, as provided by this HIA report
- Sharing NCH's Asset Management plans, in order both to influence and to be influenced by the public health agenda, and integrating these plans into the city's wider health strategies
- Emphasising NCH's broader role in shaping communities and places, through its wider service delivery as well as its capabilities in delivering capital programmes.

The focus of this HIA has been on the impact of physical housing improvements on health inequalities; however, NCH has a much broader role in delivering services to tenants and through its engagement with local communities. These wider roles also have a direct impact on wellbeing issues, as well as providing a channel to engage with the most health-deprived communities. For example, NCH currently delivers a number of services under the Supporting People programme, such as warden-aided sheltered housing complexes for older tenants, and the Nottingham On Call telecare alarm emergency service. There are currently around 11,000 people registered for the Nottingham On Call's personal alarm service, which includes both NCH tenants and any other local resident requiring the service (including tenants of other housing associations and private customers).

These services have an impact on health and wellbeing; a report from the Department of Communities and Local Government estimated that the £1.6 billion in housing-related support delivered through the Supporting People programme generated savings of £3.41 billion to the public purse, including £315 million of savings to the health service in a year.¹⁰³

In light of this impact, the current cuts to the Supporting People programme (the national budget has been reduced by 11.5 percent, and in Nottingham the budget has fallen from £22.3m to £12.4m, a 45 percent cut) should be of concern to the health agenda. In the context of this and other public sector efficiency cuts, there is all the more justification for an integrated and joined-up approach in order to continue to deliver services which may be outside of direct health services, but indeed have a long-term impact on overall health outcomes and therefore resources.

In addition, NCH has established networks and means of communication with some of the most health-deprived communities in Nottingham, providing an opportunity to enhance wider public health outreach programmes. For example, the NCH tenant and leaseholder newsletter is sent every six weeks to all tenants and leaseholders and could include information about public health services and local events. Also, as part of the SWM programme, contractors hold local road-show events to demonstrate the options for kitchen design, etc., and for tenants to ask questions; these events could also have information or representatives, for example, regarding healthy eating or cookery skills. NCH is also involved in grass-root community organisations such as Tenant and Resident Associations, which could be encouraged to take part in public health initiatives. There are therefore a number of routes along which public health initiatives could be integrated into NCH's front-line service delivery.

Clinical Commissioning Groups

The route for engaging with local health commissioning will in the future be via CCGs, consisting primarily of groups of local GPs plus other local health professionals. The commissioning framework will operate on a payment-by-results basis, with GPs receiving funding according to the outcomes they deliver, including for their management of common chronic diseases such as asthma, and for the wider services they offer such as child health surveillance. GPs may therefore be financially incentivised to develop services that improve these outcomes; and this HIA provides much evidence to show that improving housing will have an impact on these outcomes.

Direct engagement between GPs and housing providers would present a number of challenges, with little precedent for this in the current system. During the interviews for this report, GPs identified issues such as that they had little contact with the social housing system, and a limited understanding of how it operates. For example, where requests for housing are made on medical grounds, this is assessed by the housing referrals team within NCH; the team has their own Medical Officers to visit, verify the issues and confirm whether re-housing is required. Although patients may request a letter of support from their GP, the GPs themselves have little involvement in the case. During an interview, a GP commented that *“[patients] think a doctor’s letter... will advance them up the housing list. And I think, in common with all doctors, we don’t really know if that’s true or not. We don’t really know how the system works. We don’t know what the points mean.”*

Another issue raised is the potential for GPs not to consider housing as part of the cause or solution for a health issue, or to feel that they are not equipped to deal with this: *“I don’t think we advise people to say, not have carpet in their bedroom or something like that. I think we neglect that... we’ll say ‘Up your inhalers’”; “housing tends to sit on the outside of [the support the NHS offers] because it’s not directly health... we need people to be champions for the link between housing and health because we don’t have the time or energy or availability to be that for our patients”*. There appears to be a concern that if wider issues are brought into the equation, this would put increased pressure on already stretched GP resources: *“You could spend all day every day just writing housing letters if you wanted to”; “It would be lovely to think that we could look holistically after our patients – to be able to represent them in regards to their housing, but there just aren’t the resources and the workload we’re increasingly being asked to take just doesn’t allow for that.”*

Therefore, engaging with GPs via the CCGs may require some of these barriers to be overcome; it is necessary to present a convincing case that housing interventions could improve the health outcomes that GPs are paid to achieve, and that engagement with the housing system would not add to the already considerable resource burden that GPs are already under. This may require supplying GPs with more information about the health impacts of housing, and also about the local housing allocations system and how this operates. The aim would be to enable GPs to feel that they can adequately understand and support any patients with housing issues, even merely by referring them to the correct service. This could be communicated through targeted written materials such as leaflets, presentations from housing services at GP network events, or facilitating contact at the local level between GP practices and local Housing Patch Managers. In a number of cases, they operate from the same joint service centre (e.g., the Mary Potter centre in Hyson Green, the Clifton Cornerstone, and new facilities in Bullwell and St Ann’s).

Conclusions and recommendations

There is a clear social gradient in health in Nottingham, with those living in the most deprived areas having worse outcomes across a number of health conditions and overall life expectancy. Housing conditions are one of the multiple factors of deprivation that can impact negatively on health outcomes.

The evidence collected for this HIA demonstrates that there is a long-term positive health impact from improving housing conditions. Addressing housing conditions alone has a moderate immediate impact in improving the health of adults, due to the complexity of the multiple causes of ill health. However, there are greater positive impacts for the most vulnerable, including children and the elderly, and the cumulative and long-term effect is likely to be significant, resulting in a considerable cost saving to the NHS. This evidence provides the basis for future discussions between health and housing providers.

Here, we summarise the core recommendations and highlight a number of examples of how this could be applied, based on the evidence outlined throughout the HIA:

1. Maximise opportunities to continue to lever in health benefits through improvements to the quality of council housing stock, through NCH's Asset Management Strategy. Examples include:
 - Supporting the neighbourhood renewal project to build 500 'lifetime homes' and minimise the negative wellbeing impact of the moving process
 - Building cost-effective health and safety features into ongoing asset management programmes, e.g., hard-wired smoke detectors, thermostatic mixer valves.
2. Develop understanding and integrate delivery of public health outcomes through wider services such as housing, by engaging with the Health and Wellbeing Board and Clinical Commissioning Groups. For example:
 - Contributing to local strategies, such as the Joint Strategic Needs Assessment (JSNA) and Joint Health and Wellbeing Strategy (JHWS)
 - Engaging with GPs and Clinical Commissioning Groups through information sharing and building relationships at a neighbourhood level.
3. Consider how NCH's engagement with tenants through existing services could potentially complement or support public health initiatives. Examples include:
 - Facilitating tenants' engagement with public health services, such as smoking cessation, weight loss, Occupational Therapists, etc
 - Supporting the continued delivery of the Nottingham On Call telecare alarm service.

Appendix: Notes on data collection and analysis

Risk of harm and savings to the NHS based on the HHSRS model

The estimations of the number of incidents of harm avoided are modelled from the HHSRS data based on the methodology developed by BRE and University of Warwick.¹⁰⁴ The essential premise is to compare the number of harms that were likely to occur given the HHSRS score prior to the Decent Homes improvement works, with the number of harms likely to occur given the HHSRS score after the works.

The HHSRS score is calculated by multiplying the likelihood of a harm occurring by a spread of the expected severity of the injury should that harm occur. There are four classes of harm: Extreme, Severe, Serious and Moderate. More severe outcomes are given a higher weighting in this equation. The definitions of the types of injury under each class of harm can be found in the HHSRS Operating Guidance.

A category 1 hazard is one that has a total Hazard Score of 1000 or more. NCH recorded a log of all category 1 hazards identified in the Nottingham stock. Using figures from the BRE report, the difference was calculated between the average HHSRS scores for properties with a category 1 hazard, with the national average scores as set out in the HHSRS Operating Guidance. This allowed the calculation of the difference in the number of Extreme, Severe, Serious, Moderate harms that would be expected before and after the Decent Homes work, for each hazard category and overall, based on the actual number and type of hazards recorded for NCH stock.

The cost savings from these avoided incidents of harm were based on the representative costs calculated in the BRE report, i.e., £50,000 for treating an extreme harm, £20,000 for a severe harm, £1,500 for a serious harm, and £100 for a moderate harm.

These costs were totalled across all the hazards and all the classes of harms, giving a total estimated cost saving to the NHS in Nottingham as a result of addressing all the category 1 hazards identified in NCH properties.

The HHSRS Operating Guidance states that the likelihood rating given as part of the overall score represents the probability of an occurrence of harm in the 12 months following the assessment. Therefore, it is assumed that addressing the causes of the harm would reduce the number of incidents of harm by the same number each year, for as long as the installation continues to be effective in addressing the hazard. The number of incidents of harm and the cost to the NHS can thus be accumulated over the years following the intervention.

Local hospital admissions data

As part of the appraisal an attempt was made to measure the difference in hospital admissions for relevant health conditions, before and after the delivery of the SWM programme. To do this, an intervention group of NCH property postcodes was selected in order for them to be compared with a control group of NCH property postcodes where the work was yet to be started. Admissions to hospital per 1,000 of the population were calculated for the year before the improvements (August 2008 to July 2009) and the year after (August 2009 to July 2010).

However, this analysis produced no results of statistical significance, and no clear pattern in changes to morbidity and mortality. For this reason, the data were not included in the final report. A number of reasons may explain this result:

- The number of properties in each group and the years for comparison (including only data from one year before and one year after) were restricted due to the concurrent nature of the HIA, with much of the SWM programme still to be completed. The small sample size increased the confidence intervals, making it less likely to find a significant result
- The results may potentially have been skewed by the fact that the year after the intervention (the only year measured for comparison) happened to be one of the coldest on record, making cold-related health admissions more likely despite housing improvements
- As concluded in the appraisal, the complex causal factors for poor health mean that removing even one of these factors (i.e., poor housing) is unlikely to result in a significant change in total numbers of actual hospital admissions. The effect is more likely to be seen in terms of self-evaluations of general health and, potentially, visits to GPs.

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Employment and the local economy



**Nottingham
City Homes**



Chapter summary

Background to the project

Nottingham City Homes, in partnership with Nottingham Trent University, is conducting a two-year impact study on the wider social benefits of the Decent Homes programme, known in Nottingham as the Secure Warm Modern programme.

The research investigates the impact of this significant investment in Nottingham's council housing properties on social outcomes such as crime, health and wellbeing, the environment, and fuel poverty. The report focuses on the impact of the Secure, Warm, Modern programme on spending in the local economy and its effect on employment and training.

The Secure Warm Modern programme in Nottingham

Nottingham City Homes' (NCH) Secure Warm Modern programme aims to bring Nottingham's 28,300 council homes up to and above the national Decent Homes standard. This requires a significant capital investment in the housing stock between 2008-2015, delivered under the following streams of work:

- Secure: Upgrading windows in 15,300 properties to 'Secure by Design' double-glazed units plus replacing old doors
- Warm: Upgrading 19,700 heating systems to full central heating with A-rated boilers
- Modern: Replacing 17,000 kitchens and 12,700 bathrooms, plus electrical rewires.

This is a large capital development project within Nottingham, with a total budget of £187m. It therefore represents a significant financial injection into the construction industry, along with associated impacts such as increased employment, training and stimulation of the local economy.

The Sustainable Communities Strategy, The Nottingham Plan to 2020,¹ is the city's long-term plan for maintaining its economic competitiveness, and ensuring that all local residents benefit from this. A strategic aim of the Nottingham Plan is to 'tackle poverty and deprivation by getting more local people into good jobs', including targets to increase employment and thus reduce the number of workless households, increase skills and qualifications required to progress in work and earn more, and thereby significantly reduce poverty and deprivation. These factors are particularly relevant for Nottingham, which has higher unemployment and lower skills than the national average.

The construction sector is the fifth-largest employer in Nottingham, and was badly hit by the economic downturn and reduction in house building.² Nottingham City Council has therefore pledged to focus on creating local jobs in the construction industry, by ensuring that infrastructure developments that are planned for the city are enabled to draw on local employment sources.

1. One Nottingham (2009). Available at: www.nottinghamcity.gov.uk/onenottingham/index.aspx?articleid=5486

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The impact of the Secure, Warm, Modern programme on the local economy and employment was measured using the New Economic Foundation's Local Multiplier 3 tool, which measures how money is spent and re-spent within a defined local area. The impact on skills and training, business development and on local communities was also measured using a range of indicators.

