# HACT
ideas and innovation in housing



## Valuing Housing and Local Environment Improvements using the Wellbeing Valuation Method and the English Housing Survey

### Results and Guidance Manual

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Results and Guidance Manual

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# Contents

# 1. Foreword

Providing good quality homes is the central focus of Clarion Housing Group. Formed from the recent merger of Affinity Sutton and Circle, Clarion has ambitious plans to scale up delivery across the country.  But our work isn't just about building new homes; it's also about continuously improving our homes and neighbourhoods. We know that this is good for business, but it's also part of our social purpose in building homes and developing futures: supporting sustained regeneration, providing access to employment opportunities, and ensuring young people have the best start.

Affinity Sutton has a legacy of working with HACT to develop ways to measure these activities as a co-funder of the original Social Value Bank – a bank of values that enabled us to understand and quantify the impact of everything from engaging in training opportunities to regularly attending sports activities. The advent of the Social Value Bank signalled a key shift in the way the sector measures these outcomes, providing a consistent measurement mechanism that enables us to move beyond talking about purely quantitative impacts, whilst still employing a lightweight and accessible methodology.

The Social Value Bank, created using the Wellbeing Valuation Approach, has been extremely well received by the sector. Many housing associations use it to understand the benefits of activities broadly categorised under the 'community investment' banner. But can the same approach be applied to other activity – activity that we consider 'core business'? That was the question that prompted the work underpinning this report.

Clarion Housing Group is proud to carry on this tradition and our collaborative relationship with HACT and Simetrica by co-funding this new set of values with Keepmoat. This new research embodies the next generation of the Social Value Bank, taking it into a new dimension by exploring impacts of core housing activity, like repairs, maintenance and estate-based regeneration. This also represents a new, more holistic, way of thinking about these activities, which have been traditionally viewed as necessary to maintaining the quality of the home, but also as transactional and commercial areas of the business.

The ability to consistently measure these areas of work by extending the applicability of the Social Value Bank opens up a range of possibilities. It means we can talk across the business about how our work impacts residents. It means we can think differently, using this research to challenge some of the assumptions we once held about what we think residents want and what improves their wellbeing. And it means we can use this information, alongside other data and insights, to inform decision-making in new ways.

These values are a significant step towards being able to represent the impact on residents of the range of physical interventions to our homes. But there is more practical testing to be done to ensure the full potential of the approach is realised. We have developed ways of using these values internally so that they can have a constructive influence on investment decisions. We will now be developing a more operational report on how we use these values to share with industry so that health and wellbeing can be a key consideration when assessing the impact of investment.

Clarion is delighted to be launching this work with HACT and we look forward to applying these new values as we move forward.

**Neil McCall**
Housing Association Chief Executive Officer
Clarion Housing Group

# 2. Executive summary

Housing associations annually spend £3.3 billion on routine maintenance, planned maintenance and major repairs, representing a huge proportion of organisational expenditure. The ability to determine the impact of these improvements on the lives of those actually living in social housing and receiving the perceived benefits of these improvement works has not previously been quantified robustly.

Using Wellbeing Valuation, this project analysed data collected through the English Housing Survey. The approach enables monetary values to be placed on the impact of housing provider activities around core housing; it does this by investigating the associations between attributes of the home, including its surroundings, and individual wellbeing.

This research identifies, and places financial values on, the relationships between residents' wellbeing and outcomes related to three key areas:

- Warmth / property energy efficiency
- Local area issues
- Property defects and faults

Our analysis of the data has revealed that these property-related issues or circumstances are all associated with significant differences in the wellbeing of individuals living in the affected property. This provides an indication that good quality housing, free from issues within properties and in local areas, is associated with higher social value. Having these values provides the opportunity to consider vital social impact alongside other benefits and costs, and to compare disparate outcomes on a consistent basis through the use of results of other Wellbeing Valuation research. The values from this research will be merged into the existing Social Value Bank.

The values created by this project are derived from professional assessments of properties and neighbourhoods, conducted in the physical survey element of the English Housing Survey. Consequently, they can be applied based on a professional assessment of a change of situation (or resolution of a problem), and do not rely on establishing each beneficiary's opinion of the situation.

In 2014, Affinity Sutton and Catalyst commissioned HACT and Simetrica to produce a ground-breaking piece of research to apply the Wellbeing Valuation approach to community investment activity.

HACT and Simetrica published the Social Value Bank, which offered a new way for housing providers to understand the social impact of their investment in communities. It contains values for community investment outcomes in domains such as employment and training, health, money management, local neighbourhood and crime, youth, and physical activity. The values in the Social Value Bank are differentiated by geographic region and (where appropriate) the age of the individual. There are 53 outcomes and a total of 591 differentiated values.
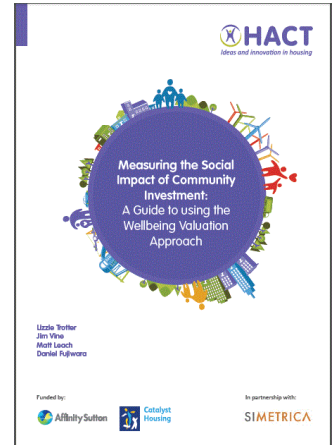
Wellbeing Valuation features as part of HM Treasury Green Book guidance[1] and sits at the heart of policy evaluation approaches within the UK Government and across the OECD.[2] It is being increasingly used across a range of sectors and countries at the highest level. As a practical deployment of this technique, the Social Value Bank offers a practical and proportionate way to measure, and place a value on, social impact. It has become the *de facto* industry-standard method to measure social impact in the housing sector. The Social Value Bank has been downloaded over 4,000 times and more than 300 organisations have attended training and are using the model in their business decisions. There has also been considerable interest in the Social Value Bank from outside of the housing sector.

The widespread adoption of the Social Value Bank prompted fundamental questions about the way the sector perceives the value of its work as a whole and has stimulated deeper consideration of how success should be measured in all areas of the business and what information should inform investment decisions. While the Social Value Bank helped to answer questions concerning the social impact of community investment, housing providers were interested in learning how to apply the same methodology to the social impact of their core investment – the development and management of housing.

Housing associations annually spend £3.3 billion on routine maintenance, planned maintenance and major repairs[3], representing a huge proportion of organisational

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[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf

[2] http://www.oecd.org/statistics/Guidelines%20on%20Measuring%20Subjective%20Well-being.pdf

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414362/Global_Accounts_2014_Full.pdf

expenditure. These improvements include both planned works, like installing new kitchens and bathrooms or replacing single glazed windows for double glazing, and those prompted by tenants in response to stock condition issues, such as issues with damp. In addition to internal works, housing providers also invest in external regeneration schemes to improve the condition of estates by creating better local spaces free from problems like vandalism. The ability to determine the impact of these improvements on the lives of those actually living in social housing and receiving the perceived benefits of these improvement works has not previously been quantified robustly.

This research has the potential to broaden the evidence available to housing providers to help inform business decisions by introducing the ability to consider quantitatively, for the first time, the social impact of a range of outcomes related to core housing activity on their tenants' lives.

