Office for National Statistics

Consultation

Response to consultation on the changes to health state life expectancy methodology

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1. Executive summary

ONS ran a public consultation to review the National Statistics (NS) methodology on health state life expectancy, between 7 December 2017 and 8 February 2018[1]. The consultation was run alongside the proposed methods paper[2] to gain feedback on the proposed changes. Responses were invited via an online survey or e-mail. ONS would like to thank all the respondents for taking the time to respond to the consultation.

The consultation included three different methods, along with two other options; to either remain unchanged, or conduct further investigations to test alternative methods:

1. Maintain the existing method, simply using the prevalence of health states observed in Annual Population Survey (APS) data;
2. Method 1 – impute then model prevalence from observed APS data;
3. Method 2 – model then impute prevalence from observed APS data;
4. Method 3 – impute then model prevalence from observed APS data with the model including a census prevalence predictor term, or finally;
5. Conduct further investigative analyses using more complex modelling approaches.

Respondents were asked to comment on each of the options, and indicate which method they would prefer ONS to use in future estimates of health state life expectancies. Altogether, five responses to the consultation were received.

Of the methods compared against each other and the existing method, the majority recommended that ONS use method 3, agreeing that this addressed some of the existing method's volatility in prevalence estimation. However, respondents raised concerns of discontinuity arising from the use of future censuses or their replacement, and whether a change in method would result in a break in the time-series.

ONS will consider whether the health questions to be included in the 2021 Census form would present a discontinuity; if the items are sufficiently comparable to the 2011 Census, we will undertake an interpolation study to examine the change in census based age, sex and area specific prevalence rates between the 2011 and 2021 at sub-national area level. We will then seek to improve the model through use of extrapolation of expected change in the census prevalence term as the next decade continues. Formal tests of the adequacy of the model for the 2020 to 2022 period will also be determined based on performance against the 2021 Census based estimates.

A decision will then be taken on whether a further revision to the method is necessary. If this is deemed necessary, ONS will consult again on such proposed changes. The opportunity to use the census between two-time points will be available for the first time for estimating change in general health prevalence for use in estimation of healthy life expectancy (HLE). This provides further scope to undertake further methods testing to improve the quality of these statistics.

ONS proposes to use method 3 as the new method from the date of the next publication. To communicate the impact of the definition change, ONS will publish an updated Quality and Methodology Information (QMI) report which will be published alongside the next health state life expectancy release, due for publication in December 2018.

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[1] See https://consultations.ons.gov.uk/health-and-life-events/changes-to-health-state-life-expectancy-methodolog/

[2] See https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/methodologies/proposedmethodchangestoukhealthstatelifeexpectancies

2. Background

Why did we consult on the National Statistics changes to health state life expectancy methodology?

The methodology of health state life expectancy estimates was reviewed:

- To address the volatility of healthy life expectancy (HLE) and disability-free life expectancy (DFLE) estimates for some sub-national areas where particularly in older age groups, the populations are small;
- To gain feedback from users on the proposed method change to guide decisions on the merit of implementing this method change as detailed in the proposed methods paper.

What methods were consulted on?

Three different methods for the change in health state life expectancy methodology were presented. The options are briefly outlined below, and were explained fully in the published proposed methods paper. Other options were also suggested for either the method to remain the same or further investigation to take place.

The primary focus was on ONS' proposed method, method 3, whereby the addition of the census term in the equation has the potential to rein in exceptionally volatile data. The proposed method is designed to address the current weakness of small sample sizes producing somewhat erratic health state prevalence estimates across the age distribution in those areas with smaller populations, which lead to abrupt changes in health state life expectancies.

We investigated three variations to the modelling approach, which each used an imputation method which applies 2011 Census prevalence data to impute health and disability-free prevalence rates for children (aged under 16) and the two oldest age groups (85 to 89 and 90 years and over) based on the pattern of change in prevalence between age groups found at census.

Method 1
First, the existing imputation method is applied to the raw Annual Population Survey (APS) parameter estimates to calculate ages 0 to 15 and ages 85 to 89 and 90 and over. Second, a prevalence rate for each age group is estimated using a least squares regression taking the midpoint of the age band and its square as explanatory variables for each sex and geographical unit separately.

Method 2
First, the modelling least squares approach is applied to raw APS parameter estimates on the age groups that are available from ages 16 to 19 and 80 to 84 years. Second, the imputation method is applied from the fitted estimates for age groups 16 to 19 and 80 to 84 to estimate prevalence rates for the remaining age groups.

Method 3
The same as Method 1, except that a census health state term is included in the least squares regression. Since HLE and DFLE are expected to change only modestly over time, the addition of a census term in the equation has the potential to rein in exceptionally volatile data (as was observed for females in Rutland).

3. Summary of responses

ONS received five responses to the consultation from organisations including government departments and a local authority. A list of the responding organisations can be found at the end of this document. A summary of the responses is provided below for each of the seven questions asked. Considerations to the responses are detailed in the conclusions and next steps section.