Key findings

Over the course of the Secure, Warm, Modern programme from 2008 to 2015, NCH will receive just over £187m in funding from the Department for Communities and Local Government (under the national Decent Homes programme) and from Nottingham City Council. The Local Multiplier 3 (LM3) model analyses how much of this spending remains within the local economy, and is re-spent by local people and businesses. The local areas are defined here as, firstly, within the boundaries of Nottingham city and, secondly, within the county of Nottinghamshire (including the city).

In the last financial year (2010/11) 560 people were employed on the SWM programme, including NCH staff, contractors and sub-contractors. Of these employees, 28 per cent live within Nottingham city, and 51 per cent within Nottinghamshire (including the city).

The programme is delivered by seven contractor partners, only one of which (NCH's Direct Labour Organisation) is based in the city. The remaining contractors are part of larger regional or national construction companies, which specialise in the delivery of large-scale capital projects in the social housing sector. The profile of the construction industry in the region, with very few medium or large-sized companies with the required specialist expertise, restricts the choices NCH has in selecting its contractors. However, each of the companies has established an operational base within the city, and around 30 per cent of contractor staff live in Nottingham. They also make use of local sub-contractors and suppliers; 23 per cent of sub-contractors are based within the city and 53 per cent within the county (including those in the city), and 52 per cent of the spend with suppliers is with businesses located in the city.

The LM3 score shows that every £1 of the initial investment from the Secure, Warm, Modern programme generates £1.36 within Nottingham city, or £1.46 spending across Nottinghamshire (including the city). This means that every £1 that is spent on SWM generates an additional 36p of spending in Nottingham city, due to the way it is re-spent by local businesses and people; when the rest of Nottinghamshire is included, the resultant spending increases to 46p.

Therefore, the £37.6m spent on SWM in 2010/11 generated £54.9m spending in Nottinghamshire, i.e., the original investment plus an additional £17.3m spending in Nottinghamshire. Of this additional spending, £13.5m was spent within the Nottingham city boundaries.

The SWM programme has additional social benefits through the training and skills development it encourages. The 'One in a Million' scheme requires that contractors take on an apprentice for every £1m of their contract. This has created 105 Apprenticeships to date, with a target to create 200 Apprenticeships by the end of the programme in 2015. The training and qualifications gained through the Apprenticeship are valued in the job market, and are recognised through higher earnings and employment opportunities for the individual throughout their career, compared to those with lower or no formal qualifications. The total social value of these 105 Apprenticeships, in terms of increased earnings over their lifetime, amounts to £12.9m.

NCH staff are also supported through relevant training and qualifications. Since the start of the SWM programme in 2008, staff on the team have undertaken over 2,000 hours of training (an average of 56 hours per staff member) and completed over 400 training courses. This includes both internal and e-learning courses, as well as eight externally accredited qualifications. The total cost of this investment in training for the SWM team is around £33,000. However, the returns to this training are high, particularly for higher-level vocational and craft qualifications. For example, the three NCH staff who have completed a Level 3 City and Guilds certificate are each estimated to earn £48,000-£74,000 more than others with only a Level 1 or 2 qualification, over their working career.

Delivering a large-scale capital programme such as Secure, Warm, Modern has helped to build the organisational capacity of both NCH and contractor partners. Key Performance Indicators (KPIs) show that the programme has been delivered on time and within budget, and that customer satisfaction has been increasing throughout. Such evidence of the organisation's capabilities has contributed to NCH and partners winning a further £12m for 2010-12 to deliver energy efficiency improvements to the stock.

Conclusions and recommendations

The Secure, Warm, Modern programme represents a significant investment in the local council housing stock, and this research has aimed to measure its wider social impact in terms of the effects on the local economy and employment.

The LM3 analysis shows that the overall score for SWM is at the lower end of the possible range of LM3 scores (the lowest possible score being £1 and the highest around £2.20). This is mainly due to the non-local nature of the majority of the main contractors, most of whom are part of a larger regional/national company.

Although the multiplier score is fairly low, the size of the spending on the SWM programme overall means that the multiplied effect on the local economy is significant. This also means that a small increase in the local multiplier score could bring considerable extra resources to the city. For example, if the current multiplier for Nottingham city of 1.36 were to continue for the remainder of the programme, this would generate an additional £37m spending within the city over this period (2011-15). However, if the multiplier were to increase by just 1p for every £1 spent to 1.37 (for example, by increasing spending with local sub-contractors by 5 percent), this would generate a further £1m spill-over into the city's economy for the remainder of the programme. This statistic demonstrates how small changes in procurement arrangements could make a large difference to Nottingham's economy.

The recommendations provide considerations for NCH: to build on existing initiatives and commitment to playing a positive role in the local economy and developing training and skills, and to develop a strategic approach to sustainable procurement that will maximise the potential positive impact of all future investment programmes.

Recommendation 1:

Develop a sustainable procurement strategy and toolkit to embed social benefits into all purchasing and contracting arrangements.

Recommendation 2:

Work with contractors and partners to maximise the positive impact of current and ongoing programmes.

Recommendation 3:

Establish monitoring with contractors to identify the destination of apprentice leavers, as a first step towards supporting apprentices beyond the completion of their training.

Recommendation 4:

Consider conducting a Local Multiplier 3 analysis on other sections of the company, such as repairs and maintenance, and housing support services.

The report has shown that the Secure, Warm, Modern programme has a significant positive effect on the local economy, employment and skills. It has also demonstrated how further benefits could be achieved through small changes to the supply chain, ensuring that the Decent Homes funding stays within, and has an exponential effect upon, the local economy. NCH is therefore able to contribute to the aims of Nottingham's Sustainable Communities Strategy by providing jobs and training to local people.

Introduction

Nottingham City Homes, in partnership with Nottingham Trent University, are conducting a two-year impact study on the wider social benefits of the Decent Homes programme, known in Nottingham as the 'Secure, Warm, Modern' programme. The research investigates the impact of this significant investment in Nottingham's council housing properties on such social outcomes as crime, health and wellbeing, the environment, and fuel poverty.

This report focuses on the impact of the Secure, Warm, Modern programme on spending in the local economy and its effect on employment and training.

The Secure, Warm, Modern programme

Nottingham City Homes' (NCH) Secure, Warm, Modern programme aims to bring Nottingham's 28,300 council homes up to and above the national Decent Homes standard.

This requires a significant capital investment in the housing stock between 2008-2015, including:

- **Secure:** Upgrading windows in 15,300 properties to 'Secure by Design' double-glazed units plus replacing old doors
- **Warm:** Upgrading 19,700 heating systems to full central heating with A-rated boilers
- **Modern:** Replacing 17,000 kitchens and 12,700 bathrooms, plus electrical rewires.

This is a large capital development project for the city, with a total budget of £187m. It therefore represents a significant financial injection into the construction industry, along with associated impacts such as increased employment, training, and the stimulation of the local economy.

NCH currently works with seven constructor partners, each specialising in a stream of the work:

Secure

Warm

Modern



NCH is also the lead and Accountable Body for Efficiency East Midlands (EEM) procurement consortium. EEM membership includes 17 social housing providers within the region, working collaboratively to secure efficiencies in the procurement of asset management services. These efficiencies include both cost savings and also 'non-cashable' savings such as local labour and Apprenticeships. Many of the materials for the SWM programme were procured through the EEM consortium.

Employment, skills and the local economy

Employment and skills

The 'up-skilling' of the UK workforce is seen by the government as a key factor in driving long-term growth and creating a fairer society. Skills are important for the economy as they lead to increasing productivity; however, they are also important to the individual, providing access to employment and as a means of social mobility. A central element of the recent skills policy has been the expansion of the Apprenticeship programme, with the Government announcing an increase in funding to £1.4bn for 2011/12 to create an additional 100,000 Apprenticeship places by 2014.³

Reducing long-term unemployment is another important policy focus. The Government's 'Work Programme' is the overall strategy for addressing long-term unemployment; under this programme regional providers are contracted to provide intensive support to the long-term unemployed to support them into a job and sustained employment. There is particular concern regarding the more than one million young people who are not in education, training or employment (NEET). Under the previous Government, the Future Jobs Fund supported community-focused job placements for young people, and the current Government has recently announced a £1 billion scheme to subsidise employers providing work and training programmes for people aged 16-24.⁴

One Nottingham's Sustainable Communities Strategy (SCS) 'The Nottingham Plan to 2020' sets out the effect of economic growth on the city's residents and communities. This includes the strategic aim to 'tackle poverty and deprivation by getting more local people into good jobs'.

The specific aims under the 'Working Nottingham' strategic theme are to have:

- More people in employment and fewer workless households
- More adults with the appropriate skills and qualifications able to progress in work and earn more
- Significantly reduced poverty and deprivation.

Building on this aim, the city council in Nottingham has pledged to create 'local jobs for local people' by:

- Increasing the employment of local people and ensuring suppliers sign up to and deliver the jobs pledge
- Improving workforce development (training and skills), ensuring good conditions of employment, and ensuring suppliers sign up to and deliver the skills pledge
- Making sure suppliers use apprenticeships and training that lead to secure employment for local people.

3. Department for Innovation, Business and Skills (2011). Available at:

<http://www.bis.gov.uk/news/topstories/2011/Feb/national-apprenticeship-week-2011>

4. Department for Work and Pensions (2011). Available at:

<http://www.dwp.gov.uk/newsroom/press-releases/2011/nov-2011/dwp132-11.shtml>

5. Nottingham Labour Manifesto (2011). Available at:

<http://open.nottinghamcity.gov.uk/comm/download3.asp?dltype=inline&filename=28136/LabourManifesto.pdf>

To support these initiatives the council established the 'Nottingham Jobs Plan', which aims to create opportunities locally for employment and training for those who are out of work. Leading by example, since 2003 the city council has increased the proportion of its own workforce who also live in the city from 43 per cent to 54 per cent, and has ring-fenced all entry-level jobs and training opportunities for local people. The leader of the city council has pledged to continue to increase the proportion of the council's workforce from the city.⁵ In addition, the council took up the opportunity provided by the Future Jobs Fund to create 1,000 job placements for young people in the city in 2011.

Addressing employment and skills issues is particularly relevant for Nottingham, which has higher unemployment and lower skills than the national average. For example, unemployment is higher in Nottingham than on average in the UK (at 6.2 per cent in Nottingham city in March 2010, compared to 4.2 per cent UK-wide). There is, however, considerable variation among areas of the city and groups of people; unemployment is over ten per cent in Aspley, Bestwood, Bulwell and St Ann's, with young people and those looking for low-skills employment representing around one third of current job seekers. Of Nottingham's population, 77.5 per cent is economically active (i.e., in work or unemployed but actively seeking work), compared to 78.7 per cent across the UK.

Workers in Nottingham earn, on average, less than the UK median. The median gross weekly pay of full-time workers resident in Nottingham is £416.70, compared with £496 in England.

Average qualification levels have increased across Nottinghamshire over the last decade yet remain below England averages. In Nottingham and Nottinghamshire in 2008, 67 per cent of residents aged between 19 and retirement age were qualified to at least Level 2, compared to 69 per cent in England overall. A greater proportion of Nottingham and Nottinghamshire residents have no qualifications than the national average (13.3 per cent compared to 11.9 per cent).

Local economic development

The priority sectors for economic development identified in the Nottingham Plan include the public sector (along with science and new technology, finance and business services, retail, leisure and tourism, and the creative industries). While the housing/construction industry is not among the priority sectors, Nottingham City Council has pledged to focus on creating local jobs in the construction industry, by making sure that infrastructure developments that are planned for the city are enabled to draw on local employment sources.

Wider regional economic development will be supported by the newly formed Local Economic Partnership, which includes Nottingham city, along with Nottinghamshire, Derby and Derbyshire. The LEP will have responsibility for strategic coordination across the region, supplying the necessary evidence base to inform decisions in areas such as employment and skills, infrastructure and planning. The LEPs replace the Regional Development Agencies, which were disbanded following the election of the coalition government.

The housing construction sector in the area

The shape of the housing construction industry affects the choices available to NCH in delivering a significant investment programme such as Secure, Warm, Modern. NCH's decision to outsource the construction work and to have an elemental programme (rather than a whole-house approach) means that it requires specialist contractor partners with the capacity and experience in delivering a large-scale programme in a social housing context.

