Measuring inequalities

Technical guide for trends in mortality and life expectancy

This guide describes the methods, indicators, data sources and terms used in the publication, *Measuring inequalities: Trends in mortality and life expectancy*. It summarises the more technical aspects of the methods, indicators and data sources. It also provides definitions, notes for interpretation, and details of where to find further information. It is intended that this technical guide is used in conjunction with the

- individual profiles for all 22 local authorities
- more detailed Wales profile
- online data files covering Wales, health boards and local authorities.

How to use this Technical Guide and Glossary:

- Section 1 describes the national and local deprivation fifths used within the profiles.
- Sections 2 and 3 contain notes for interpretation in relation to the mortality and life expectancy indicators used within the profiles and the methods used to measure the inequality gaps.
- Sections 4 and 5 contain a list of the indicators included in the profiles and their data sources.
- Section 6 is the Glossary, which contains a list of abbreviations and definitions for terms used within the inequalities profiles and this guide.

On the electronic version of this guide, you can click on the contents page to navigate the document.

Links to the profiles, data files and this technical guide are available from www.publichealthwalesobservatory.wales.nhs.uk/inequalities.

For further details, please contact us on publichealthwalesobservatory@wales.nhs.uk.

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Public Health Wales Observatory

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1. Understanding local and national deprivation fifths

The analysis presented in the local authority profiles, the Wales profile and the online data files examines differences in health outcomes between those living in the most deprived and those living in the least deprived areas. A measure of deprivation for each individual would be the ideal. In the absence of suitable individual level socio-economic data, an area-based deprivation measure is used: the Welsh Index of Multiple Deprivation (WIMD) 2008. As with all area-based measures, it has to be noted that not everyone living in a deprived area is necessarily living in deprived circumstances and, equally, some people living in an area classed as least deprived may experience deprivation. The analysis also uses the residence at the time of death and the associated deprivation fifth. This may not necessarily be the area or deprivation fifth where individuals have grown up or lived for most of their lives.

As WIMD data is not directly comparable between releases, the latest available release at the time (WIMD 2008) was used for all of the analyses. The trend in outcomes, therefore, does not take into account any potential change in deprivation level over time. This means that the analysis is covering the trend in time for fixed areas which have a fixed deprivation fifth.

For the Wales-level analysis, all Lower Super Output Areas (LSOAs) in Wales were grouped into fifths according to their published rank. These deprivation fifths are commonly used. For the health board and local authority level analysis, however, specific deprivation fifths within each area have been produced, as some areas do not have sufficient numbers of LSOAs in each national fifth. In Blaenau Gwent for example, there are no LSOAs that are nationally classed as least deprived (see Figure 2b). This approach is consistent with those used elsewhere in the UK, including in the development of Fair Society Healthy Lives (Marmot) indicators [1] at a local level in England.

Local deprivation fifths for each local authority or health board have been produced by ranking all LSOAs *within* the local authority and grouping them into fifths, based on the WIMD. These fifths were produced using Stata, a statistical software package. Each local authority and health board therefore has its own local fifths depending on the deprivation distribution *within* that area. In areas with a greater range of deprivation levels, the inequality gap is inevitably larger than in areas where there is less diversity. Comparisons, therefore, often illustrate the difference in the range of deprivation between areas, rather than how outcomes relate to particular levels of deprivation for those areas. The specific distributions of deprivation are described within the individual local authority profiles, accompanied by charts (see Figure 1 for an annotated chart). Examples of some of the local authority deprivation charts are shown in Figure 2 and have been selected to highlight the different ranges of deprivation within local authority fifths on a scale relative to Wales fifths. The text accompanying the charts describes how the range of deprivation within the local authority may influence the results of the analysis in terms of the inequality gap in health outcomes.

Reference

1. Marmot Review Team. *Fair society, healthy lives: strategic review of health inequalities in England post-2010. The Marmot review*. London: TSO; 2010. Available at: www.instituteofhealthequity.org [Accessed 23rd Nov 2011].

Figure 1: Range of deprivation within local authority fifths on a scale relative to Wales fifths (chart used in local authority profiles)

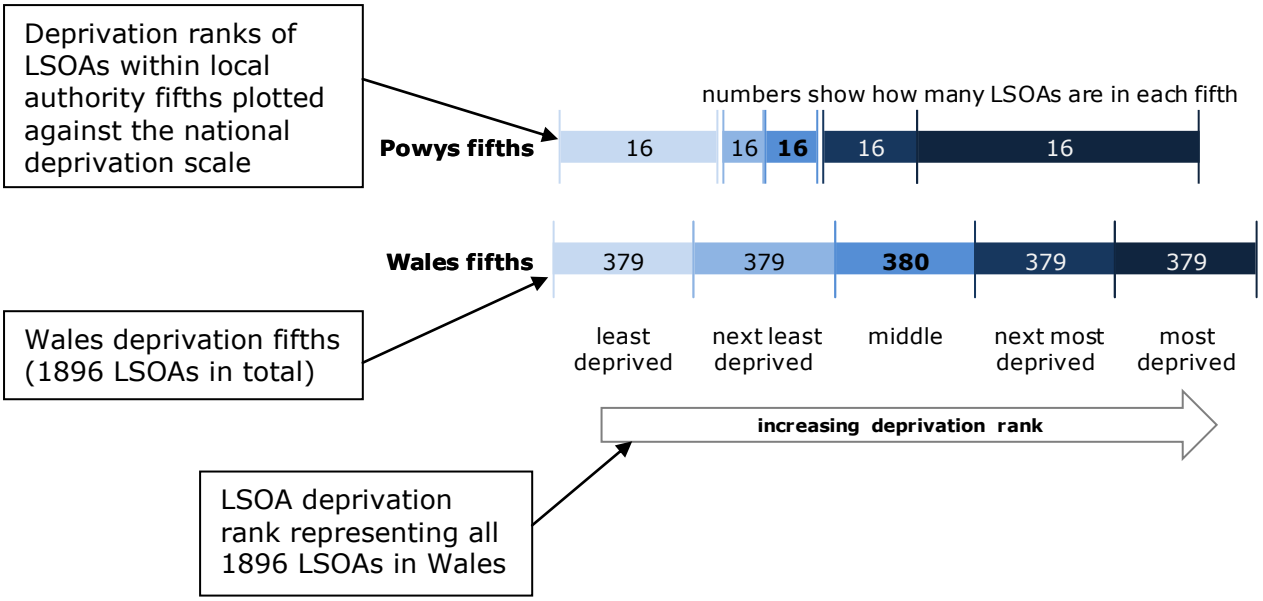
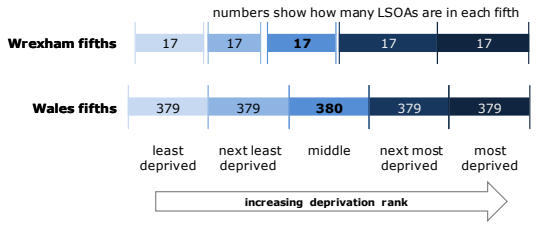
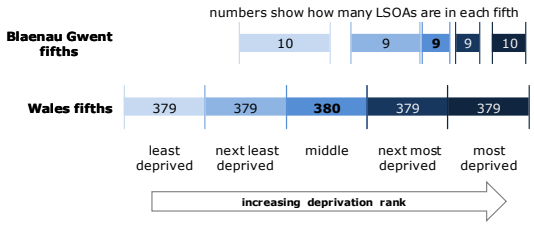


Figure 2: Examples of the ranges of deprivation within local authority fifths on a scale relative to Wales fifths

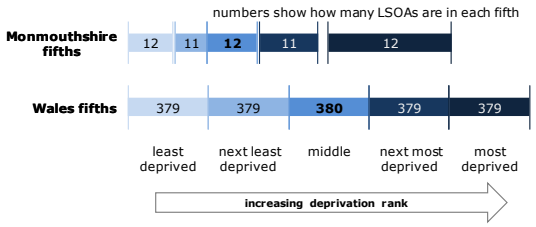
2a Local authority with LSOAs covering the whole range of the national deprivation scale - may show a similar inequality gap to Wales



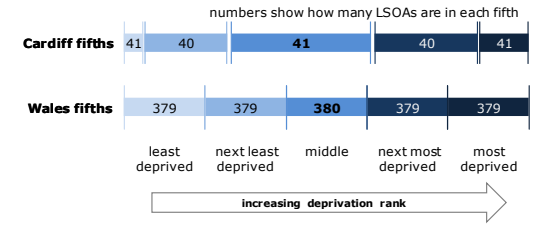
2b Local authority with LSOAs concentrated towards the more deprived end of the national deprivation scale - likely to show a narrower inequality gap than Wales



