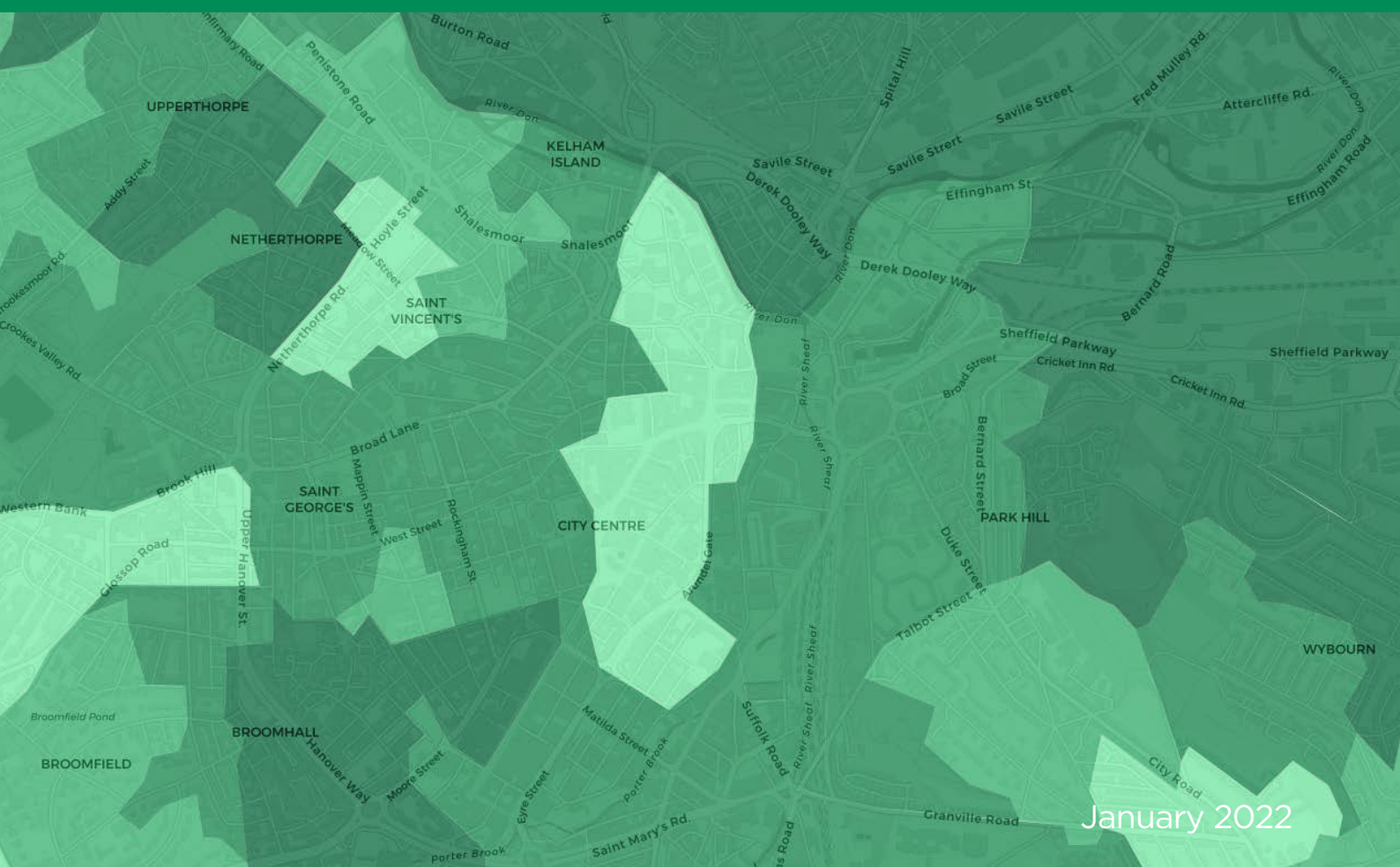# Actuarial Research Centre ®

Institute and Faculty
of Actuaries

Identifying England's mortality inequalities

Introducing the Longevity Index for England (LIFE)

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Canadian
Institute of
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About the LIFE index

In 2016 the Actuarial Research Centre (ARC), part of the Institute and Faculty of Actuaries, commissioned a large-scale, five-year research programme looking at the **modelling, measurement and management of longevity and morbidity risk.** The programme was led by researchers from Heriot-Watt University in the UK, and sponsored by the Society of Actuaries in the US and the Canadian Institute of Actuaries.

Datasets for England, Denmark, the US and Canada were obtained or developed, providing considerable country-specific insights and facilitating comparison of mortality inequalities. One of the outputs from the research has been the development of a new Longevity Index for England – the LIFE index. The LIFE index is able to identify and quantify previously uncaptured mortality inequalities in England at a much more granular level than has been possible before.

To address the UK's mortality inequalities, policy-makers need to understand where these inequalities are most prevalent. The LIFE Index provides a tool with which to make accurate, informed decisions.