While the construction sector is a significant part of the UK economy, supporting around eight per cent of GDP, work on public sector housing accounts for a small proportion of the total output; in 2009 new-build public housing accounted for 3.6 per cent of the total construction output in Great Britain, and repairs and maintenance in the sector accounted for 8.9 per cent. The industry as a whole was one of the hardest hit during the recession, with an estimated 375,000 job losses between 2008-10.⁶ Since 2007, new building in social housing has decreased by ten per cent; however, public housing repairs have continued to grow⁷ (supported by government funding through the Decent Homes programme).

The construction industry in the East Midlands is small, with few larger construction firms based in the region. For example, the East Midlands region has the second-smallest construction industry of all the nine English regions, in terms of the number of construction enterprises (8 per cent of total for England) and employment (7.4 per cent England total).⁸ The East Midlands also has the smallest number of medium/large construction employers (i.e., with 60 or more employees) of all the English regions, with only four per cent of the England total of firms this size being registered in the East Midlands. Over a third of construction firms in the East Midlands are sole traders (with only one employee).⁹

Within Nottinghamshire, however, construction is relatively important in the local economy and is the fifth-largest source of employment (8 per cent of employment). It was one of the fastest-growing sectors before the recession, in part reflecting the boom in house building, but was severely affected by the recession, contracting by 6 per cent between 2006-2007 – more than twice the decline in England.¹⁰

The construction industry is strongest (in terms of number of enterprises and employment) in the South-East, London and East. The largest concentrations of medium/large firms (60 employees or more) are in the South-East and North-East.

The overall picture therefore is that the East Midlands region as a whole has few large construction companies, and is dominated by smaller firms or sole traders. Within Nottinghamshire this accounts for a significant amount of employment. This has implications for the pool of potential contractors to be drawn on by a large capital programme in Nottingham, such as the Secure, Warm, Modern programme; particularly where the programme requires some additional skills and experience in working on social housing properties (such as the requirement for contractors to have Resident Liaison Officers).

6. The Construction Index (2010). Available at: www.theconstructionindex.co.uk/market-data/regional-construction-forecast-data/latest

7. Office for National Statistics (2010). Available at: www.statistics.gov.uk/downloads/theme_commerce/CSA-2010/Opening_percent20page.pdf

8. Construction Skills (2010) Sector Skills Assessment for the Construction Sector 2010. Available at: www.cskills.org/uploads/ssa-england_tcm17-18453.pdf

9. DWP (2011) Op. cit 2

10. Nottingham's Local Economic Assessment (2011). Available at: <http://www.nottinghaminsight.org.uk/>

Approach

Aims and objectives

The aim of this strand of the research is to evaluate the impact of the SWM programme on money flows and employment within the local economy, and the outcomes these deliver for local businesses and people.

The objectives will therefore be to:

- Map and measure money flows from the SWM spend within the local economy
- Evaluate any additional benefits to organisations and individuals as a result of the programme
- Evaluate the impact of SWM on the objectives of Nottingham's Sustainable Communities Strategy within the 'Working Nottingham' theme.

Method

The impact of the SWM programme is assessed against a 'theory of change' model, i.e., a map of potential anticipated impacts in a number of areas. This is set out in the 'Local Economy Impact Map' shown overleaf, showing the anticipated outcomes and impact of the SWM programme on relevant stakeholders, including NCH, its employees and contractors, and local businesses. The diagram also shows the money flows as a result of investment in the SWM programme. The method then assesses and measures whether these anticipated outcomes have occurred, and the level of any changes to have occurred.

To measure the impact of money flows into the local economy, the Local Multiplier 3 (LM3) model developed by the New Economics Foundation (nef) was used. Nef states that 'money that enters a local economy has a multiplied effect on that economy based on the way people spend and re-spend that money. More re-spending in the local economy means a higher multiplier effect because more income is generated'.¹¹ This flow of money through the local economy as a result of the SWM programme is also represented in the impact map.

The stages in the LM3 model are:

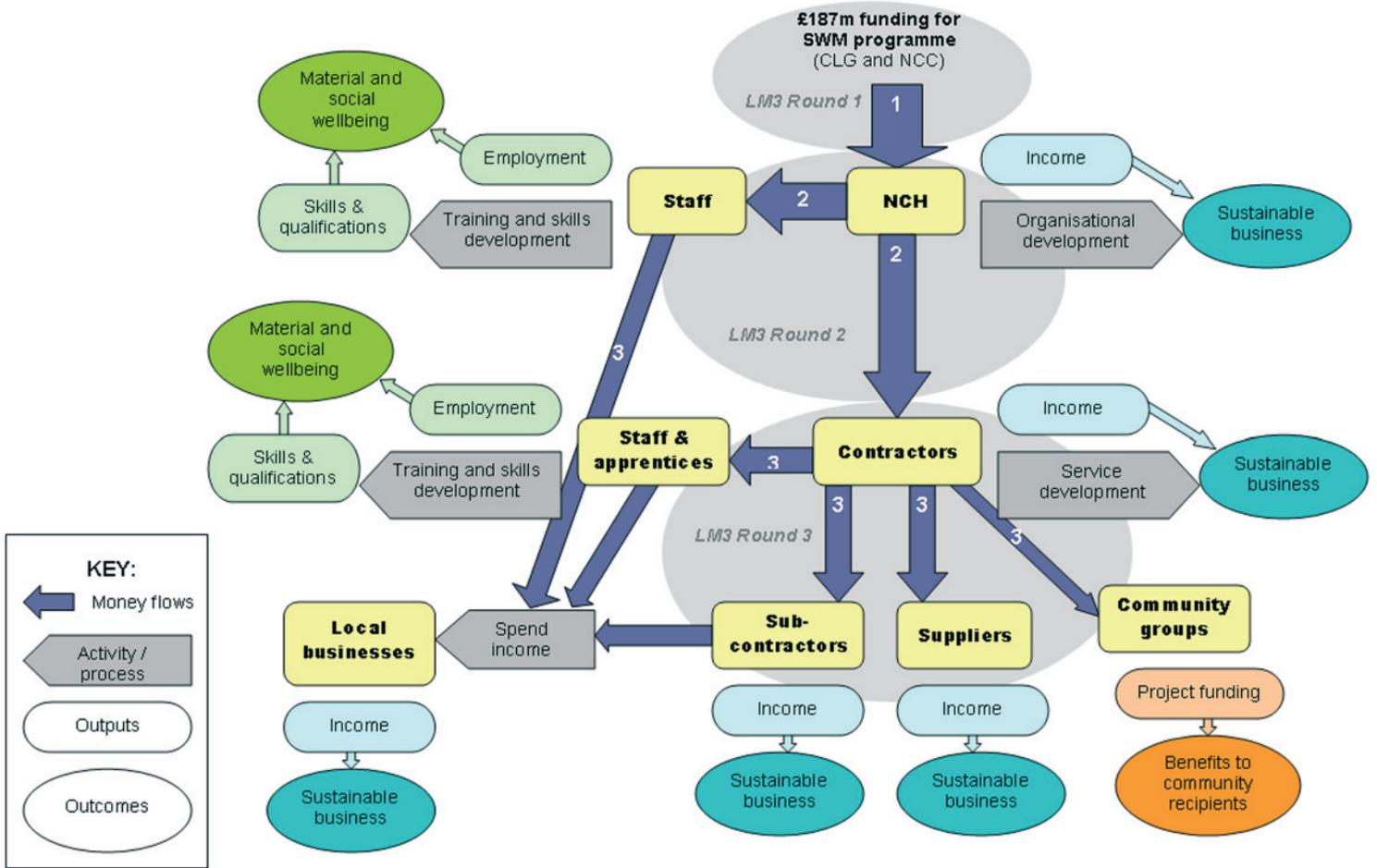
1. Define the local area
2. Identify initial income source (Round 1)
3. Break down how this income is spent within the local area (Round 2)
4. Survey the businesses and people who spend this money in order to determine where they spend their incomes (Round 3)
5. Add the spending and re-spending within the local economy.

The local area was defined, firstly, as within the Nottingham City boundaries, encompassing the 20 wards of Nottingham City. However, a wider local area was also defined as the county of Nottinghamshire, which includes Nottingham City and the boroughs of Gedling, Broxtowe, Rushcliffe, Ashfield, Newark and Sherwood, Mansfield, and Bassetlaw.

11. New Economics Foundation (2009) Proving and Improving. Available at: www.neweconomics.org/publications/proving-and-improving

The rounds of spending measured (1-3) are also shown in the impact map below. Data for Rounds 1 and 2 were collected via desk-based research, the examination of internal finance records of the total spend and the breakdown of spend on NCH staff and contractors. Local/non-local spending in Round 2 was determined by the home postcodes of employees and the registered address of each contractor company (i.e., headquarters).

Round 3 is approximated by identifying spend with and the location of contractor employees, suppliers, sub-contractors, and rent for local operational headquarters. These data were collected via a short survey conducted on the contractors. To identify the level of local re-spending by NCH employees, the assumption from the LM3 online model – that local staff spend 66 per cent income locally, and non-local staff spend 33 per cent locally – was applied (rather than asking of the employees detailed personal questions about how they spend their income).



Local Economy Impact Map

The outcome from this will be a local multiplier 'score', showing the amount spent in the local economy for each pound of the original investment.

To facilitate data collection, the LM3 is calculated for the period of the last financial year (April 2010-March 2011). The difficulties of collecting detailed historical data from the start of the programme (e.g., all previous employees and their home addresses) and changes in contractors and staff over this period meant that it was not feasible to calculate the overall LM3 score for the whole programme since 2008.

In addition, the wider benefits identified in the impact map were measured by selecting suitable indicators of these outcomes, and gathering data to measure the changes in these indicators. For example, the outcome of the improved employability of individuals was measured by the number of hours spent in training, and the investment made in staff training.

Explaining the impact map

There are additional benefits beyond the income generated for the organisations delivering SWM. For example, as a result of SWM, NCH has developed the capabilities to deliver a large planned capital programme, including human resource and capital (with skills development and experience), organisational and technical infrastructure (such as the use of project management software), and physical infrastructure (e.g., office space and equipment). Such capacity and the successful delivery of SWM puts NCH in a favourable position to bid for future funding and deliver further capital projects. Together, these factors mean that the organisation is more likely to be sustainable.

Similarly, constructor partners working with NCH are also developing their organisational infrastructure and expertise by working on the project. For example, the practice of using regular customer satisfaction surveys to monitor and improve their service has led to improvements in service delivery (as well as to evidence of successful customer satisfaction); these will give the contractors a good position from which to win future business from NCH and others. This therefore again results in the business' being more sustainable.

Some of the money given to contractors will flow directly into local communities as a result of the commitment to provide grants to fund community projects. Communities are able to apply for grants for a project of their choice, and this will result in additional investment in the community.

At an individual level, the SWM programme has created a number of jobs (across NCH, contractor partners and sub-contractors), including Apprenticeships. NCH's 'One in a Million' scheme requires contractors to take on one apprentice for every £1m of their contract. As well as being employed, many individuals are receiving further training, and are developing skills and experience on the job. This improves the individuals' productivity, which will ultimately be reflected in their progress and remuneration from their employment. This is particularly the case for the 105 apprentices who are (or have been) employed on the programme; many of these individuals were unemployed prior to starting the scheme; the training and experience they receive will not only bring them income now, but will also give them a step up towards developing a life-long career.

There is a large body of evidence that suggests that employment contributes to an individual's wellbeing. This is in terms of both their material and their psycho-social wellbeing. Employment provides the resources for people to spend on goods, including housing, food, clothes, and luxury / leisure goods, which add to their sense of wellbeing. In addition, as explained in a recent paper on Healthy Communities: 'Good-quality employment is important for wellbeing. Work can strengthen social connections and it can provide a sense of meaning, purpose and value, which are important for encouraging feelings of self-worth and satisfaction'.¹² Therefore, an expected outcome of employment on the SWM programme is that it adds to individuals' sense of wellbeing.

The outputs from the SWM spending are income (for organisations and individuals), and organisational and personal development. This results in more sustainable businesses, and improved material and psycho-social wellbeing for individuals.

Other stakeholders affected by the spending on the SWM programme include local government. The aims of local government are captured in the Sustainable Communities Strategy, and the outcomes of the SWM programme contribute to a number of the aims. For example, the programme will result in more people in employment and greater skills development. In addition, if those employed are from particularly deprived backgrounds, it may also contribute to reducing poverty and deprivation.

