

Mental Health and Life Satisfaction:
The Relationship between the Warwick Edinburgh Mental Wellbeing Scale
and Life Satisfaction
A pilot study

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Responsibility for the analysis and interpretation of these data are solely that of the authors.

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1. Introduction and background

The **Warwick Edinburgh Mental Wellbeing Scale (WEMWBS)** (Putz, O’Hara, Taggart, & Stewart-Brown, 2012) in both its long and short form is being used increasingly across the housing sector to directly measure changes to mental health as part of wider assessments of the wellbeing and social impact of housing provider activities. Its growing popularity as a practical measure of impact is driven by both its academic rigour (Tennant et al., 2007) and its credibility with and relevance to the health sector – which is growing increasingly important as local funding and delivery partners.

WEMWBS is a list of 14 positively worded items related to mental health, with 5 response categories ranging from ‘none of the time’ (scored as 1) to ‘all of the time’ (scored as 5), designed to measure positive mental health. These items include, for example, “*I’ve been feeling optimistic about the future*”; “*I’ve been feeling useful*”; “*I’ve been feeling relaxed*”. The short form of WEMWBS (**SWEMWBS**) uses 7 of the WEMWBS items scored on the same scale.¹ As a result, SWEMWBS sums to give a total score, ranging from 7 to 35; higher scores indicate higher levels of mental well-being. Analysis has shown that robust measurement properties² and its shortness make SWEMWBS preferable to WEMWBS as a measure of mental wellbeing (Stewart-Brown et al., 2009).

HACT and Simetrica have already developed tools and metrics focused on the link between wellbeing and social value, producing the Social Value Bank (HACT & Simetrica, 2016), which forms the basis for most UK housing providers’ assessments of their local social impact. In partnership with Daniel Fujiwara at Simetrica, fifty-three outcomes were initially valued based on their relationship with life satisfaction (LS). Large national datasets, including the British Household Panel Survey (BHPS) and Understanding Society, were used to identify how people’s wellbeing correlated to other aspects of their life, like employment status or feelings about their neighbourhood. Since then, additional values have been added, including values relevant to homelessness services, housing conditions and local environmental outcomes.

Despite the increasing size of the Social Value Bank, one area that is not covered in great detail is mental health – an increasingly important area, given welfare reform and changes to health and social care policy. For example, giving mental health equal parity to physical health has been a central objective of the 2010-2015 Coalition Government (Parkin, 2016), and the Mental Health Taskforce has recently been set up by the 2015 Government (Parkin, 2016). The appeal of the WEMWBS scales is that they may be able to pick up marginal changes in mental wellbeing resulting from interventions, that would not be picked up by the 1-7 fixed integer LS scale. As a result, a number of housing providers have approached HACT to explore the potential to conduct research on mental health related outcomes and their relationship to wellbeing in ways that retain methodological consistency with existing work.

This paper sets out the methodology and analytical approach underlying the work to measure the value to society of changes in mental health as measured by the SWEMWBS scale. This will allow organisations to **estimate the social value created by interventions which improve peoples’ mental health and subsequently their overall quality of life or wellbeing.**

¹ The 7 items are: I’ve been feeling optimistic about the future, I’ve been feeling useful, I’ve been feeling relaxed, I’ve been dealing with problems well, I’ve been thinking clearly, I’ve been feeling close to other people, I’ve been able to make up my own mind about things

² In particular, the SWEMWBS scale is unidimensional which means that it is compatible with the Rasch model, and is mostly unaffected by bias. (Stewart-Brown et al., 2009)