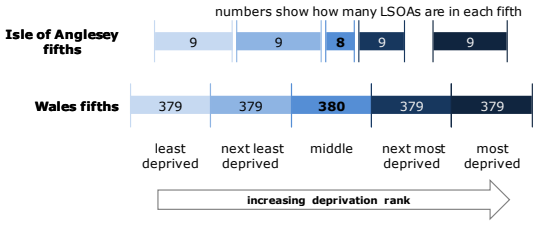
2c Local authority with LSOAs concentrated towards the least deprived end of the national deprivation scale - likely to show a narrower inequality gap than Wales



2d Local authority with LSOAs covering the whole range of the national deprivation scale, but particularly the extreme ends – likely to show a wider inequality gap than Wales



2e Local authority with LSOAs concentrated towards the middle of the national deprivation scale (the least and most deprived local authority fifths do not contain the extreme ends of the deprivation scale) – likely to show a narrower inequality gap than Wales



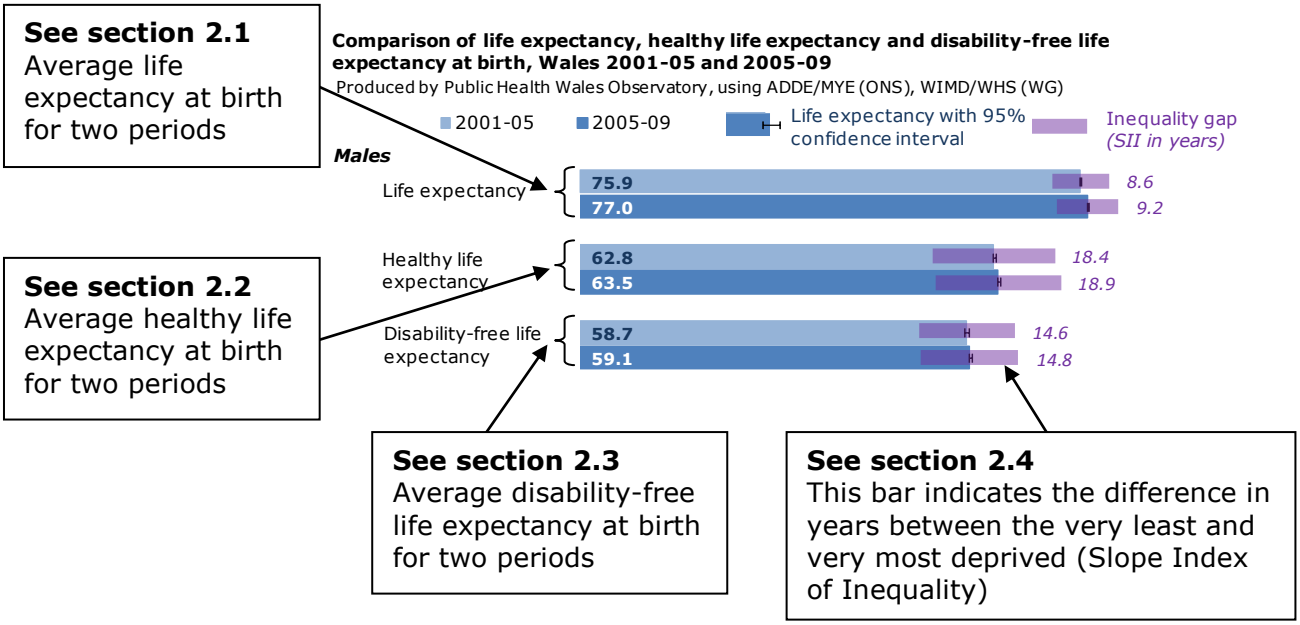
2. Life expectancy at birth

The profile publications and online data files include life expectancy, and for the first time healthy and disability-free life expectancy at birth at Wales and the local level, and by fifths of deprivation.

All types of life expectancy have been calculated for two time periods, 2001-05 and 2005-09, for males and females separately and at Wales, health board and local authority level. They have also been produced by fifths of deprivation within each area, which has been used in the calculation of the Slope Index of Inequality (see section 2.4).

These three types of life expectancy for each area and time period are displayed in the profiles in the format of the chart in Figure 3. Sections 2.1 to 2.5 explain how to interpret the measures, and the details of the method of their calculation, data sources and caveats for each indicator are included in Section 4. The data for the estimates, including those for health boards, are also published in the data files in Excel format on the website at www.publichealthwalesobservatory.wales.nhs.uk/inequalities.

Figure 3: Overview of a comparison chart (males only)



2.1 How to interpret life expectancy at birth

Life expectancy at birth represents an estimate of the average number of years a newborn baby could expect to live, if the then current mortality rates for the area applied throughout their lives. Mortality rates, however, are likely to change during their life and many people may also move elsewhere for at least part of their lives. Life expectancy is therefore a comparative population measure of mortality of those living in the area rather than an exact prediction of individual life expectancy for a newborn. The details of the method of calculation, data sources and caveats can be found in Section 4.1.

Life expectancy estimates are directly comparable between areas, time periods and sexes. 95 per cent confidence intervals have been produced which describe the degree of uncertainty around the estimates. These intervals can be used to ascertain the statistical significance of a difference between two estimates. If, for example, the confidence intervals between the life expectancy estimate in the earlier period and the estimate in the later period overlap, then the difference between the two is not statistically significant.

2.2 How to interpret healthy life expectancy at birth

Healthy life expectancy (HLE) at birth is an estimate of the average number of years newborn babies could expect to live in good health, if the then current mortality rates and prevalence of good health applied throughout their lives. Mortality rates and prevalence of good health are, however, likely to change during their life and HLE is therefore a comparative population measure of mortality and good health rather than an exact prediction of individual HLE. The details of the method of calculation, data sources and caveats can be found in Section 4.2.

Healthy life expectancy estimates are comparable between areas, time periods and sexes. Also included were 95 per cent confidence intervals, which describe the degree of uncertainty around the estimates. These reflect the size of the population and also the certainty of the survey data for good health. An area with a large population and a large sample size will have relatively narrow confidence intervals, whilst areas with a small population and a small sample size will have large confidence intervals. These intervals can be used to ascertain the statistical significance of a difference between two estimates. If, for example, the confidence intervals between the healthy life expectancy estimate in the earlier period and the estimate in the later period do not overlap, then the difference between the two is statistically significant. The interpretation of results in areas with small populations and sample sizes and resulting large confidence intervals is generally more difficult.

The HLE estimates are very sensitive to variation in health status data, particularly in the older age groups, where there are fewer survey responses. Welsh Health Survey data is self-reported and subject to the individual's own perception of health.

2.3 How to interpret disability-free life expectancy at birth

Disability-free life expectancy (DFLE) at birth is an estimate of the average number of years a newborn baby could expect to live free from limiting long-term illness and disability. It assumes that the then current mortality rates and prevalence of limiting long-term illness and disability applied throughout their lives. These are, however likely to change during their life and DFLE is therefore a comparative population measure of mortality and limiting long-term illness and disability rather than an exact

prediction of individual DFLE. The details of the method of calculation, data sources and caveats can be found in Section 4.3.

Similarly to HLE, DFLE estimates are comparable between areas, time periods and sexes. 95 per cent confidence intervals have been produced, which describe the degree of uncertainty around the estimates. These reflect the size of the population and also the certainty of the survey data for limiting long-term illness and disability. An area with a large population and a large sample size will have relatively narrow confidence intervals, whilst areas with a small population and a small sample size will have large confidence intervals. These intervals can be used to ascertain the statistical significance of a difference between two estimates. If, for example, the confidence intervals between the DFLE estimate in the earlier period and the estimate in the later period do not overlap, then the difference between the two is statistically significant. The interpretation of results in areas with small populations and sample sizes and resulting large confidence intervals is generally more difficult.

The DFLE estimates are very sensitive to variation in health status data, particularly in the older age groups, where there are fewer survey responses. Welsh Health Survey data is self-reported and subject to the individual's own perception of health.