HACT previously published '*The Social Impact of Housing Providers*'[4] in 2013, which began to value different attributes of the home using the wellbeing valuation method. This identified some associations between housing outcomes and subjective wellbeing and demonstrated the plausibility of applying the wellbeing valuation approach to core housing activity. It was, however, limited to exploring the handful of factors within the British Household Panel Survey and was wholly reliant on respondent-reported assessments of housing situations.

This research supersedes the values contained in '*The Social Impact of Housing Providers*', and adds to the values contained in the Social Value Bank analysing data from the **English Housing Survey** (EHS).

## About the research partners

This research reaffirms Affinity Sutton's position as commissioner of cutting edge, high utility social impact research that pushes boundaries, and supports more effective investment in social housing. The new values will be entered into the existing Social Value Bank as they have been derived using consistent methods and can be applied and interpreted in the same way.

This work's other sponsor, Keepmoat, is a housing and construction company that aims to construct, refurbish and regenerate places to improve economic and social outcomes for people. It works in hundreds of communities across the UK delivering a

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[4] http://www.hact.org.uk/sites/default/files/uploads/Archives/2013/02/The%20Social%20Impact%20of%20Housing%20Providers%20report2013.pdf

wide variety of projects for local people. Its activities cover new build, regeneration, responsive repairs and maintenance. SOAR Build, Keepmoat's construction-related Social Enterprise, is an example of taking practical steps with an aim of delivering social value and supporting construction through local employment. As this report shows, there are social benefits for residents associated with the core work that Keepmoat undertakes as it delivers upgrades to homes and neighbourhoods for clients, as well as those delivered when using specifically socially-focused methods like SOAR Build.

HACT and Simetrica have established reputations for producing ground-breaking social impact measurement research and the development of accompanying practical tools for the housing sector. This includes the 2014 study *Measuring the Social Impact of Community Investment: a Guide to Using the Wellbeing Valuation Approach* and accompanying Value Calculator, and the 2015 studies *The Health Impacts of Housing Associations' Community Investment Activities* and *The Wellbeing Value of Tackling Homelessness,* all commissioned by Affinity Sutton, two in partnership with other housing providers. Housing providers are now able to apply this innovative approach to making better business decisions.

# 3. Dataset

**The English Housing Survey (EHS)** is a continuous national survey commissioned by the Department for Communities and Local Government (DCLG).[5] It collects information about people's housing circumstances and the condition and energy efficiency of housing in England. It was first run in 2008-2009. Prior to that there were two separate surveys of housing: the English House Condition Survey and the Survey of English Housing. Each year a sample of addresses is drawn at random from a list of private addresses held by the Royal Mail. There are now five years (waves) of available data.

The EHS collects information from over 13,000 households and is made up of two components:

- A household interview conducted with all householders in the sample; and
- A physical inspection of a sub sample of the properties by qualified surveyors.

Some years also include a desk-based market value assessment.

The physical inspection by a qualified surveyor is a real strength of the dataset. Householder reports of their home can be affected by a number of factors, for example, their relationship with their landlord, unrelated frustrations, or simply a lack of knowledge in specific areas. Surveyor involvement enables the collection of unbiased, informed data resulting in an objective assessment of the property.

This specialist dataset provides a broad coverage of a range of housing-related issues and offers the ability to draw on professional surveyor assessments of various aspects of housing. The EHS covers all housing tenures and for each individual in the dataset data on the quality of their home can be mapped to their health and wellbeing making it the most comprehensive UK dataset available on this subject.

This study looks specifically at how the home relates to individual wellbeing and places values on the differences in wellbeing associated with different attributes of the home and its surroundings.

We used all five waves of data (2008-2014) of the EHS. Physical survey data provided housing surveyor data on the condition of the dwelling, evaluations of each of the rooms within the dwelling, as well as the visual quality of the local area. We matched

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[5] https://www.gov.uk/government/collections/english-housing-survey

this data with household and individual-level data on housing status, employment, income, and energy use, among others. This gave a sample of 218,397 individual observations. We focused analysis on health outcomes, using self-reported health measures that were available in each wave of the data. Subjective wellbeing (measured as life satisfaction) was available only in the most recent (2013-2014) dataset.

# 4. Wellbeing Valuation method

Wellbeing Valuation derives robust value estimates in line with the welfare economic theory on valuation and represents the latest thinking in social impact measurement. Wellbeing Valuation now features as part of HM Treasury Green Book guidance and sits at the heart of policy evaluation approaches within the UK Government[6] and the OECD[7]. HACT and Simetrica have been using the wellbeing valuation approach to produce influential research that has been the basis of sector-changing tools over the last three years.

The Wellbeing Valuation approach uses self-reported measures of wellbeing (subjective wellbeing) to measure an individual's welfare, using measures such as life satisfaction. The approach assesses the associations between outcomes and subjective wellbeing, and between income and subjective wellbeing, and estimates monetary values for those outcomes. This reveals the amount of money that has the equivalent association with subjective wellbeing as the outcome being valued and so is treated as the monetary value of the outcome. In doing so the approach draws on sophisticated statistical modelling techniques.

Subjective wellbeing questions are widely included in national surveys across the OECD; the UK is at the forefront with key wellbeing questions now included in over 20 national surveys.[8] The wellbeing valuation method can be used to analyse data from these large national datasets and derive values for a wide range of different policy areas. The methodology is well suited for use within the social housing sector as it allows housing providers to value the various influences they have on tenants' lives – for example, through the management of their homes, the provision of support to find

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[6] Fujiwara, D., & Campbell, R. (2011). Valuation Techniques for Social Cost-Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches. A Discussion of the Current Issues (pp. 1–76). London, UK: HM Treasury. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf
HM Treasury. (2011). The Green Book: Appraisal and Evaluation in Central Government (pp. 1–114). HM Treasury. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf
[7] OECD. (2013). OECD Guidelines on Measuring Subjective Well-being (p. 265). Paris, France: OECD Publishing. http://dx.doi.org/10.1787/9789264191655-en
OECD. (2014). Framework for Regulatory Policy Evaluation. Organisation for Economic Co-operation and Development. http://www.oecd.org/regreform/framework-for-regulatory-policy-evaluation.htm
[8] http://www.ons.gov.uk/ons/guide-method/method-quality/specific/social-and-welfare-methodology/subjective-wellbeing-survey-user-guide/subjective-well-being-frequently-asked-questions--faq-s-.html#13

work or manage finances, and their work, often in partnership with other service providers, to help provide support for complex needs.