It is important to note how evaluations using SWEMWBS differ from the more standard approaches currently used by The Department for Health and the National Institute for Health and Care Excellence (NICE). DH and NICE currently use the Quality Adjusted Life Year (QALY) approach to value health states and health conditions. Using pricing data from the NHS, the value of a QALY can be monetised allowing it to be used in Cost-Benefit Analysis (NICE, 2012). However, the QALY has some key issues in terms of measuring the impact of mental health conditions. First, it under-represents mental health as the instruments which are translated into the QALY predominantly focus on the effect of physical health outcomes (Fujiwara & Dolan, 2014). Second, the QALY is based on the general public's perceptions of health burden and it is not necessarily informed by the lived experiences of people who have the conditions (Fujiwara & Dolan, 2014). To rectify this, a number of mental health measures have appeared in the health sciences literature, including the General Health Questionnaire (Goldberg & Williams, 1988), WEMWBS (Putz et al., 2012), the SF36 Health Survey (Ware & Sherbourne, 1992), and a bolt-on question to the EQ-5D (Jelsma & Maart, 2015). Through use of these mental health measures we are able to derive a better understanding of mental health conditions. WEMWBS provides a more extensive assessment of mental health symptoms and outcomes and is based on people's lived experiences as we can measure how people report they are feeling. However, little had been done to link this to wider research on wellbeing until a recent paper which translates these measures into impacts on life satisfaction which is treated as a common currency for wellbeing metrics (Layard, 2016).

The paper contributes to this growing literature by providing the first estimates of the value of changes in the SWEMWBS scale.

2. The WEMWBS measure

There are currently two perspectives for interpreting WEMWBS, both of which are endorsed by the Department for Health (DH) (DH, 2013):

1. WEMWBS can be used as a measure of mental health; or
2. WEMWBS can be used as a measure of global wellbeing.

In measuring social impact, our preference is to treat WEMWBS as a measure of global wellbeing, that is, to assume it is a driver of life satisfaction (or any other measure of global wellbeing). In terms of demonstrating social value there are two key reasons for our preferred approach. First, global measures of wellbeing must provide a picture of our overall quality of life and in this sense, they should be sensitive to a wide range of factors (everything that we hold as being important to our lives). There would be doubts whether measures that focus only on mental health would capture all of this. Treating WEMWBS as an input into a wellbeing function, rather than as the wellbeing function itself, allows us to measure the value of (changes in) mental health condition, and in turn the value of interventions that seek to improve mental health.

This study investigates the statistical relationship between the **SWEMWBS** scale and life satisfaction whilst adjusting for other factors that drive wellbeing as guided by Fujiwara & Campbell (2011). We tested a number of different functional forms to assess the form of the relationship between life satisfaction and SWEMWBS using both parametric and non-parametric approaches to converting the overall SWEMWBS score.³ SWEMWBS is used instead of the full WEMWBS scale. The main advantage of SWEMWBS is that it is shorter. SWEMWBS has undergone more rigorous tests for internal consistency than the 14-item scale. There is more emphasis in SWEMWBS on functioning compared

³ For parametric models, we transformed the SWEMWBS score according to a [conversion table](#)

with the 14-item scale which is more focused on feelings (Warwick Medical School, n.d.). An additional advantage in the context of this analysis is that SWEMWBS is available in the Understanding Society (USoc) panel data set which was used in the Social Value Bank. This means it is possible to link SWEMWBS to life satisfaction and other variables necessary for the WV(WV) method employed by Simetrica in the Social Value Bank.

3. Methodology and data

Our core model assumes that life satisfaction (LS) for individual i is a function of mental health (M) and a set (vector) of other factors (X) such as income, social relationships, physical health, environment, housing, education etc.

$$(1) LS_i = f(M_i, X_i)$$

In equation (1) we assume that M = SWEMWBS score.

Equation (1) is estimated using the Understanding Society (USoc) data set, which incorporated and replaced the British Household Panel Survey (BHPS) in 2009. It follows the same individuals as the BHPS plus about 60,000 new participants and it has added a new set of variables. It is a panel data set that surveys over 70,000 individuals each year on all aspects of people's lives. It is representative of England, Scotland, Wales and Northern Ireland and there are currently six waves of data available. USoc is the largest panel (longitudinal) dataset in the UK.

We estimate equation (1) using two waves (Waves 1 and 4) of the USoc data (these are the waves in which the SWEMWBS question is included). The model is estimated using a fixed effects estimator as follows:

$$(2) LS_{it} = \beta_1 M_{it} + \beta_2 X_{it} + \theta_t + c_i + u_{it}$$

Where:

X_{it} is a vector of observable factors that drive wellbeing. We include all of the key determinants of wellbeing as set out in Fujiwara & Campbell (2011).

c_i is the time-invariant individual fixed effect.

u_{it} is the idiosyncratic error term.