2.4 How to interpret the Slope Index of Inequality (SII)

The Slope Index of Inequality (SII) is a single statistic that summarises the extent of health inequalities within an area. It is an estimate of the gap in years of life expectancy, HLE and DFLE between the least and most deprived, whilst taking the entire deprivation distribution into account. The SII is a widely used indicator of health inequalities and the SII in life expectancy at birth is the measure of inequality recommended by the Association of Public Health Observatories [1]. It has also been included in the Marmot indicator set produced following the Marmot review [2].

A regression analysis was run to produce a line of best fit across all deprivation fifths, weighted by the population share in each fifth. The gradient of the line is the SII and nominally represents the gap between the most and least deprived individuals [1]. For ease of interpretation and to avoid giving the impression that individual-level data had been used, the SII in the profiles has generally been described as the difference between the most and least deprived. The overview of the method of calculation, data sources and caveats can be found in Section 4.4 for the SII in life expectancy, and in Section 4.5 for the SII in healthy and disability-free life expectancy.

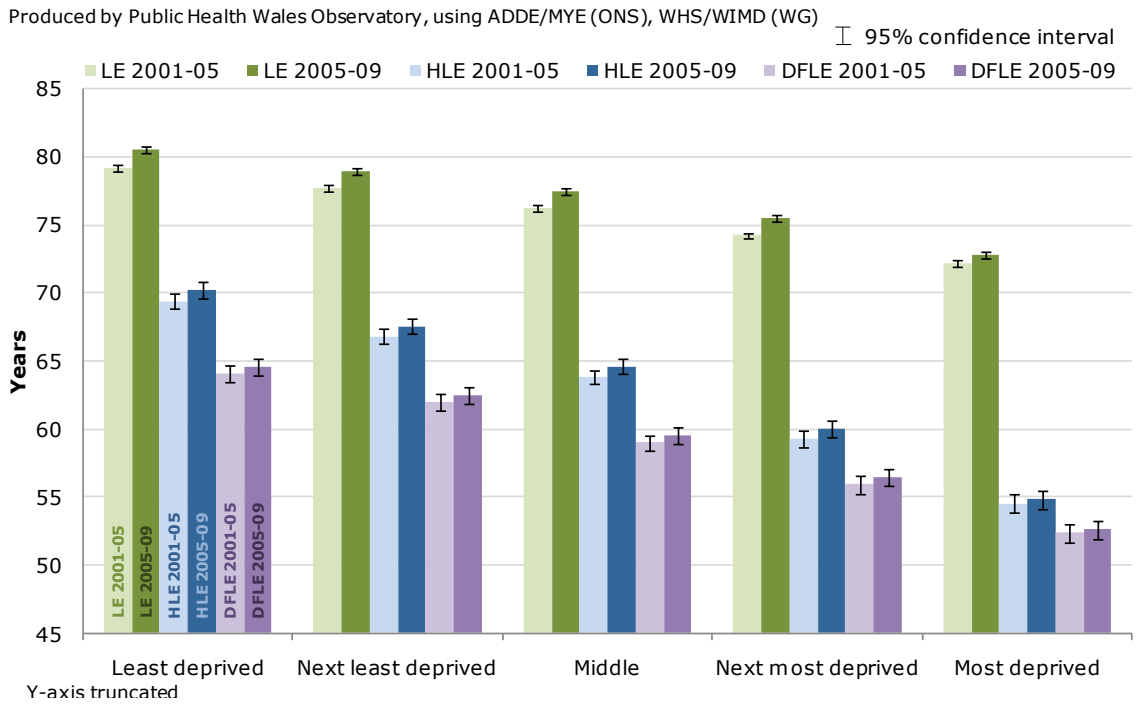
The SII gives an estimate of inequality within areas and is broadly comparable between areas. Comparisons, however, often illustrate the difference in the range of deprivation between areas. Areas with a greater range of deprivation levels will have a greater range of life expectancy estimates and therefore a greater SII. The inequality gaps in these areas tend to be larger than in areas where there is less diversity in deprivation. Further details on local deprivation fifths can be found in Section 1.

To give an indication of the uncertainty of the SII estimate, 95 per cent confidence intervals were calculated. These confidence intervals are influenced by the linearity of life expectancy estimates across the fifths. The statistical method of calculating the SII assumes a linear relationship, i.e. where a diagonal straight line could roughly be drawn across the values by increasing deprivation fifth. The chart in Figure 4 shows an example of the distribution of all three types of life expectancy by fifths for males in Wales, and a relatively linear relationship. The calculation of the SII includes weighting by population share, but for ease of interpretation the distribution is shown

simply by fifths. The effect is minimal and unlikely to affect the overall interpretation of the chart.

When there is an approximately linear pattern the confidence interval is relatively narrow. In some instances the visual inspection of the estimates by deprivation fifth showed that the distribution was not linear, and the resulting confidence interval is very wide, and in some cases even includes 0. For these cases it is possible that the relationship between life expectancy and deprivation may not be described very well by the SII. For any detailed analysis in these cases it may be advisable to use the straight subtraction between the life expectancy estimate in the most and least deprived fifths rather than the SII.

Figure 4: Life expectancy, HLE and DFLE by fifths, males, Wales



2.5 Relative Index of Inequality

The SII is an absolute measure of inequality in years, but there is also a relative measure of inequality, the Relative Index of Inequality (RII). The RII is calculated by dividing the SII by the average life expectancy, HLE or DFLE for the area. The result represents a ratio of the type of life expectancy in the most deprived and least deprived. The RII can be compared between the three types of life expectancy independently of the scale. It is a more abstract statistic, however, and not as easy to understand as the SII, which is the inequality gap in years. For the profiles the SII was chosen to describe the inequality gap, but both the SII and the RII have been included in the data files published on the website.

References

1. Baker A et al. *Health Inequality Indicators for Local Authorities. Guide to Interpretation.* APHO; 2011. Available at: www.apho.org.uk [Accessed 23rd Nov 2011].
2. London Health Observatory (LHO). *Marmot Indicators for Local Authorities in England.* LHO; 2011. Available at: www.lho.org.uk/LHO_Topics/national_lead_areas/marmot/marmotindicators.aspx [Accessed 23rd Nov 2011].

3. Mortality

The profiles for the local authorities and the profile for Wales measure inequality gaps in mortality rates for:

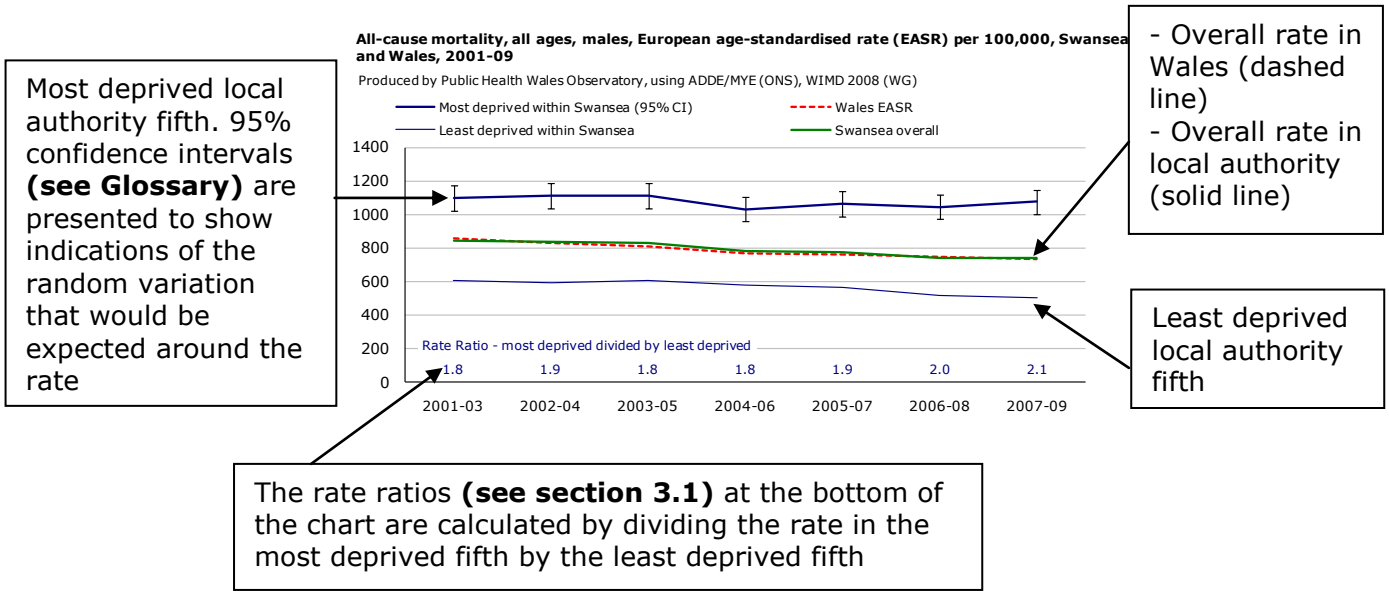
- all causes (all ages, under 75 years)
- circulatory disease (all ages)
- respiratory disease (all ages)
- cancer (all ages)
- diseases attributable to smoking (ages 35 and over).