12. Local Government Improvement and Development et al. (2010) The Role of Local Government in Improving Wellbeing p50.

Local Multiplier effect of Secure Warm Modern

Round 1

The LM3 is calculated for the 2010/2011 financial year (March 2010-April 2011), during which the total spent on the Secure, Warm, Modern programme was £37.6m. The programme began in 2008, a total of £84.1m was spent between 2008-2011. The majority of the funding was from the Homes and Communities Agency (funded by the Department for Communities and Local Government), with additional funding from Nottingham City Council and the Government Office for the East Midlands (GOEM).

Total investment in the programme from 2008 to its scheduled end in 2015 will be £187.1m.

Round 2

Round 2 covers how NCH spends that initial income – this includes spending on NCH staff and on the main SWM contractors for 2010/11.

A total of 41 NCH staff work full or part-time on the SWM programme (equating to 31 full-time equivalent positions). The total local salary spending on NCH staff was calculated by totalling the net salaries of all staff whose home postcode is within Nottingham City or Nottinghamshire.¹³ Altogether, 44 per cent of SWM staff live within the city boundaries, and 63 per cent live within the county.¹⁴ Of the total spend on net salaries¹⁵ for NCH SWM staff, 35 per cent goes to those living within the city, and 56 per cent to those within the county.

A total of £36.6m was awarded to contractors in 2010/11. The amount spent on contractors was categorised as 'local'/'non-local' according to the registered address of each contractor company, i.e., the headquarters according to Companies House. Of the seven contractor partners, only one – NCH's Direct Labour Organisation (DLO) – is based in Nottingham. The other six contractors are medium to large regional/national companies specialising in the delivery of social housing projects (see Figure 1, for the location of each contractor's registered address).

Although all of the contractors have an operational base within the city boundaries from which they run their SWM operations, the fact was considered insufficient in determining these firms as 'local'. The conclusion is based on the assumptions that, firstly, there would be significant levels of money flow back to the company's headquarters outside of the local area; secondly, that any local spending (e.g., on staff, sub-contractors, suppliers, and rent for operational bases) would be calculated in Round 3.

This gives a low total of 13 per cent local re-spend in Round 2 across both Nottingham City and Nottinghamshire.

13. Adjusted by the proportion of working hours spent on the SWM programme, rather than on other NCH Property Services division responsibilities

14. All figures for the county of Nottinghamshire include those for the City of Nottingham.

15. The net value of salaries is included in the calculation because income tax and National Insurance payments go to central government, i.e., are non-local spending.



Figure 1: Registered locations of contractor companies' headquarters

Round 3

Round 3 measures: the re-spending of NCH staff (using the assumption from the online LM3 that local staff re-spend 66 per cent of their income in the local area, and non-local staff spend 33 per cent of their income in the local area); salary spending on contractor staff, and spending on sub-contractors, suppliers and rent.

Across the seven contractors, 274 staff are employed to work on the SWM programme. This includes the 67 apprentices¹⁶ currently working for the contractors as part of NCH's 'One in a Million' scheme. Of the contractor staff, 30 per cent live within the city and 47 per cent live within the county. The remaining 53 per cent live outside Nottinghamshire and commute to work.

In addition, the work is sub-contracted to 30 sub-contractors (among the seven main contractors), who employ a further 245 staff to work on the SWM programme; 23 per cent are based within the city and 53 per cent within the county (including those in the city).

Therefore, a total of 560 people were employed on working on the SWM programme in 2010/11. Overall, 28 per cent live within the city, and 51 per cent within Nottinghamshire (including the city). Figure 2 shows the number of staff based in Nottingham City, Nottinghamshire (here excluding the city, to prevent duplication in the cumulative total) and outside of the county boundaries, for NCH, contractor and sub-contractor staff.

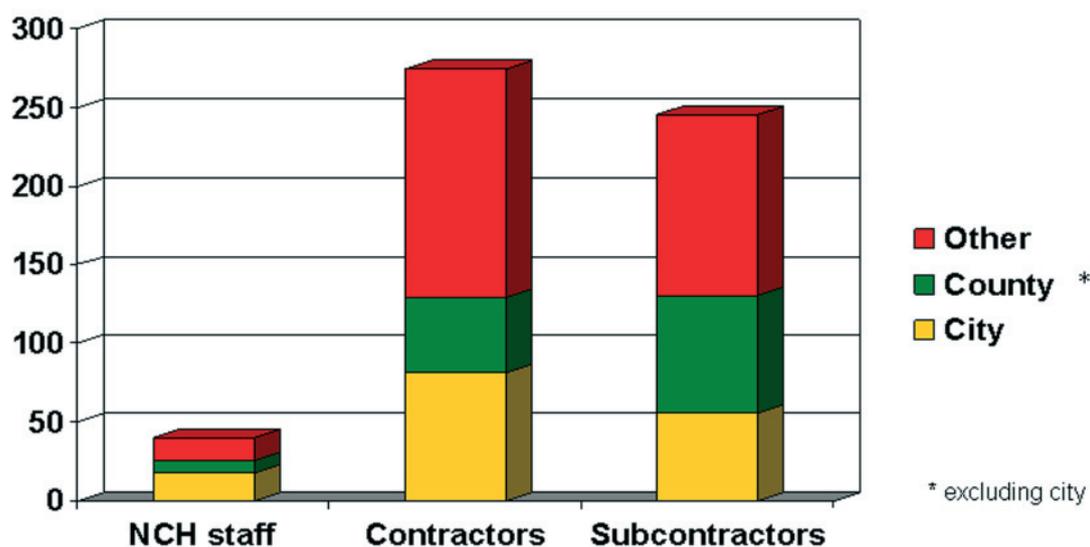


Figure 2: Locality of SWM staff

16. A further 38 apprentices have already completed their Apprenticeship with the contractors, taking the total to 105 Apprenticeships established as a result of the SWM programme.

The supply chain for the SWM programme includes 33 suppliers. The definition of whether a supplier was local or non-local was determined by the address of the local base/depot used by the contractors. Although there is potential for non-local leakage where the supplier is part of a wider regional/national chain of firms, the assumption was made that some spend with suppliers would be retained locally through salaries and rent.

Over half (52 per cent) of the spending on supplies is with suppliers based within the city, and 53 per cent is spent with suppliers based in the county (Figure 3).

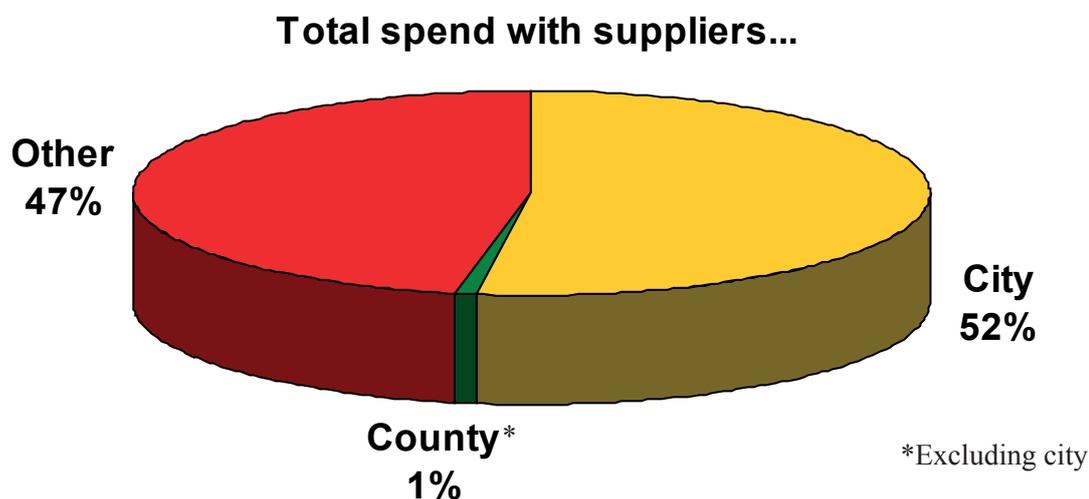


Figure 3: Locality of spend with suppliers

Finally, as noted in Round 2, all contractors have set up an operational base in the city (including offices and depots). Total spending on local rent across the six regional/national contractors for 2010/11 was included in the Round 3 spending.

Contractor partners have also contributed to local community projects, awarding three grants of £5,000 each. This contributes a further amount to money spent in the local area, which, although small in financial terms, will have significant social benefits as a result of the work of these community projects (see Section 6, below).

Local re-spend for Round 3 is higher than for Round 2, with 35 per cent re-spent within Nottingham City and 50 per cent within Nottinghamshire. This indicates the impact of the contractors on local employment and businesses, with around one third of contractor staff and sub-contractors coming from the city, and around half from the county. A slightly higher proportion of suppliers are local, at 55 per cent within the city and 61 per cent within the county. Therefore, although the majority of contractors are defined as non-local in Round 2, some of the spending with these contractors does enter the local economy in order to support the delivery of the programme in Nottingham.

Local Multiplier score for SWM

The Local Multiplier score for 2010/11 is calculated by adding up the local spending on the programme for all three rounds, and then dividing the result by the initial income (Round 1):

2010/11		Nottingham City		Nottinghamshire (including city)	
		Local spend	% total	Local spend	% total
Round 1	SWM funding	£37.6m		£37.6m	
Round 2	NCH Salaries	£4.8m	13%	£4.9m	13%
	Contractors				
Round 3	NCH staff re-spend	£8.7m	35%	£12.3m	50%
	Contractor salaries				
	Sub-contractors				
	Suppliers				
	Local rent				
	Community grants				
LM3 score		£1.36		£1.46	

Table 1: LM3 calculations and score

The LM3 score shows that every £1 of the initial investment via the Secure, Warm, Modern programme generates £1.36 within Nottingham city, or £1.46 spending across Nottinghamshire (including the city). This means that every £1 that is spent on SWM generates an additional 36p of spending in Nottingham city, due to the way it is re-spent by local businesses and people; when the rest of Nottinghamshire is included, this increases to 46p.

Therefore, the £37.6m spent on SWM in 2010/11 generated £54.9m spending in Nottinghamshire, i.e., the original investment plus an additional £17.3m spending in Nottinghamshire. Of this additional spend, £13.5m was spent within the Nottingham city boundaries.

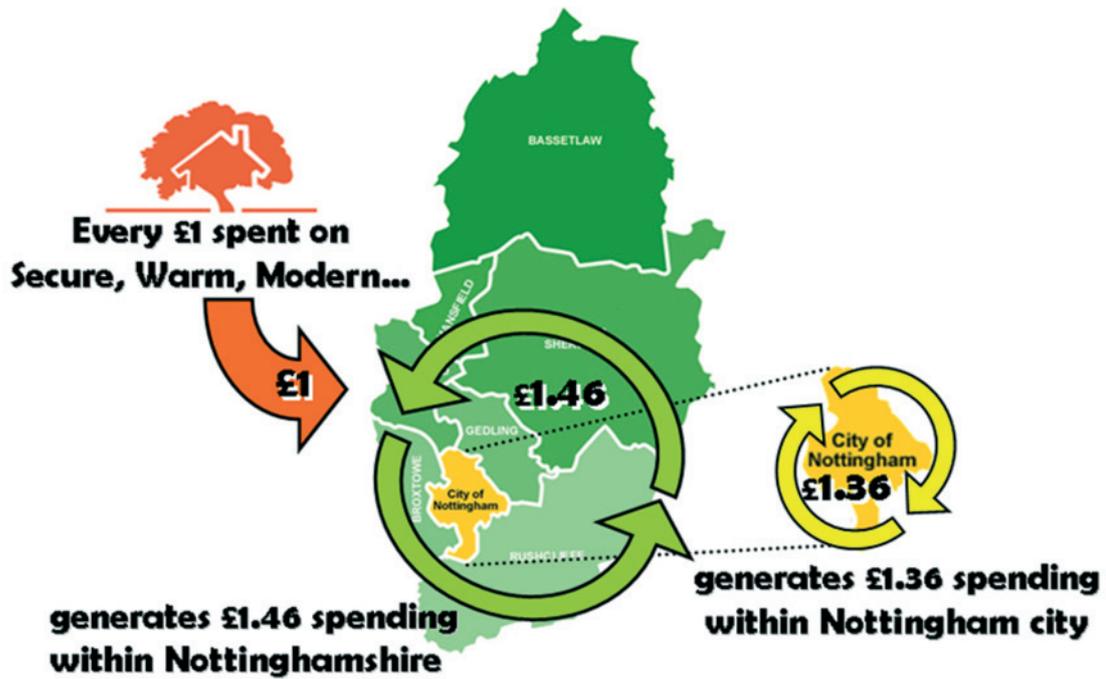


Figure 4: SWM Local Multiplier score for Nottinghamshire and Nottingham city

With some caution, the LM3 score could be applied to the whole SWM programme to show the total local spending that the programme could deliver if it were to continue to run similarly to at present (i.e., the same contractors, sub-contractors, etc). If this were the case, the spending of £84.1m to date (2008-2011) is estimated to have generated additional spending of £38.6m in Nottinghamshire, including £30m within Nottingham city. Extrapolating over the whole programme (2008-2015) the total SWM investment of £187.1m will generate an additional £85.8m spending in Nottinghamshire, including £67.3m within Nottingham city only.