θ_t is the wave fixed effect

We tested the following functional forms to ascertain the relationship between life satisfaction and SWEMWBS:

Parametric

- I. Linear model
- II. Log
- III. Quadratic
- IV. Cubic
- V. Sigmoid

Non-parametric

- VI. 28-Category SWEMWBS Model (i.e. a dummy variable for each point on the overall score)

- VII. 15-Category SWEMWBS Model
- VIII. Seven-Category SWEMWBS Model
- IX. Four-Category SWEMWBS Model

Statistical tests of goodness of fit⁴, as well as theoretical reasoning and considerations of practical application were used to determine the best functional form and model.

In line with the Social Value Bank methodology, the WV method was employed to value movements on the SWEMWBS scale using the best-fit model. This assesses how much additional money or income would be required to have the same impact on wellbeing as a change in the SWEMWBS score. This is known as the compensating or equivalent surplus measure of value which is the measure used in the Social Value Bank and which forms the basis of best-practice valuation guidelines in the UK (see HM Treasury (2011) and internationally (see OECD (2013)). The values are differentiated by UK regions (London and non-London) and by three age groups (under 25 years, 25-49 years, 50+ years) as per the Social Value Bank. This was performed by using split sample models whereby the regression models were run for each category (region and age group). However, it should be noted that by splitting the sample there may be models in which sample size is low enough that results can be driven by outliers in the data. Due to this risk, we apply constraints on the differentiated values to ensure that they do not vary too far from the full model value. The constraints are set using average levels of variance across the whole sample using similar methods as applied in the Social Value Bank.

For a full description of the WV approach and the differentiation analysis please refer to the UK Social Value Bank documentation (HACT & Simetrica, 2014).

4. Results

Our analysis of the different functional forms found that a non-parametric 12-category-model worked best in representing the relationship between life satisfaction and SWEMWBS. This converts the 7-35 point overall SWEMWBS score onto a 12-point scale. As set out in Table 1, we present the results of this model here. The results of the other models that were tested are available on request, but are not presented here in the interests on brevity.

As can be seen in Table 1, category 1 covers a wider range of points on the 7-35 SWEMWBS scale than the other categories. This is because we found that changes in the SWEMWBS score at lower levels of the SWEMWBS scale did not have a statistically significant impact on life satisfaction.

Table 1. SWEMWBS 12 category model with accompanying Full model values

Category	Overall SWEMWBS score	Full Model Value
1	7-14	£0
2	15-16	£9,639
3	17-18	£12,255
4	19-20	£17,561
5	21-22	£21,049
6	23-24	£22,944
7	25-26	£24,225
8	27-28	£24,877
9	29-30	£25,480

⁴ R squared, Adjusted R squared, F tests of joint significance of all SWEMWBS related variables and RSME

10	31-32	£25,856
11	33-34	£26,175
12	35	£26,793

Table 1 also set out the monetary values for each SWEMWBS score for the full model (not differentiated by age and region) based on the WV approach. This is also shown graphically in Figure 2. The values represent the value of a change in the SWEMWBS score from the base category of a SWEMWBS score of 7-14. In other words, if an individual, moves from a SWEMWBS score in between 7-14 to another category they would experience the value of this move as set out in Table 1. For example, based on the full model the value to an individual of moving from a score of 10 (category 1) to a score of 15 (category 2) is £9,639 per annum, whilst the value of moving from a score of 10 (category 1) to a score of 27 (category 8) is £24,877 per annum.

The results can also be used to determine the value of moving in between any point on the scale by looking at the difference in value at those two points. For example, the value to an individual of moving from a score of 15 (category 2) to a score of 27 (category 8) is £24,877 - £9,639 = £15,238 per annum.

As can be seen from the magnitude of the values we find that the relationship between SWEMWBS and life satisfaction is non-linear. The impact on life satisfaction (and hence the magnitude of the value) is higher for changes in the SWEMWBS score around the early mid-section of the scale (around the points of 15-22). Whilst improvements in the SWEMWBS score after 22 are still positively associated with increases in life satisfaction the magnitude of the association dwindles. In other words, the marginal effect of SWEMWBS reduces but always stays positive. This means (as one would arguably intuit) that improvements in mental health (as measured by SWEMWBS) become less valuable the better one’s mental health is to begin with.