As well as the above indicators the profile for Wales also measures inequality gaps in alcohol-attributable and alcohol-related mortality.

For each of the indicators three-year rolling average mortality rates from 2001-03 to 2007-09 have been calculated for males and females using the European age-standardised rate (EASR) per 100,000 population (see Glossary for definition of EASR). Mortality rates are presented for the most and least deprived fifths within the chosen geographical area (Wales, health boards or local authorities) alongside the overall rates for the geographical area. The data files behind the charts in the profiles are available in Excel format on the website at www.publichealthwalesobservatory.wales.nhs.uk/inequalities.

The trend charts in the local authority profiles compare overall rates for Wales and the local authority to the most and least deprived fifths within the local authority (Figure 5). 95 per cent confidence intervals are shown for the most deprived fifth within the local authority (confidence intervals for the other rates are available via the online data files). The rate ratios (described in section 3.1) appear at the bottom of the chart.

Figure 5 Mortality rates compared between the most and least deprived local authority fifths



3.1 How to interpret the rate ratio

The rate ratio used in the inequalities profiles is the mortality rate in the most deprived fifth divided by the rate in the least deprived fifth. A rate ratio of two, for

example, means that the mortality rate in the most deprived fifth is twice as high as in the least deprived fifth. The rate ratio is a measure of relative inequality that can be compared between causes of death and over time and is independent of the scale. 95 per cent confidence intervals are provided for the rate ratios in the data files published online. These intervals can be used to estimate the statistical significance of a difference between two rate ratios. If, for example, the confidence intervals between two rate ratios do not overlap, then the difference between the two is statistically significant. Changes in the rate ratio over time at the local level are often not statistically significant as the confidence intervals overlap. An absolute measure of inequality, calculated as the difference in rate between the most and least deprived, is also included in the online data files.

4. Indicators

4.1 Life expectancy at birth

What is being measured?	**Life expectancy at birth**
How is this indicator defined?	An estimate of the average number of years newborn babies could expect to live, assuming that the then current mortality rates for the area in which they were born applied throughout their lives.
Where does the data actually come from?	• Annual District Deaths Extract (ADDE): Office for National Statistics (ONS) • Population mid-year estimates by LSOA and single year of age (unrounded): ONS • Welsh Index of Multiple Deprivation (WIMD) 2008: Welsh Government
Who does it measure?	Males, females
When does it measure it?	2001-05, 2005-09
What geographical area does it cover?	Wales, Welsh health boards, Welsh local authorities, including by fifths of deprivation
How is it calculated?	• Life expectancy was calculated using the preferred method of the Office for National Statistics for calculating life expectancy at birth for small areas, as described by Eayres & Williams [1] and Toson & Baker [2]. • This method has been shown to be sufficiently reliable for populations larger than 5000. • It utilizes population estimates and mortality data to calculate a life table, from which the probability of surviving each 5-year age group, given that the previous age group has been survived, is calculated. It estimates the average number of years of life expected for any particular age. In this report only the average number of years of life expected from birth is presented. • The results are reported with 95 per cent confidence intervals.
How accurate and complete will the data be for this indicator? Are there any problems, notes for interpretation or warnings with the data in relation to this indicator?	• As all life expectancy calculations are based on then current mortality rates, which have been improving for decades, average life expectancy will change over the course of a lifetime irrespective of other factors. These should therefore be considered as comparative population measures of mortality during a period of time rather than as predictions of actual individual life expectancy. • The registration of death is mandatory in the UK, so the dataset should be a near complete record of mortality *(further notes on the interpretation of ADDE are given in section 5.1).* • Data are aggregated from LSOA level to the local authority, health board or national level. This means records without a valid LSOA are excluded from the analysis and figures from this analysis may not match exactly to other data sources

	where data are aggregated at a higher level. • The small area population estimates are somewhat experimental and have been revised in the past in light of census results. However they represent the best known estimate of populations in small areas. • The 95 per cent confidence intervals are indications of the random variation that would be expected around a rate. These must be considered when assessing or interpreting a rate. The 95 per cent confidence interval represents a range which has a 95 per cent probability of including the underlying population rate. The range of the confidence interval is dependent on the size of the population from which the events came. Rates based on small populations are likely to have wider confidence intervals and rates based on large populations are likely to have narrower confidence intervals. • WIMD fifths have been calculated for Wales, health boards and local authorities independently of each other (see section 1 for details). Care should be taken when comparing the different geographies.
References	1. Eayres D.P. & Williams E.S., Evaluation of methodologies for small area life expectancy estimation, *J Epidemiol Community Health.* 2004;58:243-249. 2. Toson B. & *Baker A. Life expectancy at birth: methodological options for small populations. National Statistics Methodological series no. 33*. ONS: 2003. Available at: www.ons.gov.uk/ons/guide-method/method-quality/specific/gss-methodology-series/gss-methodology-series--33--life-expectancy-at-birth--methodological-options-for-small-populations.pdf [Accessed 23rd Nov 2011].

4.2 Healthy life expectancy at birth

What is being measured?	Healthy Life Expectancy (HLE) at birth
How is this indicator defined?	An estimate of the average number of years that newborn babies could expect to live in good health, assuming that the then current mortality rates and levels of good health for the area in which they were born applied throughout their lives.
Where does the data actually come from?	• Annual District Deaths Extract (ADDE): Office for National Statistics (ONS) • Population mid-year estimates by LSOA and single year of age (unrounded): ONS • Welsh Health Survey: Welsh Government (WG) • Welsh Index of Multiple Deprivation (WIMD) 2008: (WG)
Who does it measure?	Males, females
When does it measure it?	2001-05, 2005-09
What geographical area does it cover?	Wales, Welsh health boards, Welsh local authorities, including by fifths of deprivation
How is it calculated?	• Healthy life expectancy was calculated using the Sullivan method which is the preferred method of the Office for National Statistics for calculating healthy life expectancy at birth [1,2]. • Its calculation involved combining health status data from the Welsh Health Survey with the mortality and population data used for life expectancy. It was produced for each area and for each fifth of deprivation. • The health states were based on the Welsh Health Survey questions asking those aged 16 and over "In general would you say your health is? Excellent, Very Good, Good, Fair, Poor" and asking a parent or guardian "How is the child's health in general? Very good, good, fair, bad, very bad". Healthy was judged to be a response of excellent, very good or good for adults and very good or good for children. • Five years of survey data (2004/5 to 2009) were combined and used for both time periods of HLE. • The survey data for children at the Wales level (and by fifths) was used as a proxy for the calculation of HLE at Local Authority level. • The results are reported with 95 per cent confidence intervals.
How accurate and complete will the data be for this indicator? Are there any problems, notes for interpretation or warnings with the data in relation to this indicator?	• As all life expectancy calculations are based on then current mortality rates, which have been improving for decades, average healthy life expectancy will change over the course of a lifetime irrespective of other factors. These should therefore be considered as comparative population measures of mortality and health status during a period of time rather than as predictions of actual individual healthy life expectancy. • The 95 per cent confidence interval is an indication of the extent of random variation that could reasonably be expected

	and must be considered during assessment and interpretation of any estimate. A narrow interval is suggestive of the estimate being closer to the real unknown value. The width of a confidence interval is partly dependent on the size of the population from which the events came and also on the sample size of the WHS data per area. Estimates based on small populations and small WHS sample sizes are likely to have wider confidence intervals, and estimates based on large populations and larger sample sizes are likely to have narrower confidence intervals. • The Welsh Health Survey data is self-reported and may be affected by individuals' perception of their own health. • In a few isolated instances there were no survey respondents in the 85+ age group in a particular fifth within an area. When this occurred the results for the 80-84 age group were used as a substitute. • The survey data for children at the Wales level (and by fifths) was used as a proxy for the calculation of HLE at Local Authority level, as the sample size was not sufficiently large to break down by local authority or health board level and fifths. This is unlikely to have great effect on the HLE estimates. • Five years of WHS data (2004/5 to 2009) were combined and used for both time periods of HLE, as matching survey data is not available for the early period of 2001-05. Although the health status has not changed very much nationally over the available years there may be differences in some areas or deprivation fifths over time. Using the latest WHS data as a proxy for the early period is unlikely to have a very large effect on the HLE estimates. • The Sullivan method includes an adjustment for people living in communal establishments. As there were no reliable and timely data available, this adjustment was not made in this analysis. • *Additional issues relating to mortality data, population data, and WIMD fifths that are common to all types of life expectancy indicators are highlighted in the life expectancy indicator (4.1). Further notes on the interpretation of ADDE are given in section 5.1 and notes on the Welsh Health Survey are given in section 5.4.*
References	1. Jagger, C. *Health Expectancy Calculation by the Sullivan Method: A Practical Guide.* NUPRI Research Paper Series No 68. 1999. Toyko. 2. ONS. *Health expectancies at birth and at age 65, United Kingdom, 2007–09*. 2011. Available at: www.ons.gov.uk/ons/taxonomy/index.html?nscl=Health+Expectancy [Accessed 23rd Nov 2011].

