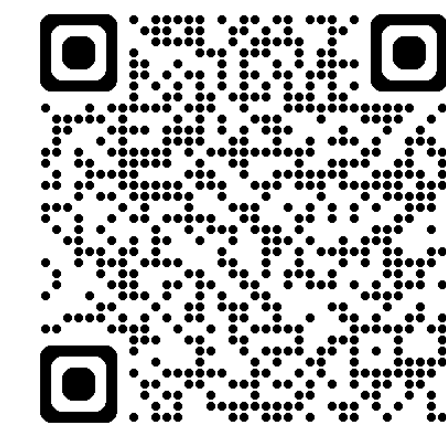


The 3x3 Performance Matrix

A Visualisation-based approach to Public Health Performance

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Background

The Public Health Outcomes Framework (PHOF)¹ is a curated collection of indicators that monitors health and wellbeing outcomes, produced by the Office for Health Improvement and Disparities. It enables local areas to benchmark themselves against regional and national comparators. We have collated PHOF indicators into an elegant 3x3 visualisation, that provides high-level, 'at-a-glance', information to strategic decision makers: highlighting successes and areas of risk, and identifying where deeper analysis or additional resources may be warranted.

Objectives

To produce an effective visualisation for displaying Walsall's PHOF performance that is:

- 1 Relative to Statistical Neighbours
- 2 Relative to Recent Trend
- 3 Easily Communicable
- 4 Reproducible with Automation

Methodology

PHOF indicators are arranged as a 3x3 matrix across two dimensions: how an area compares to CIPFA² statistical neighbours (**better/similar/worse**) and the linear regression modelled trend over time (**improving/similar/deteriorating**). A cartesian chart (Fig. 1) arranges indicators by their proportionate difference, to visually identify outliers such as areas where Walsall may be **Worse** and **Deteriorating**, or **Better** and **Improving**. The process utilises R throughout: for data retrieval (FingertipsR³ API library), engineering, modelling and visualisation, and is presented through Power BI (Fig. 2) dashboards (and as a ShinyApps⁴ app), allowing self-service, user interactivity and data exploration – in addition to select animations of relative performance over time (Fig. 3). The process was developed as an automated statistical data pipeline.

Reproducible Analytical Pipeline using the R statistical programming language



Public Health Outcomes Framework Summary Chart

How Walsall fares on each indicator relative to its statistical neighbours and by recent trend