Question 1: What is your opinion on the method proposed to model health and disability state prevalence to calculate future estimates of health state life expectancies?

Four respondents agreed that the method proposed (Method 3) to model health and disability state prevalence reduces the volatility in the estimates for sub-national areas and at the older ages, making comparisons over time easier. One responded said that because method 3 had the strongest model fit of the proposed methods, it should be used for future health state life expectancy estimates.

Further comments
Other comments relevant to this question were:

- Is a better match to census information;
- All 3 methods do appear to improve the overall methodology, particularly with regards to the national estimates;
- The change in the method only addresses some of the inconsistencies that occur at sub-national areas - it would make sense to address them all at once;
- If the change to the method is made too quickly without considering the issues, that this will be used as a reason to make further adjustments in the future.

Question 2: Does the method strike the right balance between complexity and ease of communicating results across the range of different users?

Most respondents considered the trade-off between having a complex method to reduce the volatility of the estimates, especially at sub-national areas, and how the communication of the proposed method is presented to a range of different users. If complexity is required to produce more robust figures, it should not be at the expense of clarity.

Complexity

Respondents felt that the method is somewhat complex as it currently stands and that the proposed method shouldn't be made any more complex. The current methods to calculate health state life expectancies are already quite complex and inaccessible to non-statisticians. It was recommended that the updated methods section is user friendly and adapted in consideration to non-statisticians. It was also recommended that a simplified explanation be included, perhaps in the form of a diagram for non-statisticians of how the health state life expectancy estimates are calculated (see Box 1).

Communicating results

Regarding the communication of the proposed method, respondents suggested including a detailed methodology that is available to enable users to reproduce the statistics. It is also important to clearly explain the changes in methodology to ensure that the figures are not misinterpreted. One respondent felt that stakeholders will be more interested in the results and the differences between past and future HLE estimates. Whilst the proposed method adds complexity by using quadratic regression modelling, this can be simplified by explicit explanation of the

changes in methodology in plain English, which will mitigate the risk of figures being misinterpreted.

Question 3: Are they any other things you think should be considered in the new method?

This question received two responses which is possibly due to there being a technical issue with the question online. We apologise for any inconvenience.

In response to this question, both respondents had questions regarding the 2021 Census and asked:

- What would happen if the 2021 Census results were substantially different as this would affect proposed method 3?
- What if the question on “Good” health is not asked in 2021?
- What if the census is discontinued at a later date?
- Will HLE for the years running up to the census be updated with the new census data?

The steps ONS intend to take to address the uncertainties regarding the use of the 2021 Census are provided below in the section Implementation and communication.

Question 4: Do you have any concerns with ONS implementing this new method?

The two predominant concerns raised by respondents were regarding the potential issue with the 2021 Census data and a potential break in the time-series.

There could be potential issues with future census data, as addressed in response to question 3 under implementation and communication below. However, if the potential census issues can be managed, method 3 seems preferable.

There was a concern raised over whether the method will continue to be developed, as this would cause further breaks in the time-series. Another respondent expressed concern that the implementation of the method would put at risk a long, consistent time-series.

Further comments

Other comments relevant to this question were:

- The inconsistency in the existing method is imputation based on ages 16 to 19 years for those aged 0 to 15 years. It was suggested that this needs to be addressed as part of any methodological change;
- ONS to ensure sufficient information is available to allow other departments to calculate figures and not to be reliant on ONS calculating the health state life expectancy estimates;
- Changes to the methodology to be made clear so that users do not misinterpret the figures.

Question 5: What would be the impact on your use of the statistics if this method change is implemented?

For most respondents, the method change implemented will have a minor impact. It would be a question of revising the statistics where included in reports for example. One organisation has said they will implement the method that ONS decides to use, provided sufficient information is available to allow them to replicate the estimates. The proposed changes provide data for all subnational areas which would make the data more usable for one organisation’s purposes.

Question 6: Can you tell us how you are using these statistics?

Respondents said the health state life expectancy estimates feed into public health frameworks for England and Wales, which help understand how public health is being improved and protected. The estimates also have policy impact in that they are used in consideration of the State Pension age.

As ONS produces comparable sub-national estimates for the UK, the estimates are used for snapshot and trend comparisons against other UK areas. One respondent expressed that they would find it useful if ONS published the results for local health boards for Wales in the next sub-national publication.

Question 7: On reflection which category best represents your perspective on which course ONS should take regarding the methods used to estimate health state life expectancies? (Please rank order the categories where 1 is most favoured and 5 is least favoured).

- **Maintain existing method using observed prevalence in the APS**
- **Method 1 - impute then model**
- **Method 2 - model then impute**
- **Method 3 – impute then model with a census prevalence predictor term**
- **Further investigation of more complex modelling approaches**

There was no clear preference in favour of any of these choices based on the ranking of the categories; however, with only five responses this was not altogether surprising. One respondent favoured method 3, followed by method 1, expressing that if the potential issues with census data (as discussed in response to question 3) are addressed.