4.3 Disability-free life expectancy at birth

What is being measured?	Disability-free life expectancy (DFLE) at birth
How is this indicator defined?	An estimate of the average number of years that a newborn baby could expect to live free from limiting long-term illness and disability. It is assumed that the then current mortality rates and levels of limiting long-term illness and disability for the area in which they were born applied throughout their lives.
Where does the data actually come from?	• Annual District Deaths Extract (ADDE): Office for National Statistics (ONS) • Population mid-year estimates by LSOA and single year of age (unrounded): ONS • Welsh Health Survey: Welsh Government (WG) • Welsh Index of Multiple Deprivation (WIMD) 2008: WG
Who does it measure?	Males, females
When does it measure it?	2001-05, 2005-09
What geographical area does it cover?	Wales, Welsh health boards, Welsh local authorities, including by fifths of deprivation
How is it calculated?	• Disability-free life expectancy was calculated using the Sullivan method which is the preferred method of the Office for National Statistics for calculating disability-free life expectancy at birth[1,2]. Its calculation involved combining health data from the Welsh Health Survey with the mortality and population data used for life expectancy. DFLE was produced for each area and for each fifth of deprivation. • The health data were based on the Welsh Health Survey question asking those aged 16 and over "Do you have any long-term illness, health problem or disability which limits your daily activities or the work you can do? (include problems which are due to old age)". For children the survey asks a parent or guardian "Does this child have any long-standing illness, disability or health problem? That is, anything this child has had for some time". Being free from limiting long-term illness and disability was judged to be a response of "No" to these questions. • Five years of survey data (2004/5 to 2009) were combined and used for both time periods of DFLE. • The survey data for children at the Wales level (and by fifths) was used as a proxy for the calculation of DFLE at Local Authority level. • The results are reported with 95 per cent confidence intervals.
How accurate and complete will the data be for this indicator? Are there any problems, notes for interpretation or warnings with the	• As all life expectancy calculations are based on then current mortality rates, which have been improving for decades, average disability-free life expectancy will change over the course of a lifetime irrespective of other factors. These should therefore be considered as comparative population measures of mortality and health status during a period of time rather than as predictions of actual individual disability-free life

data in relation to this indicator?	expectancy. • The 95 per cent confidence interval is an indication of the extent of random variation that could reasonably be expected and must be considered during assessment and interpretation of any estimate. A narrow interval is suggestive of the estimate being closer to the real unknown value. The width of a confidence interval is partly dependent on the size of the population from which the events came and partly on the sample size of the WHS data per area. Estimates based on small populations and WHS sample sizes are likely to have wider confidence intervals and estimates based on large populations and larger sample sizes are likely to have narrower confidence intervals. • The Welsh Health Survey data is self-reported and may be affected by individuals' perception of their own health and how this affects their daily activities. • In a few isolated instances there were no survey respondents in the 85+ age group in a particular fifth within an area. When this occurred the results for the 80-84 age group were used as a substitute. • The survey data for children at the Wales level (and by fifths) was used as a proxy for the calculation of DFLE at Local Authority level, as the sample size was not sufficiently large to break down by local authority or health board level. This is unlikely to have a great effect on the DFLE estimates. • Five years' of WHS data (2004/5 to 2009) were combined and used for both time periods of DFLE, as matching survey data is not available for the early period of 2001-05. The health status has not changed very much over the available years and using the latest WHS data as a proxy for the early period is therefore unlikely to have a great effect on the DFLE estimates. • The Sullivan method includes an adjustment for people living in communal establishments. As there were no reliable and timely data available, this adjustment was not made in this analysis. • *Additional issues relating to mortality data, population data, and WIMD fifths that are common to all types of life expectancy indicators are highlighted in the life expectancy indicator (4.1). Further notes on the interpretation of ADDE are given in section 5.1 and notes on the Welsh Health Survey are given in section 5.4.*
References	1. Jagger, C. *Health Expectancy Calculation by the Sullivan Method: A Practical Guide.* NUPRI Research Paper Series No 68. 1999. Toyko. 2. ONS. *Disability-free life expectancy (DFLE) for Males and Females at age 16 and at age 65: by survey source, country and English local authority district, 2006–2008 (experimental statistics)*. 2011. Available at: www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-222911 [Accessed 23rd Nov 2011].

4.4 SII in life expectancy at birth

What is being measured?	The Slope Index of Inequality (SII) in life expectancy at birth
How is this indicator defined?	• A measure of the absolute difference in years of life expectancy at birth between the least and most deprived, whilst taking into account the distribution across all deprivation fifths. • Results are reported as the slope of the regression line across all fifths within an area.
Where does the data actually come from?	See 4.1 for life expectancy at birth; proportion of population share for weighting from MYE(ONS), WIMD 2008 (WG)
Who does it measure?	Males, females
When does it measure it?	2001-05, 2005-09
What geographical area does it cover?	Wales, Welsh health boards, Welsh local authorities
How is it calculated?	• The SII was calculated following the methods published by Low & Low [1]. This used ordinary least squares regression in Stata, a statistical software package, where the independent variable was life expectancy, the dependent variable is the population mid-point of the deprivation fifth and the analytical weight was the square root of the fifths population. • This means then that for each local authority a regression model was run to produce a line of best fit across all deprivation fifths, the gradient of which was the SII. A 95 per cent confidence interval for the slope was produced at the same time. No autocorrelation adjustment was made as previous studies had shown this to have little impact on the estimation of the SII [1]. • This statistical approach assumes that data exhibit a linear relationship, i.e. a diagonal straight line could roughly be drawn across the values by increasing deprivation fifth. The calculation is consistent with that of the Marmot indicator for England [2] on "inequality in life expectancy at birth" although it is based on deprivation tenths not fifths and on a different deprivation index, which only covers England. The local estimates for England and Wales may be roughly comparable but the figure for England as a whole is not calculated specifically but is the median of the local figures.
How accurate and complete will the data be for this indicator? Are there any problems, notes for interpretation or warnings with the data in relation to this indicator?	• SII in life expectancy based on estimates of life expectancy at birth by fifths (see 4.1 for details) • WIMD fifths have been calculated for Wales, health boards and local authorities independently of each other (see section 1 for details). • The interpretation of the SII is described in section 2.4.
References	1. Low A. & Low A. Measuring the gap: quantifying and

comparing local health inequalities. *J Public Health*. 2004;26(4):388-395.

2. London Health Observatory. *Marmot Indicators for Local Authorities in England.* LHO; 2011. Available at: www.lho.org.uk/LHO_Topics/national_lead_areas/marmot/marmotindicators.aspx [Accessed 23rd Nov 2011].