Research objectives

- Publish a robust, reliable and open access mortality index at neighbourhood (LSOA) level (see LSOA description on p2)

- Explain as much as possible of the variation observed in LSOA-level mortality using publicly available data, socio-economic predictive variables, care home population and urban/rural class (thereby substantially reducing unexplained urban/rural and regional variations)

- Provide a tool and benchmark for actuaries

- Facilitate debate and action on how to tackle mortality inequality.

The LIFE index provides a tool with which to make accurate, informed decisions

Rural vs. urban mortality

The biggest significant difference identified by the LIFE index is that rural LSOAs have significantly lower mortality than predicted by the IMD. Death rates in rural areas are up to 20% lower than the decile average, and death rates in non-London conurbations are up to 10% higher.
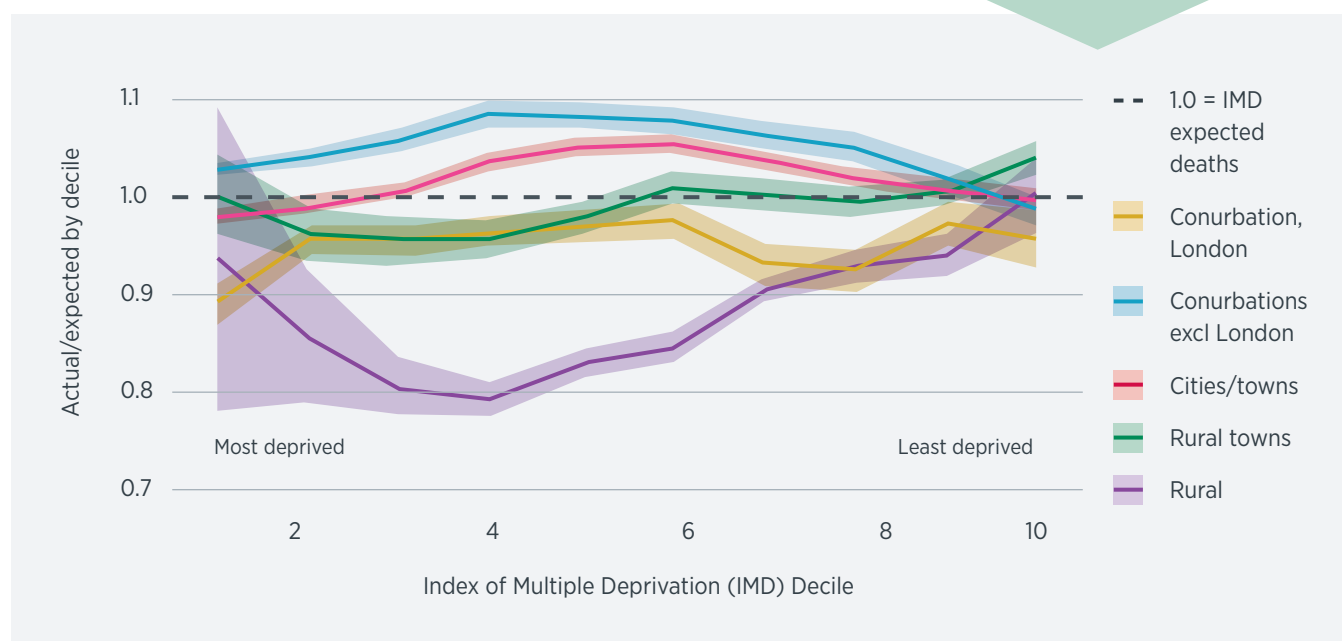
How can the LIFE index help you in your work?

The LIFE index is open access and has a web-based app that provides a user-friendly interface, allowing non-experts to explore the LIFE index and mortality inequality of lower layer super ouput areas (LSOAs, see box), as well as view life expectancy predictions. The app enables policy-makers to investigate mortality (revealing significant differences in very local areas defined by LSOAs), or to look at how individual Clinical Commissioning Groups (CCGs) compare on a like-for-like basis.