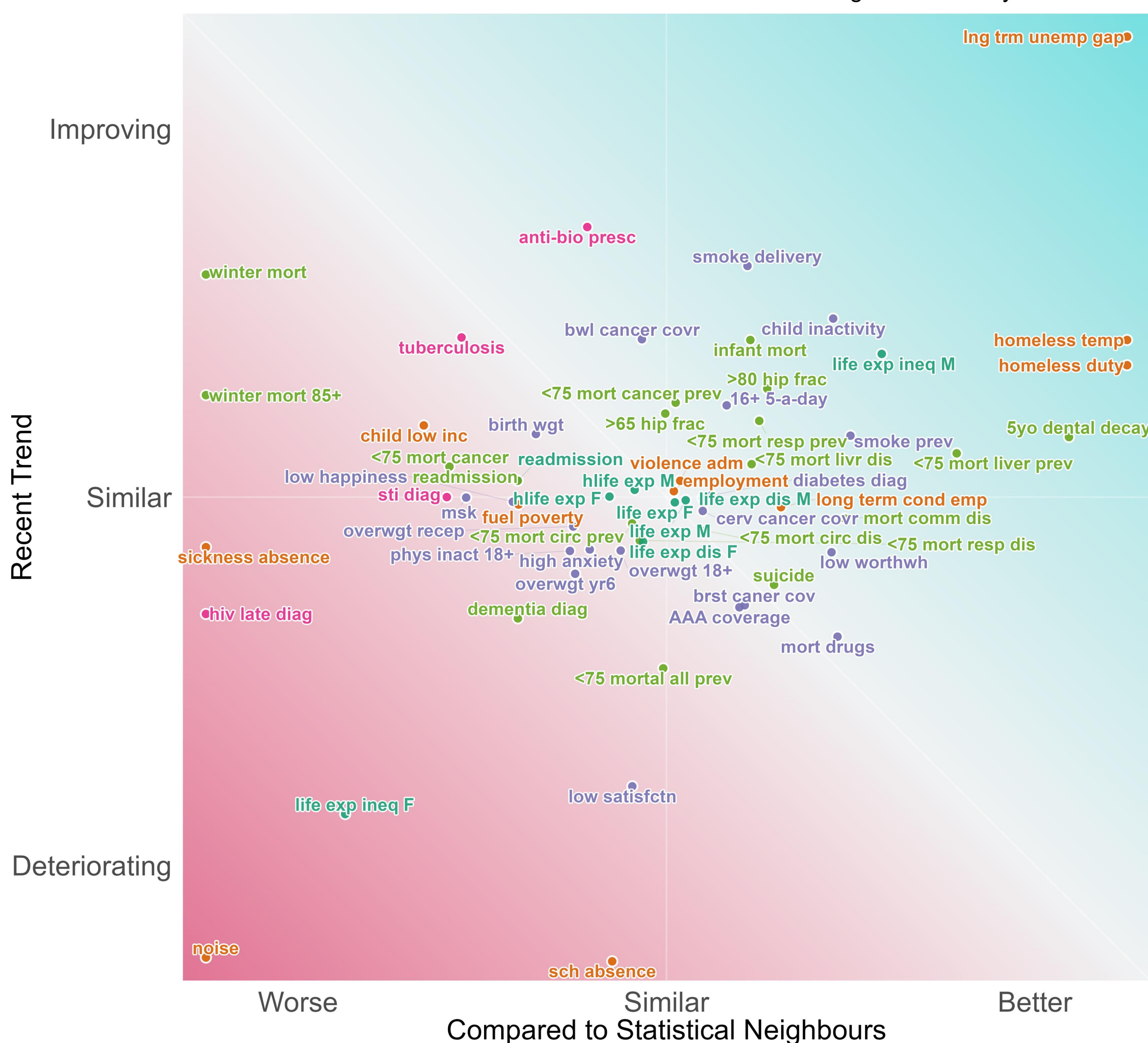


Fig. 1 Cartesian Chart plotting indicators by their linear trend over time and comparison to statistical neighbours