Business benefits

As shown in the impact map, an additional outcome of the SWM programme for NCH lies in its increased capacity to deliver a large-scale capital programme as a result of the organisational learning and development acquired during the delivery programme. This means that NCH has the capacity to make the most of new business opportunities as they arise, contributing to the sustainability of the business model. NCH's Business Plan for 2010-13 states that 'We need to secure a viable future for the organisation through securing new business, exploring alternative ways of working, developing new funding routes and making the most of the resources we have'.

An indication of this improved capacity to deliver capital programmes is found in the level and change in the company's Key Performance Indicators (KPIs) for the Asset Management and Capital Programme teams, between the start of the programme in 2008 and end of March 2011.

The primary KPIs for Decent Homes are the predictability of programme against costs and time (expressed as a percentage), and customer satisfaction (score between 1-10 from customer surveys). The programme was delivered within budget and in line with target costs each year to date. The predictability of the programme against time is consistently well above the target of 90 per cent, fluctuating slightly over the three years from 97.4 per cent in 2008/09, to 95.3 per cent in 2009/10, and to 96.9 per cent in 2010/11. Customer satisfaction with the programme has risen over time, from below the target of 8 out of 10 in 2008/09 (7.24 out of 10), to above the target (8.50 in 2010/11).

KPIs thus generally show above-target and/or improving scores over the course of the programme to date. As a result of the success of the programme so far, NCH has been able to take on further capital improvement projects from other funding streams, including a £3.5m Community Energy Savings Programme (CESP) project in Aspley and across the city, and an £8.5m programme to install over 1,300 photovoltaic panels city-wide.

Regarding contractors, KPIs have similarly shown improvement over the course of the programme, particularly in customer satisfaction. Scores for the way staff treat residents, their care and cleanliness, the quality of work, and communications have all seen upward trends, from below the target of 8 initially to above the target across all areas in the latest financial year (see Figure 5). This provides evidence of the improvement and quality of the contractors' service, both to NCH and to future clients, which contributes to their ability to win future contracts and therefore to the sustainability of their business.

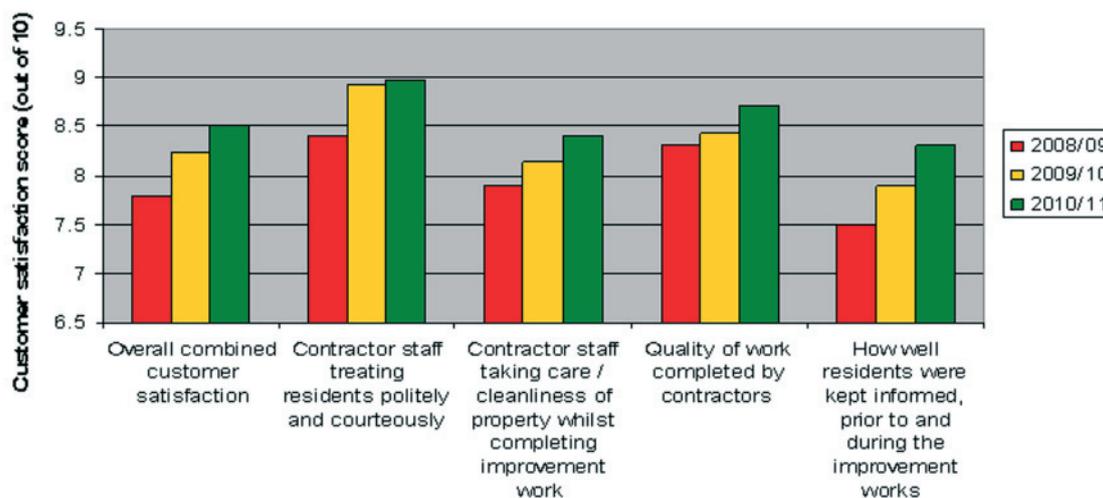


Figure 5: Customer satisfaction scores for SWM contractors

Skills and training

NCH staff

A large capital programme such as Secure, Warm, Modern requires both staff capacity and expertise to run effectively. All SWM staff operate from offices at Beechdale Court, which were set up specifically to support the running of the SWM programme.

A total of 41 staff currently work on the SWM programme (or 31 full-time equivalent positions), employing a large range of roles and specialist skills:

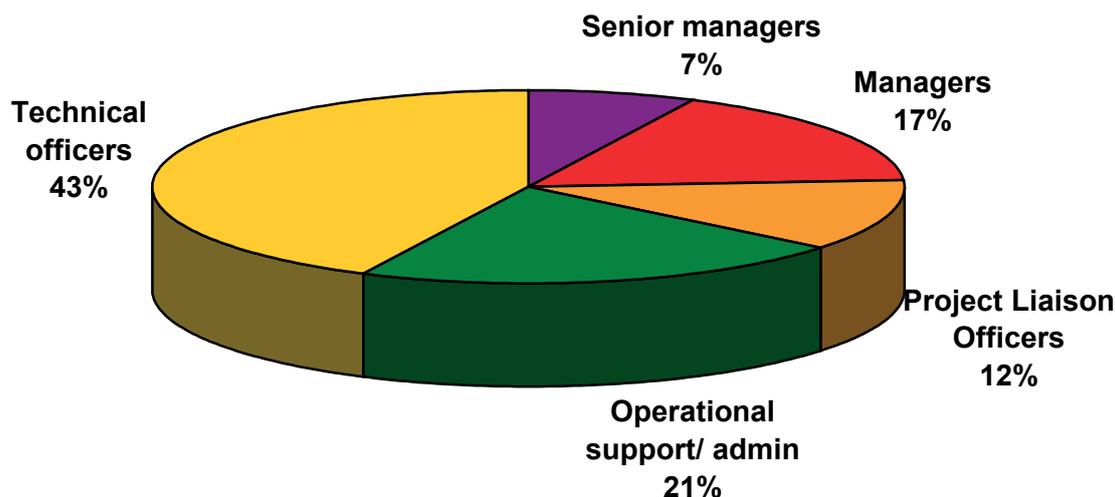


Figure 6: Roles employed on the SWM programme

All NCH staff members participate in a Personal Development Review process with their managers in order to identify strengths and areas for further development, including training. Training options include internal courses run by the NCH Learning and Development team, external courses and accredited qualifications.

Since the start of the SWM programme in 2008, staff on the team have undertaken over 2,000 hours of training (an average of 56 hours per staff member) and completed over 400 training courses. The cost of this investment in training for the SWM team is around £33,000.

The majority of courses were internally run, covering IT, management, customer care and interpersonal skills, health and safety, and technical skills. Just under half of these courses were E-learning packages developed for NCH in partnership with housing skills specialists.

The courses include eight externally accredited vocational qualifications completed by staff on the SWM team, including two City and Guilds qualifications at Level 2 and three at Level 3; two NVQs at Level 2, and an HNC qualification at Level 4.¹⁷ (Table 2)

17. Level 2 is equivalent to GCSE grades A*-C, while Level 3 is equivalent to A-levels. For further explanation of vocational qualification levels, see www.direct.gov.uk/en/EducationAndLearning/QualificationsExplained/DG_10039017

An accredited qualification is a signal of a higher level of skills of an individual, which is valued in the job market and reflected in higher earnings than those with lower or no formal qualifications. A number of studies have quantified this effect, measuring the increase in earnings of those with certain qualifications, and estimating a financial value resulting from increased earnings and employment opportunities over the working lifetime of that individual. This is known as the Net Present Value (NPV) of that qualification, and reflects the social value (i.e., indicating the higher productivity of that individual and therefore increased contribution to the economy) of that qualification. By referring to a range of published reports, the relevant figures (where available) are shown in Table 2 for the qualifications completed by members of the SWM team.

Qualification	Number completed	Increase in earnings*	Social value (NPV)
NVQ Level 2	2	3%	Not available**
City and Guilds Level 2	2	9%	£24,000 - £35,000
City and Guilds Level 3	3	15%	£48,000 - £74,000
HNC Level 4	1	22%	Not available**
TOTAL	8		£192,000 - £292,000

Table 2: SWM staff accredited qualifications and social value

**Compared to lifetime earnings of others with only a Level 1 or 2 qualification*

*** The NPV of these qualifications was not reported in the relevant literature*

This shows that a Level 2 NVQ in public administration has the smallest, yet still positive, effect on increasing estimated potential earnings.¹⁸ There are higher financial returns for craft qualifications, such as City and Guilds certificates, which increase proportionately with the level of the qualification.¹⁹ One report provides an estimate of the financial value of these City and Guild qualifications, giving a total value for the five qualifications completed by SWM staff of between £192,000 and £292,000 (i.e., reflecting the increased potential lifetime earnings of those staff members). The highest returns are to the Level 4 Higher National Certificate (HNC), which increases earnings by around 22 per cent compared to the earnings of those without vocational qualifications.²⁰

This demonstrates that there is a high return both to the individual and to the economy as a whole as a result of the training successfully completed by the SWM team. Although figures are available on the financial value of only a few of the qualifications completed, the value of even this small sample far outweighs the initial cost of all of the training undertaking by the team.

18. Dearden et al. (2004) An In-Depth Analysis of Returns to National Vocational Qualifications Obtained at Level 2

19. London Economics (2010) Returns to BTEC vocational qualifications. Available at: www.edexcel.com/Policies/Documents/Final%20Report%20Returns%20to%20BTEC%20Vocational%20Qualifications%20Fin%20E2%2080%20A6.pdf

20. Jenkins et al. (2007) The Returns to Qualifications in England: Updating the Evidence Base on Level 2 and Level 3 Vocational Qualifications Available at: http://eprints.lse.ac.uk/19378/1/The_Returns_to_Qualifications_in_England_Updating_the_Evidence_Base_on_Level_2_and_Level_3_Vocational_Qualifications.pdf

Apprenticeships

NCH's 'One in a Million' scheme requires contractor partners to take on an apprentice for every £1m income from the SWM programme. The aim is therefore to create 200 Apprenticeships over the whole SWM programme. The scheme is currently on track, with 105 Apprenticeships created so far. Of these, 67 are currently part-way through the Apprenticeship, and 38 have already completed their Apprenticeships.

Apprentices are recruited with support from BEST, a local social enterprise in Aspley that supports local people into training and employment. Of all of the apprentices, 63 per cent live within Nottingham City, and those currently being recruited will also be from within the city.

All apprentices work towards an NVQ qualification with a local college, as a required part of their Apprenticeship. The majority of Apprenticeships are at Level 2, with around ten apprentices working towards a Level 3 qualification. The Apprenticeships are in a range of trades (such as electrical, plumbing, gas, joinery, and bricklaying), and a smaller number are in Business Administration and Customer Services.

Research evidence shows that completing a Level 2 Apprenticeship increases a person's earnings by 16 per cent compared to an individual whose highest qualification is at Level 1 or 2; a Level 3 Apprenticeship increases potential lifetime earnings by 18 per cent. Apprenticeships in the construction industry have an even higher wage return, increasing earnings by 32 per cent. The Net Present Value (NPV) of a construction Apprenticeship (i.e., the future stream of benefits in terms of higher earnings, minus the cost of training) is around £157,000, while the NPV of a Business Administration Apprenticeship is lower, yet still positive, at around £57,000.²¹ This indicates a significant benefit to both the individual (in terms of higher earnings) and the economy (indicating increased productivity) as a result of Apprenticeships, particularly in the construction industry.

Using these figures, the 105 Apprenticeships delivered under the 'One in a Million' programme have therefore generated a total social value of £12.9m over the future working lifetime of these apprentices.