The 2013-14 survey was the first year the EHS included a life satisfaction question. The question was only put to a small proportion of the sample and so the data do not provide a sufficient sample size on which to base the analysis for this study. We have therefore taken an alternative, but compatible, approach to valuing wellbeing. In this method, explained in detail in Technical Appendix A1, we estimate the association between housing factors and **general self-reported health** and then value this by assessing the association between health and life satisfaction. In practice, this provides a minimum value for the expected association between the housing factors and life satisfaction, as there may be additional impacts that are not delivered via health mechanisms. This is illustrated in the diagram below.
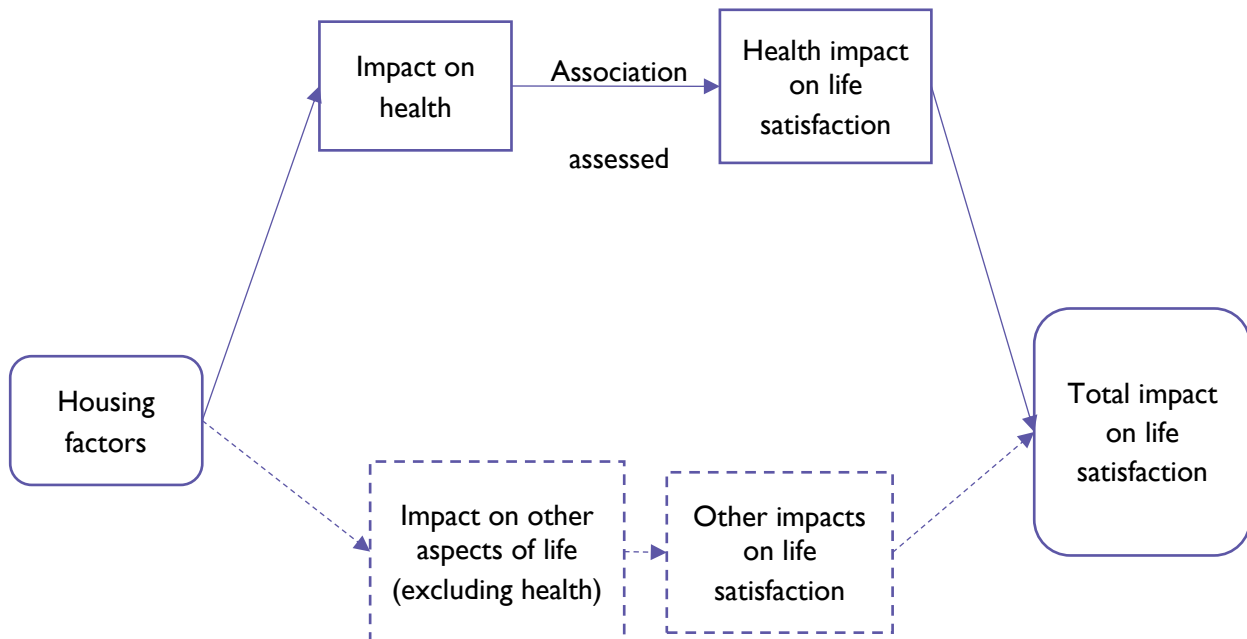


# 5. Differentiation

Differentiation analysis was performed on variables where sample sizes allowed, to enable more specific values to be applied in relation to the people benefiting from a particular change. They help us to understand the varied impacts of interventions for different groups of tenants.

Values have been estimated (i.e., differentiated) in the same age categories as in the existing Social Value Bank (i.e., <25, 25-49, and >50) to make it easier to apply them in the same way. This reflects that an outcome, say solving a damp problem, may have a greater value to someone over 50 than to someone under 25.

This differentiation is achieved by running the valuation model for different sample groups in the EHS dataset.

# 6. Values

This project has generated a bank of values directly relevant to housing providers' core investment in building, maintaining and refurbishing high quality homes and neighbourhoods. These can be used for the purpose of modelling and reporting on the impact of investment in core housing activity. We provide details of variables that were not significant in our health models in the technical appendix (Table A1).

Our analysis of the data has revealed that these property-related issues or circumstances all have a significant association with the wellbeing of individuals living in affected properties. This provides an indication that good quality housing, free from issues within properties and in local areas, is associated with higher social value. These values represent the change in wellbeing experienced by an individual where a problem present in the property or local area is solved.

| Code | Outcome | Average value | <25 | 25-49 | >50 | Evidence required |
|---|---|---|---|---|---|---|
| NRG01:2016 | Energy efficiency improved by one EPC band | £217 | £293 | £130 | £348 | Records demonstrating that the energy performance of the property improved by one EPC band, when derived from SAP 2009 energy efficiency assessments, before and after the works, for example from G to F or C to B. If works improve the rating by two bands, double the value may be applied (and so on for improvements of three or more bands). |
| ENV11:2016 | Resolution of problems with litter, rubbish or dumping | £449 | £471 | £299 | £578 | |

| ENV12:2016 | Resolution of problems with graffiti | £439 | £379 | £465 | £390 | The local area[9] around the dwelling should be surveyed to consider the extent to which the relevant problem is present, recorded on a simple subjective scale from 1 (no problem) to 5 (major problem).

Values can be applied where an area is improved from being assessed as scoring 3, 4 or 5 to being scored 1 or 2.

**Litter:** Consider the quantity of discarded items, paper, cardboard, household goods in the street and in gardens, as well as any more extensive rubbish dumping.

**Graffiti:** Consider any painting/visual defacement on outside surfaces of either public or private property. |
|---|---|---|---|---|---|---|
| ENV13:2016 | Resolution of problems with vandalism | £299 | £478 | £320 | £179 | |
| ENV14:2016 | Resolution of problems with scruffy gardens/ landscaping | £379 | £228 | £234 | £498 | |
| ENV15:2016 | Resolution of problems with scruffy/ | £449 | £270 | £439 | £482 | |

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[9] "The local area is loosely defined as the 'area around the dwelling of which the dwelling seems to be a part'. To put an imaginary boundary on this area the surveyor will need to be aware of the character of the surrounding streets. Generally, a reliable impression will have been gained as the surveyor made the initial search for the address. The area is likely to be, but not necessarily defined by physical boundaries such as roads, railway lines, canals, etc. The survey dwelling will not necessarily be at the centre of the area. Surveyors should define an area of manageable size so that they can clearly define the boundaries of the local area and visually inspect the whole area on foot before proceeding to complete the questions. For properties on large housing estates (of whatever tenure) it will rarely be appropriate to define the whole estate as the local area." This definition of local area, taken from the English Housing Survey Surveyor Briefing Manual, should be employed by those assessing areas for the purposes of applying these values. http://doc.ukdataservice.ac.uk/doc/6923/mrdoc/pdf/6923ehs_surveyor_manual_2011_2012.pdf, section 1.24.1.

| | neglected buildings | | | | | **Vandalism:** Consider any evidence of deliberate damage to either public or private property. |
| | (NB: Definition excludes dwellings) | | | | | **Scruffy gardens/landscaping:** Consider to what extent poorly maintained private plots and public open spaces have a negative impact on the area. |
| ENV16:2016 | Resolution of problems with dog or other excrement | £401 | £412 | £241 | £498 | **Scruffy/neglected buildings:** Consider to what extent run down or unsightly commercial civic, or other public buildings that have a negative effect on the environment. |
| | | | | | | **Dog/other excrement:** Consider to what extent dog mess is a problem, or other excrement in the area. |
| ENV17:2016 | Resolution of problems with condition of dwellings | £336 | £255 | £299 | £331 | **Condition of dwellings:** This is an impression of the external condition of dwellings in the area. Consider whether run down or unsightly residential properties (including blocks of flats) have a negative visual impact on the local area. |
| ENV18:2016 | Resolution of problems with condition of road, pavements | £196 | £158 | £117 | £299 | **Condition of road, pavements and street furniture:** Consider how well road surfaces, pavements and other street furniture are maintained.[10] |