4.5 SII in healthy and disability-free life expectancy at birth

What is being measured?	The Slope Index of Inequality (SII) in healthy life expectancy and disability-free life expectancy at birth
How is this indicator defined?	• A measure of the absolute difference in healthy or disability-free life expectancy at birth between the least and most deprived, whilst taking into account the distribution across all deprivation fifths. • Results are reported as the slope of the regression line across the estimates of all fifths within an area.
Where does the data actually come from?	See Section 4.2 for healthy life expectancy or 4.3 for disability-free life expectancy at birth, proportion of population share for weighting from MYE(ONS), WIMD 2008 (WG)
Who does it measure?	Males, females
When does it measure it?	2001-05, 2005-09
What geographical area does it cover?	Wales, Welsh health boards, Welsh local authorities
How is it calculated?	• The SII was calculated following the methods published by Low & Low [1]. This used ordinary least squares regression in Stata where the independent variable is healthy or disability-free life expectancy, the dependent variable was the population mid-point of the deprivation fifth and the analytical weight was the square root of the fifths population. • This means then that for each local authority a regression model was run to produce a line of best fit across all deprivation fifths, the gradient of which was the SII. A 95 per cent confidence interval for the slope was produced at the same time. No autocorrelation adjustment was made as previous studies had shown this to have little impact on the estimation of the SII [1]. • This statistical approach is appropriate for data which exhibit a linear relationship, i.e. a diagonal straight line could roughly be drawn across the values by increasing deprivation fifth.
How accurate and complete will the data be for this indicator? Are there any problems, notes for interpretation or warnings with the data in relation to this indicator?	• SII in healthy life expectancy is based on estimates of HLE by fifths and details of their calculation and caveats are listed in Section 4.2 • SII in disability-free life expectancy is based on estimates of DFLE by fifths and details of their calculation and caveats are listed in Section 4.3 • The 95 per cent confidence interval of the SII reflects how well the regression line fits the HLE/ DFLE estimates across fifths. The charts of types of life expectancy by deprivation fifth should be examined for linearity of distribution. • Local WIMD fifths have been calculated for Wales, health boards and local authorities independently of each other (see section 1 for details). • The interpretation of the SII is described in Section 2.4.
References	1. Low A. & Low A. Measuring the gap: quantifying and

	comparing local health inequalities. *J Public Health*. 2004;26(4):388-395.

4.6 All cause mortality and main causes of death

What is being measured?	Rates of death from all causes, circulatory disease, respiratory disease, and cancer
How is this indicator defined?	Mortality (per 100,000 population) from: • All causes; all ages • All causes; under 75s • Circulatory disease; all ages (ICD-10 codes I00-I99) • Respiratory disease; all ages (ICD-10 codes J00-J99) • All cancers - All malignant neoplasms excluding non-melanoma skin cancer; all ages (ICD-10 codes C00-C99, excluding C44)
Where does the data actually come from?	• Annual District Deaths Extract (ADDE): Office for National Statistics (ONS) • Population mid-year estimates by LSOA and single year of age (unrounded): ONS • Welsh Index of Multiple Deprivation (WIMD) 2008: Welsh Government
Who does it measure?	Males, females; all ages (and under 75s for all causes)
When does it measure it?	2001-03 to 2007-09 (three year rolling averages)
What geographical area does it cover?	Wales, Welsh health boards, Welsh local authorities, including least and most deprived fifths of deprivation
How is it calculated?	• Counts of deaths registered between 2001 and 2009 were extracted from ONS mortality files, for all causes (all ages and under 75) and for selected causes of death where the underlying cause of death corresponds to one of the ICD-10 codes listed in the indicator definition (above). • Mortality rates were calculated and the results standardised to LSOA mid-year population estimates 2001-2009 to adjust for the effect of age in comparisons between areas. • Results are presented as European age-standardised rates (EASR) per 100,000 population and 95 per cent confidence intervals are shown for the most deprived fifth.
How accurate and complete will the data be for this indicator? Are there any problems, notes for interpretation or warnings with the data in relation to this indicator?	• Mortality counts are derived from an annual mortality extract supplied by ONS and are based on the original underlying cause of death for which there is nearly 100% coverage on the mortality register. There is the potential for the underlying cause of death to be incorrectly attributed on the death certificate and, therefore, the cause of death misclassified. • The registration of death is mandatory in the UK, so the dataset should be a near complete record of mortality. However, the assigning of cause of death on the medical certificate is known to vary, for example between areas. *(Further notes on the interpretation of ADDE are given in section 5.1).* • The 95 per cent confidence intervals are indications of the random variation that would be expected around a rate. These must be considered when assessing or interpreting a rate. The

	95 per cent confidence interval represents a range which has a 95 per cent probability of including the underlying population rate. The range of the confidence interval is dependent on the size of the population from which the events came. Rates based on small populations are likely to have wider confidence intervals and rates based on large populations are likely to have narrower confidence intervals. • Data are aggregated from LSOA level to the local authority, health board or national level. This means records without a valid LSOA are excluded from the analysis and figures from this analysis may not match exactly to other data sources where data are aggregated at a higher level. • WIMD fifths have been calculated for Wales, health boards and local authorities independently of each other (see section 1 for details). Care should be taken when comparing the different geographies.

4.7 Smoking-attributable mortality

What is being measured?	Rate of deaths attributable to smoking
How is this indicator defined?	Estimated mortality (per 100,000 population) in those aged 35+ attributable to smoking based on the following underlying causes of death (including ICD-10 codes): **Malignant Cancers** C00–C14 Lip, Oral Cavity, Pharynx C15 Oesophagus C16 Stomach C25 Pancreas C32 Larynx C33–C34 Trachea, Lung, Bronchus C53 Cervix Uteri C64–C66, C68 Kidney C67 Urinary Bladder C92 Myeloid Leukemia C80 Unspecified site **Cardiovascular Diseases** I20–I25 Ischaemic Heart Disease I00–I09, I26–I51 Other Heart Disease I60–I69 Cerebrovascular Disease I70 Atherosclerosis I71 Aortic Aneurysm I72–I78 Other Arterial Disease **Respiratory Diseases** J10–J18 Pneumonia, Influenza J40–J43 Chronic obstructive lung disease J44 Chronic Airway Obstruction **Diseases of the Digestive System** K25-K27 Stomach/duodenal ulcer Relative risks for each cause of death due to smoking are applied to the number of deaths by cause, age and sex to estimate the number of deaths attributable to smoking.
Where does the data actually come from?	• Annual District Deaths Extract (ADDE): Office for National Statistics (ONS) • Population mid-year estimates by LSOA and single year of age (unrounded): ONS • Welsh Index of Multiple Deprivation (WIMD) 2008: Welsh Government • Eastern Region Public Health Observatory (ERPHO) • Welsh Health Survey 2008-09: Welsh Government • Relative risks available at: www.ic.nhs.uk/webfiles/publications/Health%20and%20Lifestyles/Statistics_on_Smoking_2010.pdf
Who does it measure?	Males, females; aged 35 and over
When does it	2001-03 to 2007-09 (three year rolling averages)

measure it?	
What geographical area does it cover?	• Wales, Welsh health boards, Welsh local authorities, including least and most deprived fifths of deprivation
How is it calculated?	• Counts of deaths registered between 2001 and 2009 were extracted from ONS mortality files, where the underlying cause of death corresponds to one of the ICD-10 codes listed in the indicator definition (previous page) and the deceased was 35 years or older. • Local authority, age and sex specific smoking prevalence and cause specific relative risks were applied to obtain the smoking attributable fraction (SAF) for each relevant death. • Mortality rates were calculated and the results standardised to LSOA mid-year population estimates 2001-2009 to adjust for the effect of age in comparisons between areas. • Results were presented as European age-standardised rates (EASR) per 100,000 population and include 95 per cent confidence intervals for the most deprived fifth.
How accurate and complete will the data be for this indicator? Are there any problems, notes for interpretation or warnings with the data in relation to this indicator?	• The accuracy of these estimates is determined on the accuracy of: 1. Mortality data – because this is cause specific there may be coding variation between places although for the key contributors e.g. cancer deaths, this is less likely. 2. The relative risks are based on research done in the 1980s in the United States The method used to calculate relative risks is based on estimates of the contribution of smoking to a range of causes of death as published by the NHS Information Centre in Statistics on Smoking: England, 2010 (www.ic.nhs.uk/pubs/smoking10). These data are derived from the American Cancer Prevention Society II study (1982 -88) and assume that the contribution of smoking to deaths in Americans in the 1980s is the same as its contribution to a Welsh population in 2001-2009. 3. Smoking prevalence is estimated using survey data. Smoking status is self-reported and as such there is likely to be some responder bias. Sample sizes at may also be small for some areas and age groups. • Previous analysis presented in the lifestyle and health profiles used a method based on different smoking prevalence and relative risks. This data is not comparable to that previously published. However, this improved method has been applied to historic data. • *Additional issues which are common to all mortality indicators are highlighted in the main cause of death indicator and section 5.1 on the Annual District Deaths Extract.*