Figure 2: Value of SWEMWBS score for the full model (not differentiated by age and region)

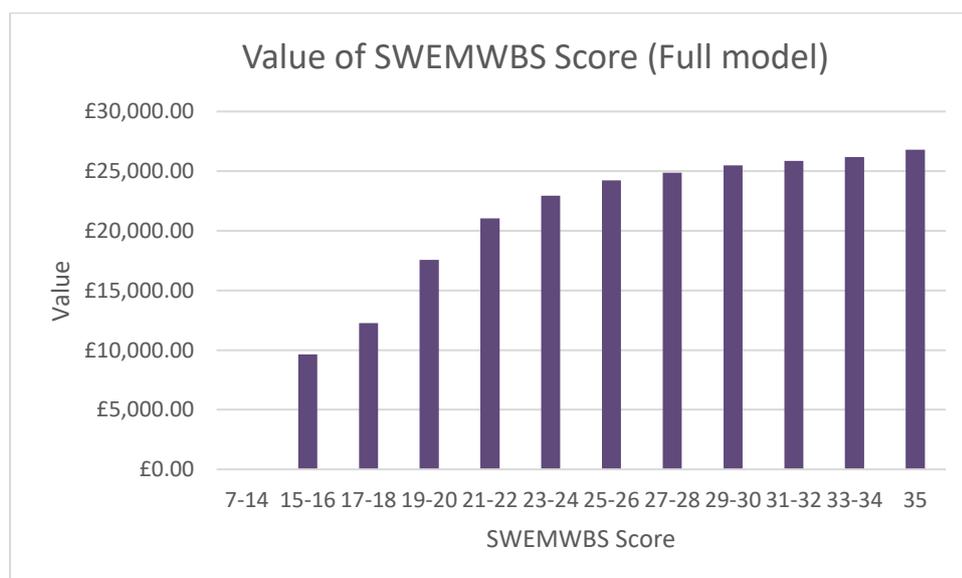


Table 2 also gives the values for each SWEMWBS score differentiated by age and region (again in comparison to the reference case of a SWEMWBS score of 7-14). For example, the value of having a SWEMWBS of 21 for a 24-year-old living in London is £21,401 in comparison to having a score of 7-14. And the value for a 45-year-old living outside of London who moves from a SWEMWBS score of 18 to 22 is £20,831 - £10,523 = £10,308.

5. Application

It is necessary to compare the overall benefits of interventions to their costs to decide whether they are worthwhile to society and which have the greatest impacts. This is best conducted using Cost Benefit Analysis (CBA) as recommended by HM Treasury Green Book guidance on policy evaluation (HM Treasury, 2011).⁵ The SWEMWBS Value Calculator enables organisations which run mental health interventions to show how they benefit people based on the estimated impact of the intervention on SWEMWBS responses by intervention recipients. This can then be compared to the interventions costs in order to conduct a full CBA.

Since there is a non-linear relationship between SWEMWBS and life satisfaction there does not exist a single value for a generic one-point changes in the SWEMWBS score. Therefore, values must be estimated from a status quo baseline case. In application, this will be the movement in SWEMWBS pre-intervention to post-intervention (after controlling for other factors that could have impacted on the SWEMWBS score besides the intervention itself).

The social value created by the intervention equals the impact of the intervention on SWEMWBS multiplied by the value of the change in SWEMWBS multiplied by the number of people impacted upon minus the costs of the intervention:

$$\text{Social value} = (\Delta\text{SWEMWBS} \cdot \text{average value of } \Delta\text{SWEMWBS} \cdot \text{number of beneficiaries}) - \text{Costs}$$

A first order estimate of the change in SWEMWBS dues to the intervention can be estimated from the difference in pre-intervention and post-intervention SWEMWBS scores:

$$\Delta\text{SWEMWBS} \approx \text{SWEMWBS}_{\text{post}} - \text{SWEMWBS}_{\text{pre}}$$

However, this can only ever be a loose proxy for the change in SWEMWBS because pre-post differences do not represent causal impacts of the intervention. There are many other factors (such as a change in jobs, getting married etc.) that could have explained the change in SWEMWBS scores as well. Evidence shows that pre-post changes tend to systematically *overstate* the impact of an intervention (Dancer 2014).