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[10] These definitions of problems in the local area, taken from the English Housing Survey Surveyor Briefing Manual, should be employed by those assessing areas for the purposes of applying these values. http://doc.ukdataservice.ac.uk/doc/6923/mrdoc/pdf/6923ehs_surveyor_manual_2011_2012.pdf, section 1.24.10.

| | | | | | |
|---|---|---|---|---|---|
| | and street furniture | | | | | |
| PRO01:2016 | Rectification of serious condensation/ mould growth | £770 | £1,232 | £462 | £1,212 | Survey confirmation that the relevant defect was present in the property before the works, and that it was subsequently rectified.<br><br>**Serious condensation/mould growth:** Extensive patches of mould growth on walls and ceilings and/or mildew on soft furnishings. Remedies would include redecoration, increase ventilation and/or increased heating provision. Do not record very minor defects; only record defects which would be significant enough to be taken into consideration when making a Health and Safety assessment.<br><br>**Penetrating damp:** Defective if present. Do not include temporary condensation, or if cause has been cured. Do not record very minor defects; only record defects which would be significant enough to be taken into consideration when making a Health and Safety assessment.<br><br>**Ceiling faults:** Assess whether faults are present or not. Include all ceilings and other soffits to the room and sloping ceilings in attics/ dormers.<br><br>**Floor faults:** Assess whether faults are present or not. (No special definitions.) |
| PRO02:2016 | Rectification of penetrating (higher level) damp | £674 | £404 | £482 | £876 | |
| PRO03:2016 | Rectification of ceiling fault | £266 | £426 | £160 | £426 | |
| PRO04:2016 | Rectification of floor fault | £754 | £1,206 | £615 | £786 | |
| PRO05:2016 | Rectification of wall fault | £390 | £401 | £234 | £514 | |
| PRO06:2016 | Rectification of door faults (interior doors) | £578 | £347 | £347 | £903 | |

| | | | | | | Wall faults: Assess whether faults are present or not. Include all walls of a room whether external, party wall, or internal partitions.<br><br>Door faults: Assess whether faults are present or not. Internal doors only. Doors opening to the outside environment should be assessed under exterior. The entrance door to a flat, which opens off an enclosed hall, landing or stair, is classed as an exterior door. Include doors into walk in cupboards. If a door is missing, and it is intended that a door should be present, then record this as a fault. [11] |
|---|---|---|---|---|---|---|

Details of the calculation of these values, including the sources of each of these variables within the EHS, are provided in Appendices A1 and A2.

All of the values are consistent and comparable with the Social Value Bank as they have been derived using the same methodological approach. While the EHS values were derived through an indirect method (using health rather than life satisfaction as the key variable) this does not affect the compatibility of the values. Consequently, the Social Value Bank will be updated with this new set of values.

## Values for multiple environmental improvements

Where more than one environmental improvement is being delivered, the respective values from the table above cannot be added together as this would result in a degree of double counting. Instead, special values have been created (see below) that specify the value of achieving two outcomes together. The

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[11] These definitions of problems in properties, taken from the English Housing Survey Surveyor Briefing Manual, should be employed by those assessing areas for the purposes of applying these values. http://doc.ukdataservice.ac.uk/doc/6923/mrdoc/pdf/6923ehs_surveyor_manual_2011_2012.pdf, sections 1.5.12 to 1.5.18, and 1.5.26 to 1.5.29.

evidence required for applying these values is the same as for the single values above except, of course, you need to have the evidence that both outcome A and outcome B have been achieved.

| Code | Outcome A | Outcome B | Average value | <25 | 25-49 | >50 |
|---|---|---|---|---|---|---|
| ENV11C12:2016 | Resolution of problems with litter, rubbish or dumping | Resolution of problems with graffiti | £500 | £500 | £473 | £578 |
| ENV11C13:2016 | Resolution of problems with litter, rubbish or dumping | Resolution of problems with vandalism | £449 | £478 | £384 | £578 |
| ENV11C14:2016 | Resolution of problems with litter, rubbish or dumping | Resolution of problems with scruffy gardens/ landscaping | £656 | £656 | £478 | £824 |
| ENV11C15:2016 | Resolution of problems with litter, rubbish or dumping | Resolution of problems with scruffy/ neglected buildings | £801 | £741 | £712 | £908 |
| ENV11C16:2016 | Resolution of problems with litter, rubbish or dumping | Resolution of problems with dog or other excrement | £556 | £556 | £534 | £578 |
| ENV11C17:2016 | Resolution of problems with litter, rubbish or dumping | Resolution of problems with condition of dwellings | £684 | £684 | £589 | £740 |
| ENV11C18:2016 | Resolution of problems with litter, rubbish or dumping | Resolution of problems with condition of road, pavements and street furniture | £595 | £595 | £416 | £718 |
| ENV12C13:2016 | Resolution of problems with graffiti | Resolution of problems with vandalism | £439 | £478 | £465 | £390 |
| ENV12C14:2016 | Resolution of problems with graffiti | Resolution of problems with scruffy gardens/ landscaping | £695 | £607 | £584 | £785 |
| ENV12C15:2016 | Resolution of problems with graffiti | Resolution of problems with scruffy/ neglected buildings | £773 | £649 | £623 | £872 |

| ENV12C16:2016 | Resolution of problems with graffiti | Resolution of problems with dog or other excrement | £595 | £595 | £706 | £498 |
|---|---|---|---|---|---|---|
| ENV12C17:2016 | Resolution of problems with graffiti | Resolution of problems with condition of dwellings | £578 | £578 | £673 | £423 |
| ENV12C18:2016 | Resolution of problems with graffiti | Resolution of problems with condition of road, pavements and street furniture | £567 | £537 | £465 | £628 |
| ENV13C14:2016 | Resolution of problems with vandalism | Resolution of problems with scruffy gardens/ landscaping | £528 | £528 | £545 | £498 |
| ENV13C15:2016 | Resolution of problems with vandalism | Resolution of problems with scruffy/ neglected buildings | £539 | £539 | £439 | £482 |
| ENV13C16:2016 | Resolution of problems with vandalism | Resolution of problems with dog or other excrement | £478 | £478 | £561 | £498 |
| ENV13C17:2016 | Resolution of problems with vandalism | Resolution of problems with condition of dwellings | £495 | £495 | £528 | £331 |
| ENV13C18:2016 | Resolution of problems with vandalism | Resolution of problems with condition of road, pavements and street furniture | £329 | £478 | £395 | £299 |
| ENV14C15:2016 | Resolution of problems with scruffy gardens/ landscaping | Resolution of problems with scruffy/ neglected buildings | £528 | £498 | £500 | £589 |
| ENV14C16:2016 | Resolution of problems with scruffy gardens/ landscaping | Resolution of problems with dog or other excrement | £734 | £640 | £475 | £684 |
| ENV14C17:2016 | Resolution of problems with scruffy gardens/ landscaping | Resolution of problems with condition of dwellings | £528 | £483 | £384 | £695 |
| ENV14C18:2016 | Resolution of problems with scruffy gardens/ landscaping | Resolution of problems with condition of road, pavements and street furniture | £428 | £386 | £268 | £617 |
| ENV15C16:2016 | Resolution of problems with scruffy/ neglected buildings | Resolution of problems with dog or other excrement | £801 | £682 | £680 | £639 |