Recent Trend	Compared to statistical neighbours		
	Worse	Similar	Better
Improving	<ul style="list-style-type: none"> Indicator Estimated dementia diagnosis rate (aged 65 and older) (Persons All ages) Healthy life expectancy at 65 (Male 65) Low birth weight of term babies (Persons >=37 weeks gestat... Percentage of physically inactive adults (Persons 19+ yrs) The percentage of the population who are in receipt of long L... Under 75 mortality rate from causes considered preventable (...) Winter mortality index (age 85 plus) (Female 85+ yrs) Winter mortality index (age 55 plus) (Persons 55+ yrs) Winter mortality index (Female All ages) Winter mortality index (Male All ages) Winter mortality index (Persons All aged) Year 5 prevalence of overweight (including obesity) (Persons ...) 	<ul style="list-style-type: none"> Indicator Abdominal Aortic Aneurysm Screening Coverage (Male 65) Life expectancy at 65 (Male 65) Percentage of cancers diagnosed at stages 1 and 2 (Persons ...) Percentage of physically active adults (Persons 19+ yrs) Proportion of the population meeting the recommended 5 a da... Self reported wellbeing: people with a low satisfaction score (P... The percentage of the population who are in receipt of long ter... Under 75 mortality rate from all circulatory diseases (Male <75 ...) Under 75 mortality rate from all circulatory diseases (Persons ...) Under 75 mortality rate from causes considered preventable (...) Under 75 mortality rate from causes considered preventable (...) Under 75 mortality rate from circulatory diseases considered p... 	<ul style="list-style-type: none"> Indicator Violent crime - hospital admissions for violence (including se... Violent crime - hospital admissions for violence (including se... Violent crime - hospital admissions for violence (including se... Self reported wellbeing: people with a low worthwhile score (...) Under 75 mortality rate from all circulatory diseases (Female ...) Under 75 mortality rate from respiratory disease (Male <75 yrs) Mortality rate from a range of specified communicable disea... Mortality rate from a range of specified communicable disea... Percentage of people in employment (Persons 16-24 yrs) Under 75 mortality rate from causes considered preventable (...) Percentage of 5 year olds with experience of visually obdolu... Percentage of physically active children and young people (...) Homelessness: households in temporary accommodation (N... Homelessness: households owed a duty under the Homeless... The percentage of the population who are in receipt of long L...
Similar	<ul style="list-style-type: none"> Indicator Under 75 mortality rate from cancer (Persons <75 yrs) Under 75 mortality rate from cancer (Male <75 yrs) Under 75 mortality rate from cancer (Female <75 yrs) Healthy life expectancy at 65 (Female 65) Reception prevalence of overweight (including obesity) (Pers... Inequality in life expectancy at 65 (Male 65) Disability-free life expectancy at 65 (Female 65) Children in low income families all dependent children unde... 	<ul style="list-style-type: none"> Indicator Under 75 mortality rate from respiratory disease (Persons <... Under 75 mortality rate from respiratory disease (Male <75 ...) Under 75 mortality rate from respiratory disease (Female <... Under 75 mortality rate from circulatory diseases consider... Under 75 mortality rate from causes considered preventabl... Under 75 mortality rate from cancer considered preventabl... Under 75 mortality rate from cancer considered preventabl... Under 75 mortality rate from all circulatory diseases (Femal... Under 75 mortality rate from all circulatory diseases (Femal... Self reported wellbeing: people with a high anxiety score (P... Proportion of drug sensitive TB notifications who had compl... Percentage of people in employment (Persons 50-64 yrs) Percentage of people in employment (Persons 25-49 yrs) 	<ul style="list-style-type: none"> Indicator Cancer screening coverage: breast cancer (Female 50-79 yrs) Cancer screening coverage: cervical cancer (aged 25 to 49 y... Deaths from drug misuse (Male All ages) Disability-free life expectancy at 65 (Female 65) Inequality in life expectancy at birth (Male All ages) Infant mortality rate (Persons <1 yr) Smoking prevalence in adults (19+) - current smokers (APS) Smoking prevalence in adults (19+) - current smokers (APS) Smoking status at time of delivery (Female All ages) The percentage of the population with a physical or mental i... Under 75 mortality rate from respiratory disease considered p... Under 75 mortality rate from respiratory disease considered p... Under 75 mortality rate from respiratory disease considered p...
Deteriorating	<ul style="list-style-type: none"> Indicator Adjusted antibiotic prescribing in primary care by the NHS (...) Emergency readmissions within 30 days of discharge from... Hip fractures in people aged 65 to 79 (Male 65-79 yrs) HIV late diagnosis in people first diagnosed with HIV in the... Inequality in life expectancy at 65 (Female 65) New STI diagnoses (excluding chlamydia aged under 25) (p... Percentage of adults aged 18 plus classified as overweight... Percentage of adults aged 19 and over meeting the 5-a-day... Percentage reporting a long-term Musculoskeletal (MSK) pr... Sickness absence: the percentage of employees who had a... TS incidence (three year average) (Persons All ages) The rate of complaints about noise (Persons All aged) Under 75 mortality rate from cancer (Female <75 yrs) 	<ul style="list-style-type: none"> Indicator Pupil absence (Persons 5-15 yrs) Under 75 mortality rate from all circulatory diseases (Male <... Under 75 mortality rate from liver disease (Male <75 yrs) Suicide rate (Male 10+ yrs) Hip fractures in people aged 65 and over (Female 65+ yrs) Hip fractures in people aged 65 and over (Male 65+ yrs) Hip fractures in people aged 80 and over (Female 80+ yrs) Hip fractures in people aged 80 and over (Male 80+ yrs) Suicide rate (Female 10+ yrs) Suicide rate (Persons 10+ yrs) Under 75 mortality rate from liver disease (Female <75 yrs) Under 75 mortality rate from liver disease (Male <75 yrs) Under 75 mortality rate from liver disease (Female <75 yrs) Under 75 mortality rate from liver disease (Male <75 yrs) 	

Fig. 2 Power BI Matrix of indicators arranged by trend over time and comparison to statistical neighbours