4.8 Alcohol-attributable mortality

What is being measured?	**Rate of deaths attributable to alcohol**
How is this indicator defined?	Estimated mortality (per 100,000 population) attributable to alcohol, based on underlying causes of death from 45 disease groups considered either entirely or in part attributable to alcohol [1]. Attributable fractions [1] for each cause of death due to alcohol are applied to the number of deaths by cause, age and sex to estimate the number of deaths attributable to alcohol.
Where does the data actually come from?	• Annual District Deaths Extract (ADDE): Office for National Statistics (ONS) • Population mid-year estimates by LSOA and single year of age (unrounded): ONS • Welsh Index of Multiple Deprivation (WIMD) 2008: Welsh Government • North West Public Health Observatory (NWPHO) alcohol-attributable fractions [1]
Who does it measure?	Males, females, persons (at health board level); all ages
When does it measure it?	2001-03 to 2007-09 (three year rolling averages)
What geographical area does it cover?	Wales, Welsh health boards, including least and most deprived fifths of deprivation
How is it calculated?	• Counts of deaths registered between 2001 and 2009 were extracted from ONS mortality files, where the underlying cause of death corresponds to one of the 45 disease groups considered either entirely (13 disease groups) or in part (32 disease groups) attributable to alcohol [1]. (All disease groups listed in the alcohol-related mortality indicator are included in this indicator, although not all are considered wholly attributable to alcohol.) • These were then multiplied by age/sex-specific attributable fractions as published by North West Public Health Observatory (NWPHO) [1] to give the total number of deaths in each geographical area estimated to be attributable to alcohol. Deaths aged under 16 were only included if the condition was wholly attributable to alcohol, i.e. the attributable fraction was 1. • Mortality rates were calculated and the results standardised to LSOA mid-year population estimates 2001-2009 to adjust for the effect of age in comparisons between areas. • Results were presented as European age-standardised rates (EASR) per 100,000 population and include 95 per cent confidence intervals for the most deprived fifth.
How accurate and complete will the data be for this indicator? Are there any problems, notes	• As advised by NWPHO, only positive fractions were applied, as this indicator is based on alcohol-related harm and therefore excludes any potentially beneficial effects of drinking. • Mortality attributable to alcohol is an estimate of harm relating

for interpretation or warnings with the data in relation to this indicator?	to alcohol and may be considered experimental. • Attributable fractions calculated for England were used[1]. However, it is assumed that they can also be applied to Wales, regardless of any differences between local authorities. Underestimation may occur in areas of higher alcohol consumption and overestimation in areas of lower alcohol consumption. • *Additional issues which are common to all mortality indicators are highlighted in the main cause of death indicator and section 5.1 on the Annual District Deaths Extract.*
References	1. Jones L et al. *Alcohol-attributable fractions for England: Alcohol-attributable mortality and hospital admissions*. Liverpool: North West Public Health Observatory; 2008. Available at: www.lape.org.uk/downloads/AlcoholAttributableFractions.pdf [Accessed 23rd Nov 2011].

4.9 Alcohol-related mortality

What is being measured?	Rate of deaths related to alcohol
How is this indicator defined?	Mortality (per 100,000 population) from alcohol-related diseases. The term 'alcohol-related' is not used consistently in publications, but often refers to the definition published by the Office for National Statistics (ONS) containing those conditions that are most directly related to alcohol [1]. These conditions are (including ICD-10 codes): F10 Mental and behavioural disorders due to use of alcohol G31.2 Degeneration of nervous system due to alcohol G62.1 Alcoholic polyneuropathy I42.6 Alcoholic cardiomyopathy K29.2 Alcoholic gastritis K70 Alcoholic liver disease K73 Chronic hepatitis nec (not elsewhere classified) K74 Fibrosis and cirrhosis of liver (excluding K74.3 - K74.5 Biliary cirrhosis) K86.0 Alcohol induced chronic pancreatitis X45 Accidental poisoning by and exposure to alcohol X65 Intentional self-poisoning by and exposure to alcohol Y15 Poisoning by and exposure to alcohol, undetermined intent
Where does the data actually come from?	• Annual District Deaths Extract (ADDE): Office for National Statistics (ONS) • Population mid-year estimates by LSOA and single year of age (unrounded): ONS • Welsh Index of Multiple Deprivation (WIMD) 2008: Welsh Government
Who does it measure?	Males, females; all ages
When does it measure it?	2001-03 to 2007-09 (three year rolling averages)
What geographical area does it cover?	Wales, including least and most deprived fifths of deprivation
How is it calculated?	• Counts of deaths registered between 2001 and 2009 were extracted from ONS mortality files, where the underlying cause of death corresponds to one of the ICD-10 codes listed in the indicator definition (above). • Mortality rates were calculated and the results standardised to LSOA mid-year population estimates 2001-2009 to adjust for the effect of age in comparisons between areas. • Results were presented as European age-standardised rates (EASR) per 100,000 population and include 95 per cent confidence intervals for the most deprived fifth.
How accurate and complete will the data be for this	• *Issues which are common to all mortality indicators are highlighted in the main cause of death indicator and section*

indicator? Are there any problems, notes for interpretation or warnings with the data in relation to this indicator?	*5.1 on the Annual District Deaths Extract.*
References	1. ONS. *Alcohol-related deaths in the United Kingdom, Defining alcohol-related deaths*, ONS; 2006. Available at: www.ons.gov.uk/ons/rel/subnational-health4/alcohol-related-deaths-in-the-united-kingdom/defining-alcohol-related-deaths/index.html [Accessed 23rd Nov 2011].

5. Data sources

5.1 Annual District Death Extract

What the data tells you?	• The Annual District Death Extract (ADDE) is a dataset containing each individual death of a resident that is registered in the particular year. • The information presented in the inequalities profiles relates to deaths registered between 2001 and 2009.
How are the data collected?	• Individual records for death registrations are sent on a weekly basis from the Registrars' offices across England and Wales to the Office for National Statistics (ONS). The ONS collates and validates the data. The data are based on the underlying cause of death e.g. if an individual dies from pneumonia but had been made vulnerable to that disease by end-stage cancer, then cancer (rather than pneumonia) is recorded as the underlying cause of death.
How accurate and complete will the data be? Are there any problems, notes for interpretation or warnings with the data?	• It is a legal requirement to register a death and so the ADDE provides a reliable and complete data source. • Cause of death is based on the medical certificate of cause of death. This is completed by the certifying doctor for about three quarters of deaths and by a coroner for the remainder. Most of the deaths certified by a coroner do not involve an inquest or any suspicion of violence, but are referred to the coroner because they were sudden and unexpected, or because there was no doctor in attendance during the deceased's last illness. There will be a long delay in registering a small number of deaths for which a coroner's ruling is required e.g. suicide, homicide, undetermined intent. • It is important to note that with many thousands of doctors writing certificates, the differences in their training, habits and knowledge mean that there would inevitably be variations in the quality of medical certificates of cause of death.[1] • The cause of death is easier to define in younger people. Older people are far more likely to have many underlying health conditions, making it more difficult to determine the underlying cause of death.[2]
Who manages the data?	Office for National Statistics (ONS)
Where can you get hold of the data?	Summary data are available from: • The Office for National Statistics website: www.statistics.gov.uk/hub/health-social-care/health-of-the-population/causes-of-death/index.html • The Welsh Assembly Government website: www.statswales.wales.gov.uk/ReportFolders/reportFolders.aspx
References	1. Office for National Statistics. *Mortality Statistics: Deaths registered in England and Wales (Series DR), 2010*. Newport: ONS 2011. Available at: www.ons.gov.uk/ons/publications/re-metadata.html?edition=tcm%3A77-230730&next [Accessed 23rd

	Nov 2011]. 2. Gorina Y, Lentzner H. Multiple Causes of Death in Old Age. *Aging Trends* 2008; 9:1-9. Available at: www.cdc.gov/nchs/data/ahcd/agingtrends/09causes.pdf [Accessed 23rd Nov 2011].