| ENV15C17:2016 | Resolution of problems with scruffy/ neglected buildings | Resolution of problems with condition of dwellings | £462 | £462 | £478 | £482 |
|---|---|---|---|---|---|---|
| ENV15C18:2016 | Resolution of problems with scruffy/ neglected buildings | Resolution of problems with condition of road, pavements and street furniture | £512 | £428 | £467 | £584 |
| ENV16C17:2016 | Resolution of problems with dog or other excrement | Resolution of problems with condition of dwellings | £729 | £667 | £540 | £651 |
| ENV16C18:2016 | Resolution of problems with dog or other excrement | Resolution of problems with condition of road, pavements and street furniture | £473 | £473 | £340 | £573 |
| ENV17C18:2016 | Resolution of problems with condition of dwellings | Resolution of problems with condition of road, pavements and street furniture | £423 | £413 | £307 | £506 |

Details of the method used to calculate these composite values are provided in Appendix A5.

# Values for SAP improvements within EPC bands

To enable application of the values in circumstances where energy efficiency works do not move properties by a whole EPC band, we have also interpolated from these a set of values that can be applied per SAP point at different parts of the points range:

| Code | Outcome | Average value | <25 | 25-49 | >50 |
|---|---|---|---|---|---|
| | Improve one SAP point in region… | Value per point | Value per point | Value per point | Value per point |
| **NRG01A:2016** | …above 86 | £21.70 | £29.30 | £13.00 | £34.80 |
| **NRG01B:2016** | …75 to 86 | £19.73 | £26.64 | £11.82 | £31.64 |
| **NRG01C:2016** | …62 to 75 | £16.69 | £22.54 | £10.00 | £26.77 |
| **NRG01D:2016** | …47 to 62 | £14.47 | £19.53 | £8.67 | £23.20 |
| **NRG01E:2016** | …30 to 47 | £12.76 | £17.24 | £7.65 | £20.47 |
| **NRG01F:2016** | …below 30 | £11.42 | £15.42 | £6.84 | £18.32 |

# 7. How to interpret and apply the values

Our analysis of the data has revealed that these property-related issues or circumstances are all associated with significant differences in the wellbeing of individuals living in the affected property. These values are interpreted as representing the change in wellbeing (indirectly through health) that is associated with an individual beginning to experience a problem or situation and the value of that problem being solved.

Each value represents the theoretical equivalent amount of money that each individual would have to receive for their level of wellbeing to be the same as if the problem did not exist. More practically, this value represents the social value that is assumed to be created when a problem is solved, and can be applied to each adult living in the property. For example, -£299 is treated as representing the wellbeing reduction each individual experiences if they begin to experience a problem with vandalism in the local area around their home, while £299 is taken to represent the wellbeing uplift an individual experiences if an existing problem with vandalism is solved.

Some values represent the change in wellbeing of movement between two states, for example, movement between EPC bands. In this instance, the £217 value would be applied for each upward movement, e.g. £434 applied when a property moves from band F to band D.

The majority of the values listed in the tables above can be combined. However, there are some values that cannot be combined as this would constituted 'double counting'. Double counting is an error whereby the cost or benefit of a good, service, or intervention is counted more than once.

For the set of environmental outcomes (i.e., the ones related to the resolution of problems in the local area, indicated by code numbers starting with "ENV"), the standard values cannot be added together. If two outcomes are achieved together, or if a second outcome is achieved within 12 months of the first, the special values for achieving multiple outcomes must be used instead.

Where three or more outcomes from the environmental outcomes are achieved it is still only acceptable to apply one of the values for a pair of outcomes. In this circumstance it is acceptable to select the highest of the relevant pairs. For example, if you achieve outcomes X, Y and Z for an area, you can choose to use the highest of the values of "X and Y", "X and Z" or "Y and Z".

When applying the energy efficiency values you must decide at a programme level whether you will be counting movements based on EPC bands or SAP points. Due to the way the values have been calculated, across a whole programme the results will on average come out to the same amount using either method. If you have a moderate programme where each property is improved by half an EPC band then the points-based method will give a smallish value for each home whereas the band-based method will give you a larger value for about half the homes, where the improvement happens to tip it over into a new band, and a zero value for the remaining homes where the movement is within the band. What you must **not** do is pick the option on a property-by-property basis that gives the most favourable result.

Because these values are all based upon data collected through the Physical Survey component of the EHS, each value can be applied when an identified problem is deemed resolved through an informed assessment rather than needing to conduct tenant surveys to relate the outcome to tenants' subjective views. Consequently, in order to apply the values housing providers will just need to record evidence of their professional assessment of the situation before and after works taking place. Appropriate assessments can be undertaken by anyone with appropriate professional knowledge to be able to assess the situation in line with the survey briefing specification. In some cases (such as assessment of EPC bands) this may require particular specialist training or expertise.

Where an issue or problem is solved, this value can be applied to each adult living in the property. Each outcome was differentiated for age, according to the same categories used in the existing values within the Social Value Bank, i.e. in addition to the average value, there are values for three age bands: under 25, 25-49 and above 50.

When applying the values to options appraisals or long-term plans for development, there are two main points to consider. Firstly, the values generated looked at health outcomes related to asset repairs and improvements, as there was only one wave of life satisfaction data available. Secondly, the Social Value Bank currently does not provide values for adaptation effects in subsequent years – i.e. the longevity of any uplift after an initial outcome. Intuitively, you would expect to see diminishing effects on wellbeing after any given outcome, but that pattern is not clear at this point and requires further research.

To determine wellbeing uplifts in subsequent years for the values generated using the EHS data would require access to more waves of life satisfaction data. Where current modelling assumes that there is the potential for values to have an effect beyond the first year, housing associations and other users should note that we do not yet know the extent to which there will be adaptation effects, or the number of years the values can be applied for. Therefore, users should be prepared to adjust the models applied if further research is conducted on subsequent waves of EHS data.

To apply the methodology conservatively using the current values, **it is recommended that users carefully consider the potential for over-claiming in the first instance, and that users either**: 1) apply the values for one year; or 2) include an explanation (the above note can be used as a template) in the modelling that recognises there may be future adjustments to the model.