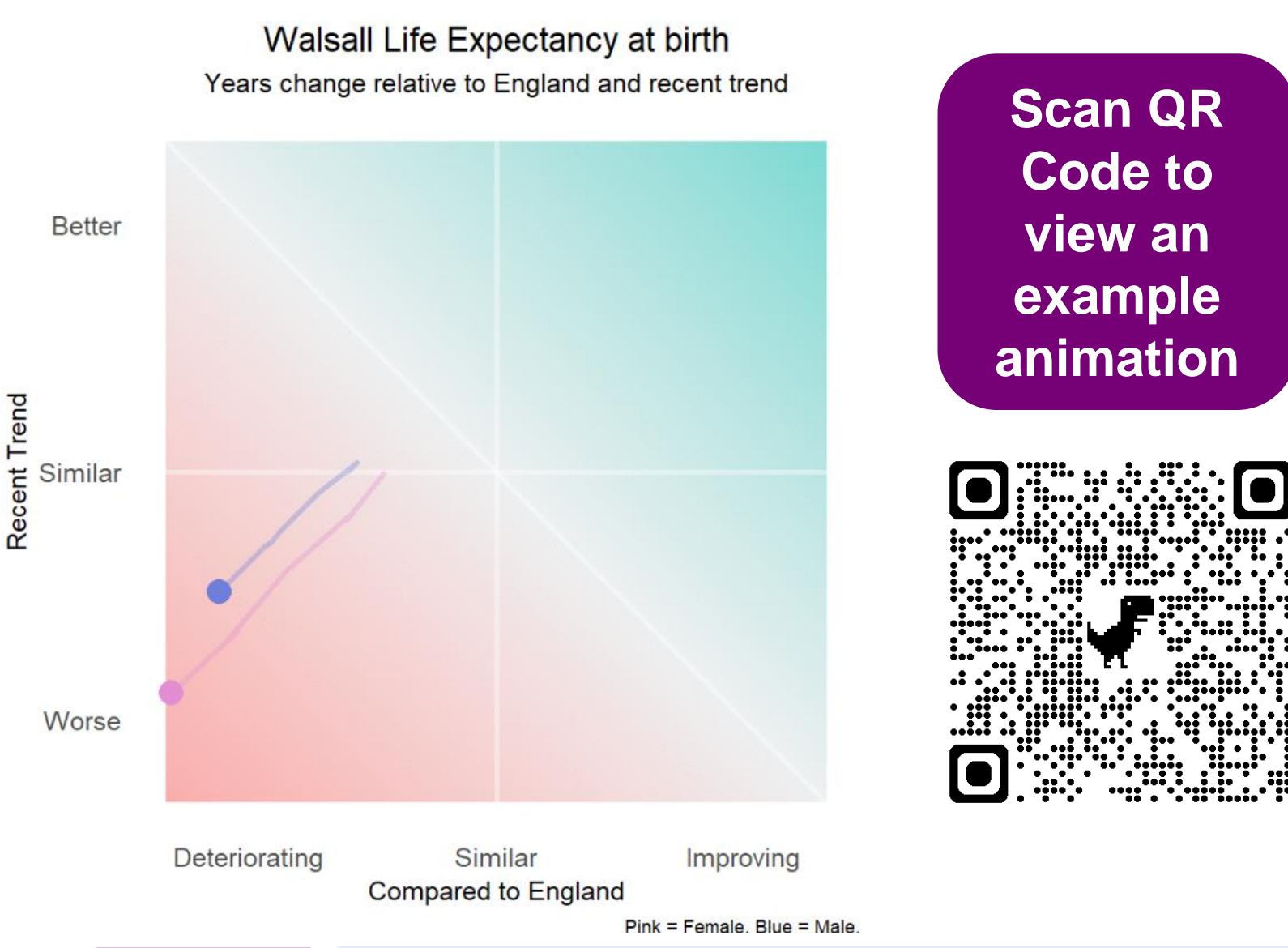


Fig. 3 Animated change in relative performance over time

Outcomes

- High-level View:** The 3x3 Matrix has introduced high-level oversight of general state of health and wellbeing. As such, it is used within Walsall to guide and inform the priorities of strategic decisions makers, such as the Health and Wellbeing Board.
- Operational Performance:** It has also been valuable at an operational level by providing a current and dynamic view of corporate and public health performance.
- Focusing Analytical Resources:** It has worked best as part of a suite of performance tools at differing resolutions, and particularly in prompting deeper analytical dives, directing the focus of limited analytical resources toward appropriate areas.
- Widespread Interest:** Having been demonstrated at multiple analytical events for local authorities, partners, and regional bodies.
- Future Development:** Plans to add additional datasets, and to develop as a broader analytical tool to support service areas and partners across the borough. Further technical development includes intent to add an optional predictive modelling element.

Recommendations

- Balanced View:** It provides a strong visual for drawing focus toward extremes (**worse** and **deteriorating**), however it is relative, and indicators clustered around the centre (**similar** and **similar**) also require attention *i.e.* it could be that indicators are equally deteriorating across all comparator areas, or are unchanged over time.
- Data-driven Development:** Engagement and open discussion and involvement of partners helped shape its development and utilisation, ensuring usable insight is provided, and in-turn improving performance reporting processes.
- Data Science Skillset:** This product was made possible through data science methodology and proficient use of R, for the custom building of visualisations, modelling and automated data engineering. It has been problematic for partners to implement without having such expertise within their teams; a skillset that is recommended for this approach. We are actively exploring options around this.

References

- 1 Office for Health Improvement and Disparities (OHID) - <https://fingertips.phe.org.uk/profile/public-health-outcomes-framework>
- 2 CIPFA - <https://www.cipfa.org/services/cipfastats/nearest-neighbour-model>
- 3 Fingertips R R Package - <https://github.com/ropensci/fingertipsR>
- 4 Shiny Apps - <https://www.shinyapps.io/>