Apprenticeship	Number completed	Increase in earnings*	Social value (NPV)
Construction	66	32%	£10,330,518
Business Administration	11	7%	£624,415
Customer Service	3	Not available	£95,784
Other Level 2	25	16%	£1,825,025
TOTAL	105		£12,875,742

Table 3: Social value of Apprenticeships completed through One in a Million

**Compared to lifetime earnings of others with a only Level 1 or 2 qualification*

21. McIntosh (2007) A Cost-Benefit Analysis of Apprenticeships and Other Vocational Qualifications. Available at: www.employersforapprentices.gov.uk/docs/research/Research_1_440.pdf

Community legacy benefits

In order to create further legacy benefits from the SWM programme, an initiative was devised whereby contractor partners provided grants to fund three community projects. The grants were advertised in the NCH Tenant and Leaseholder newspaper, and community groups were encouraged to put forward bids. Following the short-listing of bids, a 'Dragons Den'-style event was held where the groups set out their plans for the grant to a panel made up of NCH and contractor representatives.

The following three projects were each awarded a grant of £5,000:

- **Pro-vision:** This is a not-for-profit organisation providing free clothes to homeless people, single parent families and people fleeing domestic violence. The grant will be used to open a second-hand shop in Sneinton where the public will be able to drop off any donations. It will also host workshops on CV- and letter-writing skills, interview preparation and practical driving skills
- **Kings Meadows:** This community group will use the grant to open a soft play community cafe in the Meadows. The cafe will provide affordable healthy food and a safe environment for children to play, and the potential for training in hospitality and healthy eating. This will help contribute to bringing the community together
- **Aspley Park Football Club:** The grant will help the club to gain access to indoor facilities during the winter and to set up the 'mini-kickerz' project for local children (boys and girls from four to eight years old). The funding will also help to train adults to become football coaches, and to buy kits and equipment for future teams.

The first two projects will use the grant as start-up capital for a social enterprise that will become self-sustaining once up and running. The third project will use the grant to cover necessary start-up costs such as training and equipment. These projects will therefore deliver a number of wider benefits to the community, and these will continue beyond the SWM programme.

It is beyond the scope of this report to measure in detail the long-term social impacts of these projects, although some of the relevant indicators of these outcomes (from the initial grant applications) include:

- Five employment/work experience opportunities;
- Eight formal training courses;
- Further training opportunities (including Apprenticeships), job-preparation coaching and work experience for volunteers, once up and running.

The community-based nature of each of these projects means that the impact of any spending and re-investing of revenue generated is likely to be concentrated locally.

Conclusions and recommendations

The Secure, Warm, Modern programme represents a significant investment in the local council housing stock. The present research has aimed to measure the wider social impact of this in terms of its effects on the local economy and employment.

The LM3 analysis shows that the overall score for SWM is at the lower end of the possible range of LM3 scores (the lowest possible score being £1 and the highest around £2.20). This is due mainly to the non-local nature of the majority of the main contractors, most of whom are part of a larger regional/national company. NCH's procurement of these contractors included no specifications regarding locality, and was also constrained by the situation of the construction industry in the Midlands as there are few large and specialist contractors located in the area.

There is wider scope for using local companies and employees at the sub-contracting stage of the work, where it would be possible to draw on Nottinghamshire's considerable number of smaller construction firms. Currently, around half of the sub-contractors are from the county, and under a quarter from the city itself. This increases the impact of the spending on the local economy, while demonstrating that there is potential to boost the impact on the local economy (particularly within the city) through sub-contracting arrangements.

Although the multiplier score is relatively low, the size of the spending on the SWM programme overall means that the multiplied effect on the local economy is significant. This means that a small increase in the local multiplier score could bring considerable extra resources to the city. For example, if the current multiplier for Nottingham city of 1.36 were to continue for the remainder of the programme, this would generate an additional £37m spending within the city over the total period (2011-15) of the SWM programme. However, **if the multiplier were to increase by just 1p for every £1 spent to 1.37 (for example, by increasing spending with local sub-contractors by 5 per cent), this would generate a further £1m spill-over into the city's economy for the remainder of the programme.** This demonstrates how even minor changes in procurement arrangements could make a major difference to Nottingham's economy.

Commissioning for local impact

The guiding principles in Nottingham's Commissioning Framework, produced by Nottingham City Council, states that supporting local employment and a thriving Third Sector, and stimulating local markets should be included in commissioning strategies, procurement plans, processes and sub-contracting arrangements within the context of compliance with procurement law. A common perception is that procurement law is a barrier to specifying 'local' suppliers, by contravening competition or EU law; however, there are a number of ways in which organisations are able to maximise local benefits without breaching procurement law.

Examples from nef's (2005) report 'Public spending for public benefit' include:

- Proactively engaging with businesses in the area to boost their chances of being able to compete for public contracts, as well as to improve your local economy in general, as long as you do not give those enterprises an unfair advantage during the procurement process
- Build a number of social, as well as environmental, benefits into your contracts
- Divide up contract services into a number of ways, as long as you are breaking down your contract to achieve a better value rather than to avoid EU thresholds
- Include a requirement for bidders to submit optional, priced proposals for the delivery of community benefits, as long as they are relevant to the contract and the authority's community plan
- Work with a supplier to develop a local supply chain and employment opportunities to deliver a better service after awarding a contract.²²

A number of best practice examples have been developed to show how these principles may be supported in practice, for example, through social clauses in procurement and contracts.²³ For example, the London Borough of Camden together with nef developed a Sustainable Commissioning Model, in which potential contractors are asked to describe (and are scored on) how their activities and outputs will contribute towards specified service level and community outcomes as set out in the Sustainable Communities Strategy, including goals for local employment and skills.

NCH is committed to bringing maximum benefits to the local communities through the work it does, as demonstrated by the One in a Million programme targeting Apprenticeship opportunities for local people, particularly those who have been out of work. NCH works with BEST (Broxtowe Education, Skills and Training), a local social enterprise that finds ways of improving skills and employment opportunities for those living in and around the Broxtowe estate, to recruit Apprentices. NCH has also supported the development of BESTbuild, which employs local trades-people as jobbing contractors on building programmes and is now a Principle Contractor for NCH.

Recommendations

Recommendation 1: Develop a sustainable procurement strategy and toolkit to embed social benefits into all purchasing and contracting arrangements.

As a large local employer and commissioning body, NCH has a considerable opportunity to positively influence the local economy, including employment and skills outcomes. This positive effect could be widened through the participation of the Efficiency East Midlands (EEM) consortium in any social procurement initiatives. NCH has already taken the initiative in a number of ways to improve these outcomes, including the One in a Million Apprenticeship scheme and by working with BEST and BESTbuild to recruit and employ local people. However, to maximise its impact NCH should consider developing a coherent sustainable procurement strategy that embeds additional environmental, social and economic benefits across all purchases and contracts from the outset.

22. New Economics Foundation (2005) Public spending for public benefit, pp. 33-34.

23. For examples, see www.procurementcupboard.org/Tools.aspx

The Social Purchasing Action Steps²⁴ set out how to build and implement such a strategy:

1. Integrate goals into purchasing strategy: Identify your goals and integrate social values into your procurement practices strategically and prioritise initiatives according to how they will help meet your social goals.
2. Identify opportunities: Look for ways to facilitate and encourage social purchasing, e.g.,
 - Identify local social enterprises or other local organisations that could benefit from your spending, and how spending can be redirected to them
 - Provide a list of preferred suppliers for discretionary purposes (e.g., local caterers, printing etc)
 - Unbundle large contracts
 - Encourage or reward large contractors to sub-contract or otherwise engage locally.
3. Establish milestones and metrics: establish benchmarks, and set short and long-term goals, which are incorporated into staff performance criteria.
4. Internalise motivation and vision: engage internal stakeholders, and make the policy mandatory across the whole organisation, providing the necessary information and support to do so.
5. Engage suppliers and collaborate with networks: communicate your goals and practices to local suppliers, and build relationships to see how partnerships can be developed. Work with other similar-minded commissioners and the rest of the supply chain to influence them on the importance of delivering social outcomes.
6. Celebrate success: put a system in place to record and recognise success.

The above could include the development of a toolkit of practical examples and processes for including social clauses that are in line with procurement law into contracts. A number of examples and good practice case studies are available (as outlined above) to develop specific social clauses or assessment frameworks to be included in procurement and contracts. The methods could initially be developed and tested either by NCH's Procurement team (for example, with Capital Projects and Asset Management), or in partnership with EEM, with the potential to be rolled out across the rest of the company and wider partnerships.

24. Enterprising Non-Profits Social Purchasing Action Steps. Available at: www.enterprisingnonprofits.ca/sepurchasing/social-purchasing-action-steps

Recommendation 2: Work with contractors and partners to maximise the positive impact of current and ongoing programmes.

The Secure, Warm, Modern programme will still represent a considerable proportion of capital spending until its completion in 2015. Although the contracts are already agreed, opportunities for increasing the social impact in partnership with those contractors could be considered. For example, NCH could support contractors in sourcing local suppliers or sub-contractors, to increase the amount of money flows that stay within the local economy. As demonstrated above, a small change in the way the programme is delivered could have a significant positive effect on the local economy.

Recommendation 3: Establish monitoring with contractors to identify the destination of apprentice leavers, as a first step to supporting apprentices beyond the completion of their training.

The One in a Million scheme will continue to create Apprenticeships for every £1m spent up to 2015 (creating 200 in total). As the scheme progresses, greater focus could potentially be placed on supporting contractors such that apprentices stay in employment after the end of their training, to maximise the benefits of the initial investment in training. The first step for NCH would be to monitor the destination of apprentices placed with contractor partners as they complete their training, to establish what proportion are finding employment and whether this is an issue that needs addressing.

Recommendation 4: Consider conducting Local Multiplier 3 analysis on other sections of the company, such as repairs and maintenance, and housing support services.

Clearly, the Secure, Warm, Modern programme is only part of NCH's spending within the local economy; there is a considerable commitment of resources in other areas of Property Services (such as repairs and maintenance) and also in Housing Services more generally. A wider understanding of NCH's impact on the local economy could be gained from carrying out LM3 analysis across other areas of the company. It would provide information on NCH's current impact on the local economy overall, to act as a benchmark and also to identify areas of the company where this impact could potentially be increased.

Conclusion

This report has shown that the Secure, Warm, Modern programme has a significant positive effect on the local economy, employment, and skills. It has also demonstrated how further benefits could be achieved through small changes to the supply chain, ensuring that the Decent Homes funding stays within, and has a multiplied effect upon, the local economy. NCH is therefore able to contribute to the aims of Nottingham's Sustainable Communities Strategy by providing jobs and training to local people. The recommendations provide considerations for NCH: to build on existing initiatives and commitment to playing a positive role in the local economy and to develop training and skills. This will be achieved by developing a strategic approach to sustainable procurement that will maximise the potential positive impact of all future investment programmes.

Conclusions and recommendations



**Nottingham
City Homes**



Social return on investment

The Decent Homes' programme focuses on improving the physical condition of the property, ensuring that NCH homes are secure, warm and modern. However, the improvement to these homes has a wider impact than only the physical changes to the property, with direct impacts on people's lives in a number of ways. The impact occurs through a complex web of interactions between people and their built environment, leading to a number of obvious, direct impacts as well as a number of subtle changes to the way in which people are able to live their lives. Through the impact on individuals and families living in the properties, and through working directly with communities, the SWM has a wider effect on community outcomes as a whole.

To give an example of this kind of direct and consequential impact, improving energy efficiency (e.g., through new windows and boilers) has a direct effect in making the home warmer and potentially cheaper to heat, and reducing damp and mould. This improves people's quality of life, by creating a more comfortable and healthier living environment, and also by reducing stress about heating bills. There are other, less obvious, impacts; for example, it makes it easier to heat the whole home, meaning that household members can have their own spaces, including children/teenagers in their rooms, thereby potentially improving educational outcomes. Having a warm home makes it a better social space, with residents more willing to invite others to visit. Furthermore, overall this contributes to a reduction in carbon emissions towards helping Nottingham reduce its environmental impact. Therefore, at the community level, this improvement to the home delivers positive social, economic and environmental outcomes.