**NB**: The exception to the above is that values PRO01-PRO06 (inclusive) are 'one off' values. These should be applied when the relevant issue is rectified, rather than on an ongoing basis. These values *can* be applied each time the issue is rectified, if the problem recurs and is again resolved.

HACT has developed practical tools that allow housing providers to apply values from the Social Value Bank to their community investment activities. These tools will be updated with the expanded Social Value Bank, including these values. This will allow the new values to be used in the same way, to support assessments of the social impact of investment in core housing.

The original guidance on the Social Value Bank provides more detailed information and guidance on how to use these resources.[12]

**In summary:**

- A value can be applied following a thorough assessment of a property when the housing provider is satisfied that the issue in question has been resolved, or confirms movement between two situations (e.g. upward movement between EPC bands).
- The value can be applied for each adult living in that property or experiencing the change in situation.

# 8. Conclusion

These values have the potential to significantly influence how housing providers prioritise investment. Analysis using the user-friendly model provides insight into the comparative cost-efficiency of a range of repairs, improvements and upgrades but can

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[12] www.hact.org.uk/measuring-social-impact-community-investment-guide-using-wellbeing-valuation-approach

also inform higher level decisions required of a housing provider around budget allocation between areas of the business, for example, development, housing management, and community investment.

Housing providers will be able to place values on these activities and provide robust evidence both internally and in Value for Money statements. The development of these values allows an estimate of the social value of this area of investment to be captured for the first time. Critically, this provides the opportunity to consider vital social impact alongside other benefits and costs, and to compare disparate outcomes on a consistent basis through the use of results of other Wellbeing Valuation research, most significantly the Social Value Bank.

It is possible to build on this work and develop additional values through further analysis of existing and not yet explored datasets. This could capture the impact of yet more areas of housing provider investment to produce insight and enable evidence-based decision-making to ensure investment makes business sense and creates the greatest benefit for tenants.

# 9. Technical Appendices

## A1. Indirect valuation method

We estimate the association between housing factors and **general self-reported health** using data from the EHS. We use data from the British Household Panel Survey (BHPS) to assess the association between health and life satisfaction. By combining these two associations we are able to indirectly assess part of the association between housing factors and life satisfaction. This is explained further below.

### *Stage 1: Health model (EHS)*

We estimate the following health model in the EHS:

$$Health_i = \alpha + \beta_1 H_i + \beta_2 X_i + \varepsilon_i \quad (1)$$

where $H_i$ is a vector of housing-related variables (that we are interested in valuing) for individual $i$ and $X_i$ is a vector of control variables as set out in previous work[13]. General health ($Health_i$) is measured on a scale of 1-5, where 1 = 'Very poor' and 5 = 'Excellent'.

$\beta_1$ is the estimate of the association between housing factors and general health.

Running this equation for different samples within the population is also what allows us to produce the differentiated values.

### *Stage 2: Life satisfaction model (BHPS)*

Separately using the BHPS from the Social Value Bank model we estimate the following life satisfaction model:

$$LS_i = \alpha + \beta_3 Health_i + \beta_4 Z_i + \varepsilon_i \quad (2)$$

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[13] Fujiwara, D., Kudrna, L., & Dolan, P. (2014). Quantifying and Valuing the Wellbeing Impacts of Culture and Sport (p. 45). London, UK: Department for Culture, Media & Sport

where $LS_i$ = life satisfaction for individual $i$; $Z_i$ is a vector of control variables; and the same health variable ($Health_i$) is used (the BHPS and EHS contain the same general health variable measured on a scale of 1-5).

The product from the two equations from Stages 1 and 2 ($\beta_1 \cdot \beta_3$) represents the association between housing factors ($H_i$) and life satisfaction via general health. This association will be valued using the wellbeing valuation approach employing the same methodology as per the Social Value Bank.[14]

The main point for interpretation here is that the housing values are wellbeing values for the association with general health. In reality, the full wellbeing value may be larger if there are impacts of housing factors on life satisfaction that do not run through general health. If this is the case, then the health value will be a lower bound estimate of the value of the housing factor. However, since general health is highly correlated with life satisfaction and is its most important driver we can assume that this indirect approach captures a large part/most of the value of the housing factors ($H_i$) [15]. Since we have used the same methodology as in the Social Value Bank, these values can be included in the Social Value Bank model with this caveat.

Further details of the wellbeing valuation methodology can be found in the technical manual.[16]

**The mechanics and process of the indirect wellbeing valuation method**

    A.  Wellbeing valuation involves the statistical analysis of large national survey datasets such as the English Housing Survey (EHS).

    B.  The EHS includes questions on general health where householders are asked to rate their health on a scale of 1-5. Respondents also answer questions on

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[14]http://www.hact.org.uk/sites/default/files/uploads/Archives/2014/3/HACT%20Social%20Impact%20Methodology%20Paper.pdf

[15] Indeed a number of studies in the wellbeing valuation literature have used this indirect approach, for example:

Groot, W., & van den Brink, H. M. (2006). The compensating income variation of cardiovascular disease. Health Economics, 15(10), 1143–1148. doi:10.1002/hec.1116.

Fujiwara, D., Oroyemi, P., & McKinnon, E. (2012). Wellbeing and Civil Society: Estimating the Value of Volunteering Using Subjective Wellbeing Data (Working Paper No. 112) (p. 26). London, UK: Department for Work and Pensions. https://www.gov.uk/government/publications/wellbeing-and-civil-society-estimating-the-value-of-volunteering-using-subjective-wellbeing-data-wp112. Accessed 2 July 2014

Groot, W., & Maassen van den Brink, H. (2004). A direct method for estimating the compensating income variation for severe headache and migraine. Social Science & Medicine, 58(2), 305–314. doi:10.1016/S0277-9536(03)00208-9

[16]http://www.hact.org.uk/sites/default/files/uploads/Archives/2014/3/HACT%20Social%20Impact%20Methodology%20Paper.pdf

their housing situation and their lives, such as their satisfaction with their home and their aspiration to buy a property, as well as a range of demographic factors. The survey also includes a professional surveyor assessment of aspects of the home for example, whether damp is present and maintenance standards.

C.  This data together with the BHPS dataset is used in statistical modelling that allows us to isolate the relationship between any housing-related variable and health and then to reveal the average relationship that a particular housing outcome would have with life satisfaction (indirectly through general health).

We then access data on income to estimate how higher levels of income are associated with life satisfaction. We can then reveal the amount of money that has the equivalent association with an individual's life satisfaction as a specific housing outcome.

