EE422

Estimating Quality-Adjusted Life Expectancy (QALE) by Ethnicity for Application in Distributional Cost-Effectiveness Analysis

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Summary

+ Quality-adjusted life expectancy (QALE) helps measure both how long people live and the quality of their health. It is also a key input for Distributional Cost-Effectiveness Analysis (DCEA).
+ This study explores how QALE varies across ethnic groups in England, by combining ONS life expectancy data and health-related quality of life data from the Understanding Society survey to estimate QALE by sex and ethnicity.
+ National average QALE at birth is estimated to be 70.3 years for men and 71.0 years for women. QALE varies significantly across ethnic groups:
  • Among men, QALE ranged from 65.9 years (Bangladeshi) to 73.9 years (Asian Other).
  • Among women, it ranged from 63.9 years (Pakistani) to 74.6 years (Black African).
+ These differences highlight ethnicity as a key dimension of health inequality. Being able to capture the impacts of health interventions on these inequalities via quantitative methods such as DCEA will help to guide more equitable health policies.

Background

+ Distributional cost-effectiveness analysis (DCEA) is an analytical framework that allows incorporation of health equity considerations into decision-making.
+ One key input of DCEA is the distribution of quality-adjusted life expectancy (QALE) across subpopulations.
+ The National Institute for Health and Care Excellence (NICE)[1] now permits manufacturers to conduct DCEA for the appropriate equity-relevant subgroup, which for some diseases may be ethnicity.
+ However, in England, QALE estimates by subgroup are currently only available by Index of Multiple Deprivation (IMD).[2]
+ This project aims to estimate how QALE varies among ethnic subpopulations in England.

Methods

+ Quality-adjusted life expectancy was estimated among ethnic subpopulations by combining life expectancy data with health-related quality of life (HRQoL) measures stratified by ethnic group.

QALE	Life Expectancy	Office for National Statistics (ONS): Life table by ethnic group: England and Wales, 2011-2014
	Utility Scores	Understanding Society: Wave 7 (2017). Sample size - 38,420 individuals.

+ The analysis was divided into three stages, following the approach used by Love-Koh et al. (2015) across IMD quintiles:[2]

1. Disaggregate mortality rates and life expectancies stratified by sex and ethnicity into single years of age.

+ Life tables published by the Office for National Statistics (ONS)[3] were calculated in 5-year age bands. These were disaggregated into single years of age, assuming uniform mortality rates across each age band.

2. Calculate utility scores by sex and ethnicity.

+ Utility scores by sex and ethnicity were estimated using Wave 7 of the Understanding Society (USoc)[4] data, administered in 2017, drawing on survey responses from 37,247 participants.
+ Wave 7 was prioritised for analysis due to its sample size, inclusion of ethnic minority boost samples, and closer timing to the 2011-2014 ONS life table compared to other waves.
+ SF-12 (12-item Short Form Survey) was mapped to EQ-5D (European Quality of Life 5-Dimensions) using a published mapping algorithm[5], and a power transformed linear regression predicted EQ-5D by age and sex, stratified by ethnic group.
+ The optimal power transformation for the regression was determined by a Box-Cox test.

3. Combine outputs from steps 1 and 2 to obtain estimates of QALE by sex and ethnicity categories.

+ The health state life expectancy estimates template[6] published by the ONS was adapted to estimate QALE from predicted EQ-5D in each ethnic group.

Results

+ A cubic transformation was identified as the optimal power transformation and applied to linear regression models for EQ-5D.
+ Weighted average QALE at birth was estimated from USoc data to be 70.3 years for men and 71.0 years for women. These figures are slightly higher than those derived from the Health Survey for England, which report averages of 68.2 years for both men and women.[7]
+ For men, QALE ranged from 65.9 to 73.9 years, for Bangladeshi and Asian Other ethnic groups, respectively.
+ For women, QALE ranged from 63.9 to 74.6 years, for Pakistani and Black African groups, respectively.
+ Across all ethnic groups, QALE formed a larger proportion of LE for men, suggesting a higher average quality-of-life compared to women.
+ For both men and women, QALE formed the largest proportion of LE for white ethnic groups and smallest for Pakistani ethnic groups, suggesting a higher average quality-of-life for white ethnic groups across their lifetime compared to other ethnicities.

Figure 1. Distribution of life expectancy (LE) and quality-adjusted life expectancy (QALE) at birth across ethnic groups in England - Men.