Throughout the report a number of estimations of the cost impact of the outcomes, in terms of benefits or savings, were calculated to give an indication of the value of the impact of the programme. In order to develop this more comprehensively, a detailed SROI analysis was carried out for one sample area, Aspley ward. The decision was taken to focus on one area as this meant that a more extensive range of outcome measures were available (for example, the crime report only included sample estates in Aspley ward), and this was one of the first areas to receive the SWM work. Focusing in detail on one area allowed us to capture as comprehensively as possible the full range of impacts, from across the themes covered in the research, to give an overall ratio of the social return on investment of the programme in that area. Although this is based on data from Aspley ward, this gives an indicative feel for the scale of benefits created from similar investments across the entire programme.

The SROI analysis aims to represent the value of the social, economic and environmental outcomes of activities, compared to the initial investment in those activities. The calculation is carried out by identifying relevant changes, or outcomes, resulting from the programme for various stakeholders, and using indicators to measure the size of the change in those outcomes. This is then assigned an appropriate financial proxy value, to enable comparison in cost terms with the initial investment. The valuation of the benefits also takes into account things such as the duration of the benefits occurring, accounting for what would have happened anyway without the intervention, and how much of the outcome can be attributed to the programme.⁴²

42. For a full description of the SROI process, see the Cabinet Office's Guide (2009), available at: www.neweconomics.org/publications/guide-social-return-investment

The basis of the SROI analysis is an impact map, similar to that shown on the chapter cover, summarising all the outcomes of the programme that have been identified through the research and consultation with stakeholders, and also linking this to the inputs and outputs of the programme. A full impact map is included in the Appendix. The value is calculated over a 10 year period, accounting for the long-term nature of the investments made in properties (for example, boilers are expected to have a serviceable lifetime of 15 years, whilst the lifecycle of windows is longer at 30 years) and thus the extended duration of their positive impact. This timescale was selected as having a reasonable balance between capturing these long-term impacts and not overstating the impact by predicting too far into the future.

The impact on tenants was considered to be the most material to this research, but the effects on wider city partners, such as the NHS, Police, Fire and Rescue Service and the Local Strategic Partnership (One Nottingham) were also taken into account. For tenants, the outcomes measured reflected those identified throughout this report, covering the impact on their security, comfort, energy costs, health and wellbeing, employment opportunities, and satisfaction with their home and resulting sense of home and place. The negative effect of the stress of the refurbishment process on their wellbeing was also taken into account. Wider community level impacts, such as the reduction in carbon and increase in contribution to the local economy, were included as outcomes for One Nottingham, representing city stakeholders more widely. The impact in terms of reduced resource burden for other local stakeholders, including the NHS, Police and Fire and Rescue Service, were also accounted for.

The calculation takes into account an estimation of what would have happened anyway, if NCH had not invested in the refurbishments; this is known as the 'deadweight'. In this case, some deadweight would have occurred if tenants had been willing to make their own improvements to their properties. The deadweight for most outcomes was assumed to be equivalent to the percentage of properties where work was not carried out, either because it wasn't needed or the tenants refused the work.

The calculation also takes into account how much of the impact was due to the actions of others (attribution); this ranged from full attribution to NCH for some outcomes (such as reducing energy costs from new windows and heating) to partial attribution in other cases (such as crime reduction, where local police activity clearly also played a role in reducing burglary levels). The final aspect to take into consideration is the 'drop-off', i.e. whether the value of the change to stakeholders deteriorates over time, lessening its value in the future. For most outcomes, the benefits were assumed to continue at the same level over the lifetime of the installation; e.g. new windows were assumed to deliver the same benefits in terms of burglary reduction and increased insulation year on year.

Taking these considerations into account, the total social value generated by the Secure Warm Modern programme in Aspley is estimated to be £21.6 million in the year immediately following the work, with a projected total of £79.2 million in social present value over the 10 years after the programme. The cost of the investment in new windows for 2,790 properties, 1,740 heating systems, 1,680 kitchens and 1,140 bathrooms in Aspley was £16.6 million. Thus **the SROI ratio (total present value: total inputs) for Aspley is £4.76: £1**, i.e. every £1 invested generates £4.76 in social value. The initial investment is paid back in terms of social value within the first year following the installations, after which the cumulative social value generated exceeds the initial investment costs.

Contribution to Nottingham city strategies and targets

In achieving these community outcomes, the Secure, Warm, Modern programme is contributing to many of the city's objectives and targets, as set out in the Sustainable Communities Strategy, The Nottingham Plan to 2020. Table 7 sets out a number of the objectives and indicators from The Nottingham Plan, and describes how SWM has contributed to these.

The most significant contribution is clearly to the Neighbourhood Nottingham strategic objectives, particularly the targets to reduce carbon emissions and fuel poverty. SWM will contribute towards an estimated 17 per cent of Nottingham's target for reducing domestic carbon emissions and nine per cent of the overall carbon reduction target. Of the 5,621 surveys conducted after the SWM work was carried out, only 23 remain with a SAP rating of less than 35, demonstrating the impact that SWM has had on helping to eradicate fuel poverty.

This is a positive start towards NCH's overall contribution, as the SWM programme addresses only the most basic and cost-effective measures in improving energy efficiency (double glazing and heating systems). Further work to address the hardest-to-heat properties is now under way, for example, fitting internal insulation to over 1,000 solid-wall properties under the CESP funding, with more measures planned in NCH's Low Carbon Roadmap to 2020. NCH has therefore already made a significant contribution to carbon reduction and fuel poverty targets, and will continue to improve on this to 2020.

The wider impact of SWM evaluated in this project shows that it contributes to targets under the Working, Safer and Healthy Nottingham strategic objectives. As well as evaluating the contribution of SWM to these outcomes, the project has also highlighted where and how this contribution could be increased. The following section outlines the learning from the project and future recommendations.

Over leaf: Table 7: Secure, Warm, Modern contribution to Nottingham's Sustainable Communities Strategy

Neighbourhood Nottingham

Every neighbourhood will have a distinctive identity and provide a great place to live.

- Raise resident satisfaction with their neighbourhoods (across the city) to the highest of all Core Cities in England (target is currently 80%); and to no less than 5% below the city average in every neighbourhood
- Eradicate fuel poverty by 2016 (defined as the percentage of income-based benefits recipients living in homes with energy efficiency ratings below 35)
- Reduce the city's carbon emissions by 26% of 2005 levels by 2020 (to 4.81 tonnes CO2 per capita – this target is in line with Government target to reduce emissions by 34% of 1990 levels)

- NCH tenants giving a positive score for satisfaction with their area as place to live has risen from 71% in 2008 to 79% in 2011. Satisfaction with the quality of their homes has also increased from 69% to 76% (STATUS/STAR survey)
- Of those properties surveyed, there are only 23 homes with SAP rating less than 35 following SWM work
- Estimated total reduction in carbon emissions from SWM by 2015 will be 43,500 tonnes, 9% of SCS target to reduce to 4.81 tonnes per capita

Working Nottingham

Nottingham will have more people in employment and fewer workless households; will have more adults with the appropriate skills and qualifications able to progress in work and earn more; will have significantly reduced poverty and deprivation.

- Increase the city's employment rate to 75%
- Raise the proportion of adults with at least Level 2 qualifications to 90%
- Move the City of Nottingham up out of the 10% most-deprived authorities in England, i.e., out of the bottom 35
- Make sure that no neighbourhood is in the most-deprived 5% nationally

- SWM provides 560 jobs, of which 28% are within the city
- All 200 apprentices will be complete qualifications to at least Level 2, plus NCH staff completing 8 qualifications at Level 2 or above
- SWM directly impacts on the 'Living Environment' domain of the IMD, by reducing the number of social houses in poor conditions or without central heating. It also contributes to the other domains, e.g., employment; income; education, skills and training; health and disability; and crime

Safer Nottingham

Be a significantly safer city with lower crime, fear of crime and perceptions of lower anti-social behaviour.

- Reduce 'all crime' to the average for Nottingham's family of similar CDRPs
- Reduce the perceptions of anti-social behaviour (ASB) to the average for Nottingham's family of similar CDRPs

- Contributed to a reduction in burglary of 42% in two sample estates, with further reduction anticipated following door replacement programme
- Housing improvements contribute to reducing ASB through reduction in noise transmission; and signalling effect of 'broken windows theory' (see p. 23)

Healthy Nottingham

People will be healthier and happier, live longer, and will feel able to achieve their potential and make a positive contribution to city life.

Health inequalities between areas and social groups will be significantly reduced.

- Reduce the health inequality gap between Nottingham City and England by 70% by 2020 (defined as mortality rate from all circulatory diseases at ages under 75)
- To improve mental health and wellbeing across the city

- Estimated to have contributed to improving the health outcomes, including circulatory disease; of some of the most health deprived communities in Nottingham
- Estimated to have contributed to an improvement in mental health of nearly 1,500 tenants

Learning points and key messages

What have we learned?

The findings from the research, as well as the process itself, have provided a number of insights regarding the way that NCH can use information such as this to inform ongoing and future housing investment programmes. A number of key learning points are summarised below:

Understanding how housing investment affects social outcomes can be used to inform both the design and the delivery of future housing investment programmes:

One of the key objectives of the project was not only to understand what the impact of the SWM has been, but also to use this evidence to inform future housing investment decisions. Understanding the social impacts of housing programmes adds further depth and quality to the information used to make decisions on priorities, specifications and programme design.

The research has shown that each element fitted, such as windows, boilers and kitchens, has a range of implications for the wellbeing of the occupants. The research validates the priorities that tenants themselves set for the Secure, Warm, Modern programme; for example, the windows installed under the 'Secure' programme, the first stream to be implemented, deliver a number of benefits by not only making properties more secure, but also warmer, less draughty and with less condensation. The evidence of these wider benefits justifies NCH's decision to go beyond the basic Decent Homes standard, and replace every single glazed window with Secured by Design, A-rated thermally efficient models. Including such benefits gives a clearer indication of value for money, where 'value' takes into account the outcomes that tenants see as result of the investment. The window replacement programme therefore represents a cost-effective intervention. This view of value for money again justifies placing the 'Modern' stream towards the end of the programme, as the evidence suggests that there are perhaps fewer wider benefits from new kitchens and bathrooms, despite their being a core element of the national Decent Homes criteria, compared against the cost of installation.

As well as providing supporting evidence of the benefits that have resulted from the programme, the research has suggested where priorities and planning could be changed to deliver additional benefits. For example, the current programme replaces doors only where they are in particularly poor condition; the evidence gathered here suggests, however, that a larger-scale door replacement programme would have considerable benefits in terms of further target-hardening properties against burglary, and improving air-tightness and insulation. This might, for instance, justify prioritising the doors programme over, for example, the kitchen programme, as the door programme could deliver more social value per pound invested than does a higher-cost kitchen installation.

Evidence of social benefits helps in reviewing the way that housing investment could be planned or prioritised based on information about people and communities, rather than merely on properties. For example, as recommended in the crime report, if a door replacement programme were to be implemented, this could be prioritised by identifying people or communities that are most vulnerable to burglary via a door, using information shared by the Crime and Drugs Partnerships on crime hotspots. Similarly, current data sharing and analysis with Nottingham Fire and Rescue Service (NFRS) aims to build a person profile of those who are most vulnerable to fires and resulting injuries, which could be used to prioritise the current programme to fit hard-wired smoke alarms in all NCH properties by 2014. Intervening earlier by prioritising the programme according to the vulnerability of the occupant in this way, rather than by the property type, could in this example potentially save lives.

The research has highlighted that the way that the programme is delivered, as well as what is delivered, also matters for social outcomes. For example, while the completed work in the home delivers a range of positive outcomes for tenants, the process itself has the potential to be stressful and to have a negative impact on tenants' wellbeing. For this reason, NCH closely monitors customer satisfaction with the process and works delivered, through regular and extensive surveying following the works. Involving tenants in the design of the programme and how it will be delivered, as was the case for the Secure, Warm, Modern programme, also helps to ensure that potential negative or unintended impacts are prevented and that tenants feel a sense of 'ownership' over the programme.

Consideration of how social benefits can be optimised, for example, from future housing investment programmes, should begin from the initial programme design and procurement stage. This ensures that additional positive social benefits, such as local employment, skills and training, and contributions to community projects, are incorporated into the programme from the outset. It means that such benefits can be monitored throughout the programme delivery, for example, through programme and contractual KPIs.