## A2. Details of variable sources and analysis

All of the values were derived from variables contained within the Physical Survey element of the EHS. The table below provides the original variable names from the EHS coding, along with their descriptions and the analysis that was undertaken to generate the values.

| Code | Outcome | Variable source(s) | Description | Analysis |
|------|---------|--------------------|-------------|----------|
| NRG01:2016 | Energy efficiency improved by one EPC band | Combination: effband & estband2 | Derived variable based on physical survey using the SAP 2009 methodology. The rating bands are A to G (least efficient). | Ordinal scale based on SAP 2009 energy efficiency rating bands A to G (least efficient): 1=G (least efficient) 7=A (most efficient) |
| ENV11:2016 | Resolution of problems with litter, rubbish or dumping | farlittr | Physical survey rates on a scale of 1 (no problems) to 5 (major problems) for a local area around the dwelling. | Problem with litter/rubbish/dumping: Binary variable derived from physical survey rates: 1= 1-2 (no problems); 0= 3-5 (problems present) |

| ENV12:2016 | Resolution of problems with graffiti | fargraff | Physical survey rates on a scale of 1 (no problems) to 5 (major problems) for a local area around the dwelling. | Problem with graffiti: Binary variable derived from physical survey rates: 1= 1-2 (no problems); 0= 3-5 (problems present) |
|---|---|---|---|---|
| ENV13:2016 | Resolution of problems with vandalism | farvanda | Physical survey rates on a scale of 1 (no problems) to 5 (major problems) for a local area around the dwelling. | Problem with vandalism: Binary variable derived from physical survey rates: 1= 1-2 (no problems); 0= 3-5 (problems present) |
| ENV14:2016 | Resolution of problems with scruffy gardens/ landscaping | fargrdns | Physical survey rates on a scale of 1 (no problems) to 5 (major problems) for a local area around the dwelling. | Problem with landscaping: Binary variable derived from physical survey rates: 1= 1-2 (no problems); 0= 3-5 (problems present) |
| ENV15:2016 | Resolution of problems with scruffy/negl ected buildings | farbldgs | Physical survey rates on a scale of 1 (no problems) to 5 (major problems) for a local area around the dwelling. | Problem with neglected buildings: Binary variable derived from physical survey rates: 1= 1-2 (no problems); 0= 3-5 (problems present) |
| ENV16:2016 | Resolution of problems with dog or other excrement | farexcre | Physical survey rates on a scale of 1 (no problems) to 5 (major problems) for a local area around the dwelling. | Problem with excrement: Binary variable derived from physical survey rates: 1= 1-2 (no problems); 0= 3-5 (problems present) |
| ENV17:2016 | Resolution of problems with | farcond | Physical survey rates on a scale of 1 (no problems) to 5 (major problems) for | Problem with the condition of dwellings: Binary variable derived |

|  |  |  |  |  |
|---|---|---|---|---|
|  | condition of dwellings |  | a local area around the dwelling. | from physical survey rates: 1= 1-2 (no problems); 0= 3-5 (problems present) |
| ENV18:2016 | Resolution of problems with condition of road, pavements and street furniture | farroads | Physical survey rates on a scale of 1 (no problems) to 5 (major problems) for a local area around the dwelling. | Problem with roads: Binary variable derived from physical survey rates: 1= 1-2 (no problems); 0= 3-5 (problems present) |
| PRO01:2016 | Rectification of serious condensation/ mould growth | findfxmo | Whether the defect was present in any of the rooms surveyed in the physical survey (normally the main living room, kitchen, main bedroom, and bathroom or circulation space). Y / N | Binary variable: 1 = No serious condensation/mould growth present in any of the rooms (physical survey); 0 = Problem present |
| PRO02:2016 | Rectification of penetrating (higher level) damp | findfxpd | Whether the defect was present in any of the rooms surveyed in the physical survey (normally the main living room, kitchen, main bedroom, and bathroom or circulation space). Y / N | Binary variable: 1= No penetrating damp present in any of the rooms (physical survey); 0= Problem present |
| PRO03:2016 | Rectification of ceiling fault | finclgfl | Whether the defect was present in any of the rooms surveyed in the physical survey (normally the main living room, kitchen, main bedroom, and bathroom or circulation space). Y / N | Binary variable: 1 = No ceiling fault present in any of the rooms (physical survey); 0 = Problem present |
| PRO04:2016 | Rectification of floor fault | finflrfl | Whether the defect was present in any of the rooms surveyed in the physical survey (normally the main | Binary variable: 1= No floor fault present in any of the rooms (physical survey); |

| | | | living room, kitchen, main bedroom, and bathroom or circulation space). Y / N | 0= Problem present |
|---|---|---|---|---|
| PRO05:2016 | Rectification of wall fault | finwlsfl | Whether the fault was present in any of the rooms surveyed in the physical survey (normally the main living room, kitchen, main bedroom, and bathroom or circulation space). Y / N | Binary variable: 1= No wall fault present in any of the rooms (physical survey); 0= Problem present |
| PRO06:2016 | Rectification of door faults (interior doors) | findrsfl | Whether the defect was present in any of the rooms surveyed in the physical survey (normally the main living room, kitchen, main bedroom, and bathroom or circulation space). Y / N | Binary variable: 1 = No door fault present in any of the rooms (physical survey); 0 = Problem present |

# A3. Insignificant variables

In Table A1 we provide details of variables that were not significant in our health models. In many cases, the lack of significance can be attributed to the small proportion of respondents registering these problems. As sample sizes get smaller, the minimum size of association that can be detected by the analysis increases, all other things being equal. This means that where a very small proportion of people experience a situation, any effect of this will only be detectable and statistically significant if it is very large.

The table is ordered by reducing proportion of the population experiencing the situation. In general terms, for those issues higher up the list there are reasonably large samples of people, so if there were any practically significant relationship we would expect it to be detectable in the model. This leads us to be reasonably confident that there is no or negligible relationship for those items. As we go further down the list, the sample sizes decrease, so the chances increase that there could be a *practically* significant relationship, but it is not *statistically* significant because of small sample sizes.

**Table A1. Insignificant variables**

| Variable | Original variable name | Proportion of population experiencing issue |
|---|---|---|
| **Kitchen less than 20 years old** | finkitre | 13% of kitchens are more than 20 years old. (Regression sample = 9,596.) |
| **Windows/frames faults** | finwndfl | 13% of population have problems with windows/frames. |
| **Bathroom less than 30 years old** | finbatre | 3.9% of bathrooms are more than 30 years old. |
| **Problems with vacant buildings** | farvacnt | 3.2% of population have problems with vacant buildings. |
| **Problems with vacant sites** | farsites | 3.1% of population have problems with vacant sites. |
| **Defects: Rising (ground level) damp** | findfxrd | 2.4% of population have rising damp. |
| **Defects: Inadequate room ventilation** | findfxrv | 1.5% of population have inadequate ventilation. |
| **Combined Kitchen less than 20 years old &/or Bathroom less than 30 years old** | finkitre >20 & finbatre >30 | 0.6% of people have kitchens more than 20 years old and bathrooms more than 30 years old. |
| **Defects: Inadequate appliance ventilation** | findfxvt | 0.3% of population have inadequate appliance ventilation. |
| **Defects: Dry/wet rot** | findfxrt | 0.3% of population have dry/wet rot. |

As more waves of the EHS data are collected and released we will have more sample size. This may lead to more variance in these outcomes which could allow us to place values on some of the insignificant variables outlined above.