The LIFE index uses publically available data from the Office for National Statistics, the census and the Index of Multiple Deprivation (IMD). It has improved the way other commonly used indices, such as the IMD, predict mortality. While the IMD is a reasonable mortality predictor, the LIFE index offers a more accurate, customised mortality predictor; for example, the new index addresses the impact of care home populations.
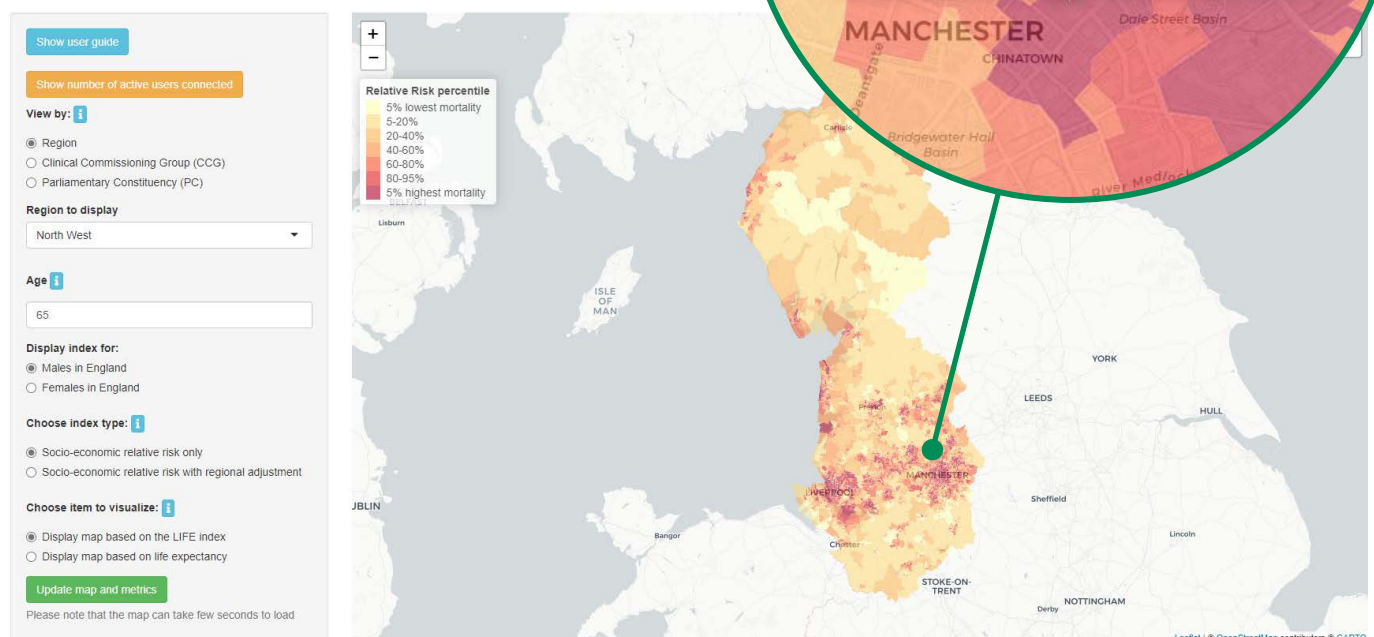
Using a heat map, the LIFE app can depict inequalities, with the option to compare LSOAs, parliamentary constituencies, CCGs, or regions. The LIFE index is based on ONS census, population and deaths data from 2001-2018 and excludes the impact of the Covid-19 pandemic.

Outputs from the app include:

- Age/sex-specific values showing how the LSOA compares to the average*

- Remaining life expectancy.

What is an LSOA?

England has 32,844 lower layer super output areas - small neighbourhoods with an average population of 1,600. These are typically socially similar (occupancy of household and dwelling type).

LSOA code : E01033653
LSOA name : Manchester 055B
Region : North West
CCG : NHS Manchester CCG
PC : Manchester Central
Index decile : 1 /10
Index value : 1.85
Remaining life expectancy from age 65 : 16 years and 9 months

*The average is based on the national average for each sex and age using ONS data.

Understanding cause of death

The Research Team has produced cause of death datasets for each Clinical Commissioning Group and age group in England. (A separate piece of research specifically focused on cancer deaths was also produced.) This work will help LIFE index users to interpret the index data further. It links cause of death to controllable underlying risk factors, such as smoking, diet and exercise, offering users a more explicit view of what possible interventions might be working, or be needed, and where. Cause of death is explored at the socio-economic level and has led to new insights into the drivers of mortality improvements, or reversals, over the last 20-30 years.

Identify inequalities more accurately

The LIFE index and app are able to assist policy-makers and practitioners in identifying inequalities at a more granular level than previously, enabling targeted policy interventions.

Identify who is getting it right

The index predicts life expectancy for similar neighbourhoods or CCGs. When the actual life expectancy for these areas is studied, some are doing much better than others with very similar characteristics. We need to understand what these areas are doing differently.

CCGs can be viewed on a like-for-like basis

After adjusting for socio-economic and urban-rural differences, users can see which CCGs have higher or lower mortality. CCG-specific variation in relative risk is small but still significant, pushing remaining life expectancies from age 65 up or down by as much as six months.

The 'north/south divide' is actually the rural/urban and rich/poor divide

Excluding London, using the LIFE index based on socio-economic and urban-rural predictive variables, a north/south divide is no longer obvious.

About the researchers

Principal Investigator Professor Andrew Cairns is a globally respected professor in actuarial mathematics and statistics at Heriot-Watt University. Dr Torsten Kleinow is an Associate Professor in actuarial mathematics and statistics at Heriot-Watt University. Dr Jie Wen held an ARC PhD scholarship at Heriot-Watt University and now works for Lloyds Banking Group.

About the Actuarial Research Centre

The Actuarial Research Centre delivers cutting-edge research, commissioned by the Institute and Faculty of Actuaries, to answer some of the biggest questions in actuarial science. This research brings together industry-leading actuarial professionals, industry and academic specialists to provide the models, insight and practical tools needed to meet key financial industry and societal challenges.

Please get in touch

Contact the Research Team to explore how the LIFE index and app can support your work **arc@actuaries.org.uk**. The Research Team is on hand to help policy-makers and practitioners get the most out of the LIFE index, app and cause of death data.

Visit the programme pages of this research programme >>

Access the LIFE index >>

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