NCH is an important partner in achieving the city's social objectives, with a wider role than merely 'bricks and mortar' issues:

The research has highlighted that NCH's housing investment work, such as SWM, has a wider impact beyond the improvement in neighbourhoods, given its positive impact on people's safety, employment, health and wellbeing. However, the asset management aspect of NCH's work is only a part of NCH's wider role in delivering housing services, and these wider services have the further potential to make a positive impact on the city's social outcomes. NCH provides services to the most deprived communities in Nottingham, and as the landlord is an established point of contact with the members of these communities. NCH is therefore a key partner in achieving the wider social aims of the city, and those of other stakeholders and partners also working to achieve these shared objectives.

A finding that has reoccurred throughout the research has been that community engagement and communication are essential to understanding and maximising potential positive outcomes. Throughout the research, much value has been found in the direct and in-depth information gathering with tenants themselves, to complement and enhance quantitative data analysis. The qualitative information gathered has provided supporting evidence and contextual information on the changes seen in the quantitative data analysis, as well as a more detailed insight into some of the more subtle or unanticipated changes that have occurred as a result of SWM.

In addition, engagement and communication are also key to achieving the potential positive impacts in full. For example, the full potential of carbon emission and fuel poverty reductions from energy efficient installations in properties can be achieved only by working with tenants and communities to understand their interactions and use of the technology and improve energy use patterns. Similarly, while improvements to the physical condition of the property contribute to improvements in health, larger gains could be seen through support to introduce lifestyle changes, such as smoking cessation or weight loss. NCH has a potential role in facilitating contact with relevant partners and programmes to provide such support to its tenants, making use of the contact with tenants occurring throughout the SWM work.

Strong partnerships are key to measuring these impacts and addressing issues that are raised:

Working in partnership with other stakeholders is all the more important in the current climate, when all agencies across the public sector are under pressure to cut costs and increase efficiency. NCH's central role will always be to manage its housing effectively and efficiently; while it aims to deliver a number of wider social objectives, it cannot be equipped to do so directly in all cases. Therefore, identifying shared objectives with other partners and working either to deliver these in partnership with others, or to facilitate the delivery of services to its tenants via other partners, is an important means through which NCH is able to achieve these wider social outcomes.

The impact study has built and strengthened working partnerships within the city. Most significantly, the Knowledge Transfer Partnership itself has established a strong operational partnership between NCH and the local university, through the Nottingham Business School. This has significantly enhanced NCH's ability to conduct the necessary research and evaluation towards understanding its social impacts, then to build this into its decision-making processes. Wider benefits of working with the Business School have included improved understanding of NCH's information resources and information flows across the organisation, more directly to inform NCH's wider information strategy. The project has facilitated links within the Business School and wider Nottingham Trent University that will continue beyond the two-year scope of the KTP project itself, with both NCH and NTU committed to reviewing future opportunities for joint working.

Other partnerships have been developed through the research process, in identifying shared objectives, developing the methodology, and data sharing and analysis. Working with the Nottingham Crime and Drugs Partnership, Nottingham City NHS and Nottingham Energy Partnership (NEP) has helped not only to carry out the research, but also to follow up on the findings and consider activities to address the issues raised. For example, NCH is currently working with NEP to deliver training on energy awareness to all NCH liaison officers on the SWM team, thus to enhance the communications/behavioural aspect of energy efficiency that was raised through the research. Also, further work is under way with the CDP to identify hotspot areas for burglary via a door, to guide investment decisions on a potential door replacement programme.

Key messages

Each strand of the research had produced its own set of specific recommendations, set out in the sections above. In reviewing all of the individual recommendations and the learning points, four overall themes emerge across the research strands. These are summarised below as the key messages from the project, with selected examples of specific recommendations from the individual research strands provided as examples:

- 1. Research into social impacts provides valuable knowledge and information towards informing future investment decisions**
 - To increase security further, a priority investment for any future resources that may be made available for further housing improvement should be the widespread replacement of the current wooden doors with Secured by Design PVC-u models
 - Maximise opportunities to continue to incorporate health benefits through improvements to the quality of council housing stock, through NCH's Asset Management Strategy
 - Develop a sustainable procurement strategy and toolkit to embed social benefits into all purchasing and contracting arrangements.

- 2. Continued partnership working is important in implementing solutions to issues raised and maximising positive impacts**
 - Insecurity in NCH properties as a result of behavioural factors (such as leaving windows/doors unsecured) could be addressed through joint awareness raising between the police and NCH.
 - Develop understanding and integrate delivery of public health outcomes through wider services such as housing, by engaging with the Health and Wellbeing Board and Clinical Commissioning Groups.
 - Work with contractors and partners to maximise the positive impact of current and ongoing programmes.

- 3. Community engagement and communication are vital factors in achieving positive social outcomes from housing investment programmes**
 - Further work could be done to raise awareness that the new windows and doors meet the Secured by Design standard, and what this means. This would help to enhance perceptions of security, and therefore improve tenants' emotional wellbeing.
 - Develop a range of communication materials and methods for helping occupants make the most of any energy efficiency improvements in their home, and test the effectiveness of the methods with tenants.
 - Consider how NCH's engagement with tenants through existing services could potentially complement or support public health initiatives.

- 4. The practice of measuring social outcomes should be embedded into the organisation, including further research and evaluation**
 - Further research should be undertaken to analyse the impact of Secure work undertaken in other areas during 2009/10, once a full year's data is available post-intervention. This would enable comparison with other areas, including those that have received a more extensive programme of door replacement.
 - Continue to monitor the actual impact of energy efficiency programmes delivered by NCH on carbon emission reductions, tenants' energy awareness and fuel bills.
 - Develop wider data on fuel poverty prevalence (or suitable approximation) to monitor distribution and changes in fuel poverty (accounting for the impact of both changing energy use and changing prices in determining fuel costs) to inform NCH's future financial advice/energy efficiency programmes and initiatives.

The Decent Homes Impact Study has provided valuable evidence on the social impacts of the Secure, Warm, Modern programme in Nottingham, as well as enhancing organisational learning through the process of carrying out the impact study itself. It has added quality and depth to the information used to shape NCH's long-term investment planning, such as the 30-year Asset Management Strategy, focusing not only on the physical state of the property, but also on the impact on people and communities. Finally, the study has supplied the evidence to show the true value of providing a decent home that is secure, warm and modern, capturing the value of the wider social and community benefits envisioned from the outset of the Decent Homes programme. This information has been of value to both NCH and the wider housing sector, including the Homes and Communities Agency. NCH will continue to measure the wider impact of housing investments.

Appendix: Social Return on Investment Impact Map for Aspley ward

Part 1: Inputs → Outcomes

Stakeholder	Description of expected changes	Inputs		Outputs	Outcomes					
		Description	Value £		Description	Indicator	Source	Financial proxy	Value £	Source
NCH tenants (3,343 properties, 8,155 tenants)	Homes are secure- fewer burglaries and people feel safe	Time (providing access to home)	£0	Windows fitted in 2,972 properties Heating upgraded in 1,741 properties New kitchen in 1,679 properties New bathroom in 1,140 properties	Reduced number of burglaries or attempted burglaries of a dwelling to NCH properties	Change in number of burglaries in a dwelling (actual, attempted and aggravated)	Police Authority data (CDP)	Socio-economic costs of burglary	£4,239	Home Office
	Heating costs are affordable, less worry about bills				Reduced fear of crime	Change in scores on 'how safe do you feel at home alone after dark'	STATUS/STAR surveys	Average cost of burglar alarm	£625	Which? 2008
	Better home conditions- warmer, less damp & mould, fewer hazards				Decreased fuel bill and fuel poverty	Number of new windows and heating systems installed	NCH data	Reduction in annual fuel bill by element	£136 from windows, £225 from heating	Energy Saving Trust
				Tenants have better health, as internal conditions prevent/improve management of relevant health issues and prevent accidents in the home	Reduced mental health, reduction in childhood asthma	Reduction in physiological, psychological, infection and accident hazards	HHSRS	Average cost of treatment by severity	£100-£50,000	BRE
					Improved mental health, reduction in childhood asthma	See NCH/ NHS Health report	Cost per depression case Treatment of Asthma	£142 £181	Thompson and Morris (2000) National Asthma Campaign	

	Increased satisfaction with home and neighbourhood				Satisfaction with home creates stability, strengthened sense of home and place	Lower turnover of properties (additional months in SWM properties)	NCH data	Month's rent	£253	NCH data
	Stress of refurbishment process				Decrease in wellbeing through stress of process	Reduction in mental health (SF-36 survey)	Liverpool HAT study	Cost of treatment for depression	£142	Thompson and Morris (2000)
	Opportunity for employment and training on the programme				Improved career chances, including material and psycho-social wellbeing	Increase in earning capacity for Apprentices	Literature on NPV of Appr'ship	Increase in annual wage compared to average local wage	£5,876	McIntosh (2007)
NHS	Fewer NCH tenants requiring GP visits and hospital admissions				Reduction in resource burden on NHS	See health outcomes for tenants above				
Police	Less resource burden in preventing and dealing with burglaries				Reduction in resource burden on Police	Change in number of burglaries in a dwelling (actual, attempted and aggravated)	Police Authority data (CDP)	Cost of burglary to police	£3,300	Northants police report
Fire and Rescue Service	Fewer call outs to domestic incidences				Reduction in resource burden on NFRS	Change in accidental dwelling fires	NFRS data	Cost of call out to NFRS	£2,988	DCLG
One Nottingham	Positive contribution to carbon reduction targets				Reduction in carbon emissions	Change in SAP emissions scores	EPC data	Cost of tonne of carbon	£22	SROI network database

Decent Homes Impact Study
March 2012

	Contribution to the local economy				Money recycled to local staff and businesses	LM3 score for Nottingham city	NCH	LM3 score	£0.36	LM3 score
State	Increased tax revenue (salaries)	Decent Homes funding for: Double-glazed windows Heating upgrades Kitchen & bathroom replacements	£6.0m	Increased tax revenue (salaries)	Number of apprentices	NCH	Increased tax take compared to on benefits per year	£1,774	SROI Network database	
	£3.0m									
	Decreased welfare bill		£7.6m	Decreased welfare bill	Number of apprentices	NCH	JSA over a year	£2,779	DirectGov	
TOTAL			£16.6m							

Part 2: Outcomes → Impact

Stakeholder	Outcomes							Impact	Total present value (discount rate 3.5%)
	Description	Quantity of change	Duration (years)	Dead-weight	Attribution to others	Drop-off	Years 1-10		
NCH tenants (3,343 properties, 8,155 tenants)	Reduced number of burglaries or attempted burglaries of a dwelling to NCH properties	62	30	10%	85%	0%	£35,480	£295,077	
	Reduced fear of crime	200	30	10%	0%	0%	£112,354	£934,402	
	Decreased fuel bill and fuel poverty	3,094	15	7%	0%	1.3%	£734,553	£5,785,095	
	Tenants have better health, as internal conditions prevent/improve management of relevant health issues and prevent accidents in the home	19	15	12%	0%	0%	£35,829	£297,979	
	Satisfaction with home creates stability, strengthened sense of home and place	1,398	15	12%	0%	0%	£182,270	£1,515,871	
	Decrease in wellbeing through stress of process	157,790	5	12%	55%	6%	£15,808,624	£64,070,573	
	Improved career chances, including material and psycho-social wellbeing	44	1	12%	0%	N/A	£6,204	£5,994	
		10	10	1.5%	0%	10%	£57,879	£322,755	

NHS	Reduction in resource burden on NHS	See health outcomes for tenants above						
		62	30	10%	85%	0%	£27,621	£229,713
Police	Reduction in resource burden on Police							
Fire and Rescue Service	Reduction in resource burden on NFRS	13.6	10	45%	0%	0%	£22,350	£185,878
One Nottingham	Reduction in carbon emissions	1,547	15	7%	0%	0%	£31,652	£263,234
	Money recycled to local staff and businesses	16.6m	7	12%	0%	0%	£5,268,999	£5,177,004
State	Increased tax revenue (salaries)	10	3	50%	0%	0%	£8,870	£26,610
	Decreased welfare bill	10	3	50%	0%	0%	£13,897	£41,691
TOTAL							£22,346,583	£79,151,875

SROI ratio = Total Present Value / Total Inputs

= £79,151,875 / £16,631,942

= **£4.76**

“The study, undertaken by Nottingham City Homes with Nottingham Trent University, of the wider impact of decent homes... has made a very useful contribution to our knowledge, and ought to be required reading for those who doubt the importance of investing in our social housing stock.”

Andrew Stunell MP, Department of Communities and Local Government
(now The Rt Hon. the Lord Stunell OBE)

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ISBN 978-0-9934093-2-5



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