# A4. Energy efficiency: EPC bands and Standard Assessment Procedure rating variables

The energy efficiency variable (EPC bands) shows the current and potential energy rating of a property. It is derived from a 'SAP rating' (Standard Assessment Procedure) and is the Government's recommended system for producing a home energy rating. EPC charts are divided into 7 bands ranging from A-G. Each EPC band covers a set range of SAP points:

| EPC band | SAP point range |
|---|---|
| A (most efficient) | 92-100 |
| B | 81-91 |
| C | 69-80 |
| D | 55-68 |
| E | 39-54 |
| F | 21-38 |
| G (least efficient) | 1-20 |

We explored a number of options for analysing this variable.

(i) We looked at moves between adjacent EPC bands (i.e. G to F, F to E, E to D, D to C, C to B and B to A). Our findings were inconclusive, with only some bands showing as significant and inconsistency in the direction of impact. We conclude that these results are caused by the low sample sizes for some of the efficiency bands (min = 91; max = 2,194). Response rates for the efficiency variable are in general low.

(ii) We aggregated some of the EPC band categories to boost sample sizes (e.g. A+B, C, D, E, F+G), creating 5 new bands in total and 4 potential values. Again we encountered low sample size issues.

(iii) We looked at general moves up and down the EPC band scale (rather than specific moves among each band). This allowed us to compare people in EPC band categories which are far apart. Using the data in this fashion maximised use of the sample and produced significant results for a change in the EPC score. This is the model that we employ and report in this study.

(iv) We explored a range of non-linear alternative functional forms to measure the relationship between EPC and health, including squared function (one point of inflection), logistic function and cubed function (two points of inflection replicating a sigmoid function). Our analysis showed that the squared form is the best fit for the data, however neither coefficient is significant and therefore we use the linear function in (iii) for EPC bands.

(v) We explored the Standard Assessment Procedure (SAP) rating points data on underlying EPC bands. We developed a combined variable of a combination of SAP09 and SAP12 variables which exist across all years of the EHS.  The regression analysis did not find a significant association between SAP rating and self-reported general health.

Having produced the average value per EPC band as described above, we investigated ways of enabling users to be able to calculate the likely impact of improvements of less than a whole EPC band. To interpolate SAP points-based values from our EPC band values we start by assuming that the differences between adjacent bands are typified by the difference between the middle of each band, e.g. middle of D to middle of C. Some will be more, e.g. bottom of D to top of C, others less, e.g. top of D to bottom of C; but on average, the difference is between mid-points. We take each midpoint, work out the number of points to the next midpoint, and then divide the value of a band move (£217 for the average value) by that number of steps. This gives us a value per point that can be employed in that range. We make an assumption that the per point values that apply from mid-B to mid-A can be extended all the way to the top of A, and similarly at the bottom end.

## A5. Values for multiple environmental outcomes

Since many of the environmental problems are commonly observed together we undertook specific analyses to identify the association between wellbeing and multiple outcomes considered together. This was specifically undertaken with a view to understanding whether it would be reasonable to apply the values for multiple outcomes together if resolving multiple issues in an area, and, if not, to establish an alternative approach instead.

This was addressed with quantitative analysis using the same general approach for calculating values as we use for calculating the values related to single outcomes. Whereas the approach is normally applied to a single outcome variable, in this case it is applied to a new variable that represents a pair of outcomes being achieved together. For example, in order to produce a value for achieving outcome A and outcome B together, we generate a new variable that takes the value 1 if both A and B are 1 and 0 if both A and B are 0. In order to conduct the analysis comparing the difference between having both issues and having neither of the issues, those situations where one of the outcomes but not the other occurred were removed:

| Outcome A | Outcome B | Generated Outcome (Outcome A AND Outcome B) |
|-----------|-----------|---------------------------------------------|
| 0 | 0 | 0 |
| 1 | 0 | N/A – Cases removed |
| 0 | 1 | N/A – Cases removed |
| 1 | 1 | 1 |

In each case the calculation of the coefficient and respective value is then calculated in the same way as for the standard single outcome values. The Generated Outcome is used as $H_i$ in the regression equation detailed in Appendix A1, and the resulting $\beta_1$ from the regression modelling is interpreted as the associated difference in wellbeing when comparing both of the issues to neither.

Producing the values differentiated by age group, as well as overall values, we found that due to small sample sizes the values for the under 25 age group were not reliable, with the majority being statistically insignificant and many implausible values. We consequently decided to apply the undifferentiated values for this age group as a blanket across all outcome pairs. (The resultant values for this age group do, however, sometimes differ from the overall averages since the floor and ceiling procedures described below were applied separately based on the individual outcome values for this age group.)

Having calculated the values for these combined outcomes, we calculated a metric for each to compare how the combined value relates to the values for the two separate outcomes:

$$M = (V_{X \, and \, Y} - V_X)/V_Y$$

where $V_{X \, and \, Y}$ is the value of the combined outcome and $V_X$ is the larger of the two separate values, and $V_Y$ is the smaller of them. This metric can be interpreted as follows:

| Value of $M$ | Interpretation |
|---|---|
| $M < 0$ | Combined value is lower than one or both of the individual values. |
| $0 < M < 1$ | Combined value is more than each of the individual values, but less than the sum of them both. |
| $M > 1$ | Combined value is more than the sum of the two individual values. |

In a large majority of cases we found that the combined value was less than the sum of the parts. This is interpreted as indicating that simply adding the two separate values would result in a degree of over-counting. Instead, those values produced by the process described above should be used, as they represent a truer reflection of the improvement in wellbeing that is observed to be associated with the difference between those people experiencing both of the problems and people experiencing neither.

In a small number of cases the analysis found that the value for the two outcomes combined was actually lower than the value for one of the constituent parts (i.e., $M < 0$). We believe that it is implausible that resolving two issues actually results in lower wellbeing than in resolving one of them, so it is likely that the results represent a statistical artefact (for example due to high correlation between the pair of outcomes). We resolved this by placing a floor on the value that we adopt for combined values, of whichever of the component parts is valued higher.

Similarly, in a small number of cases we also found values where the two outcomes combined was higher than the value for the sum of the constituent parts (i.e., $M > 1$). Whilst it is in principle possible to have values greater than sum of parts, where resolving two things together delivers some form of added advantage over resolving either alone, we adopt a conservative approach in these cases, to avoid over-counting if the high value is a statistical artefact. Consequently, we cap the value for any given pair at the sum of the parts.

Due to sample size constraints it was not possible to extend the approach to robustly calculate values for sets of three or more outcomes. Furthermore, analysis of the pairwise values suggests that there are generally diminishing returns associated with second outcomes: the mean value of $M$ across the pairs is 0.44, indicating that only 44% of the second outcome's value is observed, on average. We therefore adopt a conservative approach and say that third and subsequent outcomes should not be counted in addition to the value of pairs. However, since it is reasonable to assume that the value of resolving three issues should be at least the same as resolving any two of those problems, we permit users to select whichever of the pair values is highest. For example, if outcomes X, Y and Z are achieved for an area, the highest of the values of "X and Y", "X and Z" or "Y and Z" can be applied.

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