However, previous question responses indicated that most respondents agreed that method 3 was acceptable to proceed with going forward.

4. Conclusions and next steps

Proposed method change

The responses to the consultation identified broad support for the proposed method 3 as detailed above, although some concerns were expressed. Concerns that have been expressed above will be addressed in the implementation and communication section below. ONS will move to the proposed method 3 in the next health state life expectancy release, which is due to be published in December 2018.

Implementation and communication

ONS will take the following steps to ensure the method change is understood by users and promote the availability of full and coherent information on the changes to health state life expectancy methodology:

- The proposed method (method 3) will be used to calculate health state life expectancy estimates as of the next publication for sub-national areas of the UK, due to be published in December 2018. Subsequently, ONS will no longer publish statistics based on the previous method;
- The December publication will also take account of the revised mid-year population estimates for sub-national populations in England and Wales;
- We will assess the impact of the revised populations referring to the 2013 to 2015 health state life expectancy estimates as included in the methods change paper. This information will be made available in an appendix within the December release;
- The December publication will include additional areas such as combined authorities (geographic codes E47) for England and Health Boards for Wales;
- Other relevant future publications such as the health state life expectancy by national deciles of area deprivation publication due to be published March 2019 will apply the new method and provide a back series from 2011 to 2013;
- The health state life expectancy template will be updated to align with the new method and aid users' understanding and to help them to be able to calculate their own estimates;

- We will update the Quality and Methodology Information (QMI) report to communicate the method change concisely, the reasons for it, and its impact on the existing time-series;
- Facilitate further work with the devolved administrations to ensure understanding of the methodology to allow other departments to replicate the estimates and calculate their own estimates with other areas of interest;
- We will additionally undertake an evaluation of the method's performance, comparing the 10-year trajectory between 2010 to 2012 and 2020 to 2022 using the new method and that using the censuses to interpolate census-based prevalence over the decade;
- ONS will ensure any changes brought about by what is learnt from the 2021 Census data will be implemented with a back series. If the 2021 Census contains health questions, ONS will wait until a formal evaluation and interpolation study has been conducted and published on. This is unlikely to be published until the late autumn of 2023;
- The issue of using the 16 to 19-year age group to impute to younger ages is noted, but was not a formal part of the consultation. There has been difficulty in acquiring data at sub-national areas for children. However, as ONS now has options to assess alternative administrative sources through the Digital Economy Act, we will seek to improve upon the current method of imputation through testing the potential of such sources.

Some questions were raised in response to Question 3 and answers to these have been included below.

What would happen if the 2021 Census results were substantially different as this would affect proposed method 3?

If the 2021 Census contains health related questions like those that were asked in 2011, there will be an opportunity to better understand health state transitions over a 10-year period through linear interpolation. We will also be able to determine how well the modelled estimates and their trajectory compare to the interpolated trajectory observed in census data. At this point it will be appropriate to review the methodology based on evaluation against census data.

One option will be to adjust the 2011 Census prevalence term with an interpolated prevalence term to take account of the 10-year trajectory. An impact document will be published on any future change to the methodology.

What if questions on general health and disability are not asked in 2021?

The 2021 Census questionnaire has yet to be finalised, so it is not possible to confirm it will contain a general health question or a question asking about activity restriction because of a health condition or illness. If it does contain these items, the general health question is likely to be identical to the generic harmonised question asked in the 2011 Census. However, the activity limitation because of a health condition or illness may vary from that asked in 2011 and would therefore require further investigation into the extent of comparability.

In circumstances that the 2021 Census does not contain a general health question or a question asking about activity restriction associated with a long-term health conditions or illnesses, the proposed method would not be feasible to continue and ONS will seek to use alternative sources of information. The Digital Economy Act provides ONS with the opportunity to request administrative data for statistical purposes. ONS will seek to explore this option should the 2021 Census exclude health related questions.

What if the census is discontinued at a later date?

The 2021 Census will be the UK's first predominantly online census. For future decades ONS is exploring the possibility of a Census based on linking together administrative data supported by survey information. ONS' assessment is based on five criteria:

1. Access to data
2. Ability to link
3. Ability to meet user data needs
4. Acceptability to stakeholders
5. Value for Money

It will be expected that ONS will seek to use health attribute data from the solutions put in place to replace the population censuses.

Will HLE for the years running up to the census be updated with the new census data?

ONS will make a judgement about when and how 2021 Census data should be used in modelling. The most likely course of action will be to use interpolated estimates, avoiding an abrupt change at an arbitrary point in the decade. This will be informed following a formal evaluation of the proposed method.

5. List of responding organisations

Of those giving their permission to be acknowledged, the responding organisations included:
Public Health Wales
Swindon Borough Council
Welsh Government