Therefore, the impact of an intervention on SWEMWBS should be estimated after controlling for all of the other factors that drive SWEMWBS. This can be estimated using for example a randomised trial or statistical methods that control for other key factors. In what follows we shall call the true impact of an intervention on SWEMWBS ($\Delta\text{SWEMWBS}^*$) to differentiate it from ($\Delta\text{SWEMWBS}$), which is just

⁵ It should be noted that in a cost-benefit analysis these values cannot be used together with monetary values derived by using QALYs.

the pre-post change. Usually, $\Delta SWEMWBS > \Delta SWEMWBS^*$, which means that using the pre-post change will tend to overstate the value created by an intervention.

If the true causal effect of the intervention ($\Delta SWEMWBS^*$) cannot be estimated and instead the pre-post change estimate ($\Delta SWEMWBS$) is used, then as a minimum a deadweight factor must be applied to the results. A deadweight calibration reduces the pre-post change by a percentage based on findings of previous research which would suggest that pre-post changes overstate impact. Our recommendation would be to use a deadweight of 27% based on the Housing and Communities Agency (HCA) guidelines on a deadweight for health (Dancer, 2014). Next, we set out how the SWEMWBS values is applied in the SWEMWBS Value Calculator based on the assumption that a pre-post estimate of the change in SWEMWBS ($\Delta SWEMWBS$) is used.

Application

There is some flexibility in how the SWEMWBS values can be applied to policy interventions depending on the data available about the intervention, the capacity of those running the intervention and the desired outputs. We recommend that organisations delivering community based programmes conduct a proper evaluation with a control group to calculate the causal impact of the programme on the SWEMWBS score. If this is not possible, the second-best approach is to ask project participants to respond to the SWEMWBS statements before and after an intervention and record the total score (ranging from 7-35) for each person at both points.

It is possible to value the benefits of an intervention with the following steps:

1. Subtract the before value from the after value and subtract 27% as deadweight (see definition of deadweight below).
2. Sum the resulting values for all the participants to calculate the total social impact.
3. Minus the total costs to deliver the intervention from the total social impact to reveal the net social impact.

Worked examples;

Example 1

A couple in a flat were experiencing a neighbour noise issue. The neighbours played loud music each night preventing them from sleeping and ignored their pleas to stop. This carried on for months and caused them significant distress. One resident was signed off work with stress.

The housing association intervened and resolved the issue so the couple no longer had to endure the neighbour noise. The intervention costed £1,250.

	SWEMWBS 'before' score	Model value	SWE score MWBS 'after'	Model value
Tenant A	19	£17,561	24	£22,944
Tenant B	23	£22,944	26	£24,225

1. After score model value – Before score model value x (1-deadweight) = Per person social impact

Tenant A: £22,944 - £17,561 x (1-0.27) = £3,929.59 Tenant B: £24,225- £22,944 x (1-0.27) = £935.13

2. Tenant A social impact + Tenant B social impact = Total social impact

£3,929.59 + £935.13 = £4,864.72

3. Total social impact – Total costs = Net social impact

£4,864.72 - £1,250 = £3,614.72

Example 2

A resident in an end-terrace property hoarded materials to the point where it began to affect a retired neighbour. The neighbour was disturbed by the smell and vermin that resulted from the hoarding. This led to considerable anxiety and a reluctance to leave her property.

The housing provider supported the hoarding tenant and helped to initiate a full recovery which solved the problem for the neighbour. The cost of the intervention was £3,500.

	WEMWBS 'before' score	Model value	WEMWBS 'after' score	Model value
Tenant	16	£9,639	22	£21,049

1. After score model value – Before score model value x (1-deadweight) = Per person social impact

£21,049 - £9,639 x (1-0.27) = £8,329.30

2. Total social impact = £8,329.30 (only one person is benefiting)

3. Total social impact – Total costs = Net social impact

£8,329.30 - £3,500 = £4,829.30

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