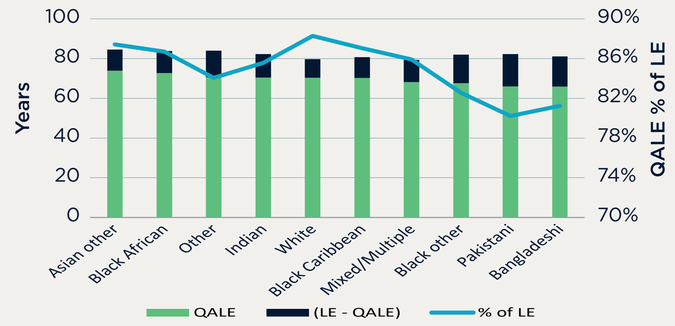

Figure 2. Distribution of life expectancy (LE) and quality-adjusted life expectancy (QALE) at birth across ethnic groups in England - Women.

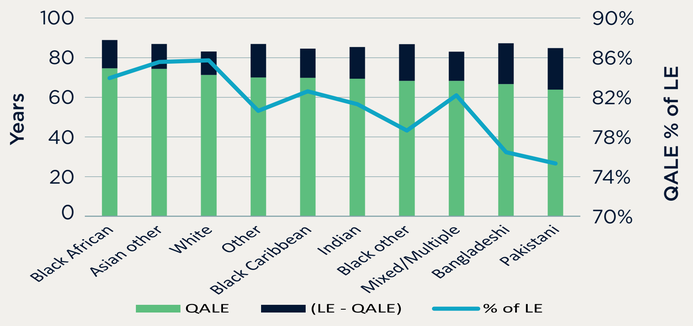

Table 1. Predicted LE and QALE at birth across ethnic groups in England, ranked by QALE - Men

Rank	Ethnic group	LE	QALE	% of LE
1	Asian other	84.5	73.9	87%
2	Black African	83.8	72.7	87%
3	Other	84.0	70.6	84%
4	Indian	82.3	70.4	86%
5	White	79.7	70.4	88%
6	Black Caribbean	80.7	70.3	87%
7	Mixed/Multiple	79.3	68.1	86%
8	Black other	82.0	67.7	83%
9	Pakistani	82.3	66.0	80%
10	Bangladeshi	81.1	65.9	81%

Table 2. Predicted LE and QALE at birth across ethnic groups in England, ranked by QALE. - Women

Rank	Ethnic group	LE	QALE	% of LE
1	Black African	88.9	74.6	84%
2	Asian other	86.9	74.4	86%
3	White	83.1	71.3	86%
4	Other	86.9	70.1	81%
5	Black Caribbean	84.6	69.9	83%
6	Indian	85.4	69.4	81%
7	Black other	86.8	68.3	79%
8	Mixed/Multiple	83.1	68.3	82%
9	Bangladeshi	87.3	66.7	76%
10	Pakistani	84.8	63.9	75%

Assumptions

+ HRQoL for ages 0-15 years was assumed equal to 16-year-olds due to lack of data, potentially underestimating QALE if younger ages have higher HRQoL. Conversely, institutionalised populations not captured by USoc often have lower HRQoL, which may lead to QALE overestimation.

Limitations

+ ONS LE estimates by ethnicity are limited by underlying data quality and availability. Higher dropout and loss to follow-up among ethnic minority groups, along with difficulty in recording outmigration, may artificially inflate LE estimates and introduce attrition bias.[8]
+ Given the number of subgroups examined, population size variation may lead to uncertainty in HRQoL estimates, particularly for smaller ethnic subgroups.
+ Mapping from SF-12 to EQ-5D may also introduce estimation bias in utility estimates. Future work should seek to use individual-level EQ-5D data to fit regression models for each ethnic group.

Conclusions

+ These results represent the first estimation of QALE by ethnicity for the UK, demonstrating the role of ethnicity as a key dimension of health equity and enabling important equity analysis using methods such as DCEA.
+ The differing rank order of ethnic groups between LE and QALE suggest that patterns of inequality may vary depending on the metric used. This highlights the importance of employing a range of measures to fully understand disparities in health outcomes.
+ By offering an alternative indicator of general health stratified by ethnic group, these findings support policymakers and researchers in exploring the multifaceted nature of health inequalities and facilitate the design of tailored public health strategies in response.

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Abbreviations

EQ-5D – European Quality of Life 5-Dimension
HRQoL – Health-related Quality of Life
LE - Life Expectancy
QALE - Quality-Adjusted Life Expectancy
ONS - Office for National Statistics
SF-12 – 12-item Short Form Survey
USoc - Understanding Society Survey