5.2 Mid-year population estimates

What the data tells you?	• Mid-year population estimates (as at 30 June each year) provide an estimate of the resident population of an area. • The analysis presented in the inequalities profiles uses population estimates between 2001 and 2009.
How are the data collected?	Population estimates are based on births, deaths and an estimate of migration since the last census. They are produced using a well established demographic approach called the cohort component method by the Office for National Statistics (ONS). In simple terms, population estimates are calculated by: • Taking the previous years' population estimate • Taking out special population groups • Ageing every person on one year • Adding births and subtracting deaths • Allowing for inward and outward migration • Adding back in the special population groups.
How accurate and complete will the data be? Are there any problems, notes for interpretation or warnings with the data?	• The estimated resident population of an area includes all people who usually live there, whatever their nationality [1]. • Members of the UK and non-UK armed forces stationed in the UK are included[1]. • UK forces stationed outside the UK are excluded [1]. • Students are taken to be resident at their term time address[1]. • The estimates include long term international migrants (defined as somebody who changes his or her country of usual residence for a period of at least one year) [1]. • The estimates do not include short term migrants (people who come to or leave the UK for less than a year) [1]. • The census and therefore mid-year population estimates are thought to underestimate the population in some areas e.g. areas of multi-occupancy housing. • ONS have a long-term programme of work on improving migration and population statistics. In May 2010 ONS released revised sub-national mid-year estimates 2002-2008 to reflect improved methods for measuring migration [2]. • Full guidance on the methodology used by ONS to calculate population estimates can be accessed at: www.ons.gov.uk/ons/guide-method/method-quality/specific/population-and-migration/pop-ests/index.html
Who manages the data?	Office for National Statistics (ONS)
Where can you get hold of the data?	Office for National Statistics website available at: www.statistics.gov.uk/hub/population/population-change/population-estimates
References	1. Office for National Statistics . *Topic guide to: Population Estimates – Technical Data* [Online]. 2011. Available at: www.statistics.gov.uk/hub/population/population-change/population-estimates [Accessed 23rd Nov 2011]. 2. Office for National Statistics . *Improvements to 2008 Migration*

	and Population Statistics [Online]. Available at: www.ons.gov.uk/ons/guide-method/method-quality/imps/msi-programme/communication/improvements-mid-2008/index.html [Accessed 23rd Nov 2011].

5.3 Welsh Index of Multiple Deprivation

What the data tells you?	• The Welsh Index of Multiple Deprivation (WIMD) 2008 is a measure of multiple deprivation at small area level. The third edition of the Welsh Index of Multiple Deprivation was released in July 2008 and replaced WIMD 2005. Since the production of the profiles the fourth edition, WIMD 2011, has been released. • WIMD is made up of eight separate domains of deprivation: income; employment; health; education; housing; access to services; environment; and community safety. • WIMD is used to give an overall deprivation rank for each of the 1,896 lower super output areas (LSOA) in Wales and to give ranks for the separate deprivation domains for each of the LSOAs.
How are the data collected?	• Deprivation ranks are calculated for each LSOA in Wales. One area has a higher deprivation rank than another if the proportion of people living there that are classed as deprived is higher. The most deprived area is ranked as one and the least deprived area is ranked as 1,896. • Each of the eight domains are based on a range of different indicators. The domain indices are weighted and combined into an overall index of multiple deprivation. The weighting is the adjustment of the contribution of the domain indices make to the overall index when they are combined. Income and employment are classed as the most important indicators and are given the biggest weighting in the overall index. • To obtain deprivation fifths geographical areas are ranked from highest to lowest by the deprivation rank and then split into five equal bands, ranging from least deprived to most deprived fifth.
How accurate and complete will the data be? Are there any problems, notes for interpretation or warnings with the data?	• The WIMD provides a deprivation rank for each of the 1,896 LSOAs in Wales. • Not everyone living in a deprived area is deprived and not all deprived people live in deprived areas. An area itself is not deprived, it is the circumstances and lifestyle of people who are living there that affects its deprivation ranks. • The WIMD cannot tell you how much more deprived one LSOA is than another. If one area is ranked as the 100th most deprived and another area as the 300th most deprived, you cannot say that one area is three times more deprived than the other. • Deprivation ranks cannot be compared with scores from a previous index. • The WIMD ranks cannot be compared with those from deprivation indices of other UK countries. • There are no official Local Authority scores. • WIMD is an ecological measure whereas individuals within an area (LSOA in this instance) may vary. • The overall WIMD index includes a health measure and so it can be argued that assessing health experiences against WIMD can have a circular effect. • Unlike measures of material deprivation some of the factors do not relate directly to material deprivation e.g. access to services.

	• It is important to note that low deprivation does not equate to affluence.
Who manages the data?	Welsh Government's Statistical Directorate and the Local Government Data Unit (Wales)
Where can you get hold of the data?	http://wales.gov.uk/topics/statistics/theme/wimd/2008/?lang=en

5.4 Welsh Health Survey

What the data tells you?	• The Welsh Health Survey provides estimates of health status, health related lifestyle and health service use at national level, for population sub-groups (such as age, sex and socio-economic group), and for local authorities / health boards. • Five years of survey data (2004/5 to 2009) were combined and used for both time periods of the healthy and disability-free life expectancy analyses in the inequalities profiles. • One year of survey data (2009) was used for the alcohol consumption and smoking charts in the profile for Wales.
How are the data collected?	• The Welsh Health Survey is based on a representative sample of adults (aged 16 and over) living in private households in Wales (plus some information for children living in those households). • Information is collected on households through a short interview and on individuals through a self-completion questionnaire.
How accurate and complete will the data be? Are there any problems, notes for interpretation or warnings with the data?	• The Welsh Health Survey is the most comprehensive survey into the health of the population at local authority level across Wales. • As the results are self-reported some of the results may be over or under estimates. • The Welsh Health Survey does not include adults living in institutional settings such as care homes or nursing homes.
Who manages the data?	The National Centre for Social Research (NatCen) (www.natcen.ac.uk) conducts the survey on behalf of the Welsh Government.
Where can you get hold of the data?	Welsh Health Survey results are available at: http://wales.gov.uk/topics/statistics/theme/health/health-survey/results/?lang=en

6. Glossary

6.1 Abbreviations

ADDE	Annual District Death Extract
APHO	Association of Public Health Observatories
CI	Confidence interval
DFLE	Disability-free life expectancy
EASR	European age-standardised rate
ERPHO	Eastern Region Public Health Observatory
HLE	Healthy life expectancy
ICD-10	International Classification of Diseases 10th Revision
LE	Life expectancy
LHO	London Health Observatory
LSOA	Lower super output area
MYE	Mid-year population estimate
NWPHO	North West Public Health Observatory
ONS	Office for National Statistics
PEDW	Patient Episode Database for Wales
SII	Slope Index of Inequality
UHB/THB	University/Teaching Health Board
WG	Welsh Government
WIMD	Welsh Index of Multiple Deprivation

6.2 Definitions

Age-standardised rate

- Age-standardisation allows comparison of rates across different populations while taking account of the different age structures of those populations. Failure to take account of differing age structures can be very misleading when comparing rates in different populations.

Attributable fractions (population attributable fractions)

- Attributable fractions are the proportions of all cases (e.g. deaths or hospital admissions) that are thought to be caused by a particular exposure, in this case alcohol or smoking. The fractions are calculated for conditions where there is considered sufficient evidence of a causal relationship between the exposure and the disease or injury.

Cardiovascular diseases

- See *circulatory diseases*

Circulatory diseases

- Circulatory diseases include all diseases caused by hardening of the inner lining of the arteries with fatty deposits. These diseases are often referred to as cardiovascular diseases and include coronary heart disease.

Confidence intervals (CIs)

- Confidence intervals are indications of the natural variation that would be expected around a rate and they should be considered when assessing or interpreting a rate. The size of the confidence interval is dependent on the number of events occurring and the size of the population from which the events came. Generally speaking, rates based on small numbers of events and small populations are likely to have wider confidence intervals. Conversely, rates based on large populations are likely to have narrower confidence intervals. In the inequalities profiles publications we use 95 per cent confidence intervals. This represents a range of values that we can be 95 per cent confident contains the 'true' underlying rate.

Disability-free life expectancy (DFLE) at birth

- Disability-free life expectancy at birth is an estimate of the average number of years newborn babies could expect to live free from limiting disability, if the then current mortality rates and prevalence of disability applied throughout their lives.

European age-standardised rate (EASR)

- The European age-standardised rate represents the overall rate you would get if the population had the same age-structure as a theoretical standard European population (direct age-standardisation). In order to calculate this we apply the rates which occur in each age band to the new (standard) population structure. The measure only allows for comparison between rates which have been standardised; it is not a proportion or risk of an event occurring and does not, of itself, involve a comparison with rates across Europe. See *age-standardised rate* for further details.

Fifths of deprivation

- Geographical areas are ranked from highest to lowest by deprivation score and then split into five bands of similar size, ranging from least deprived to most deprived fifth.

Health board

- Health boards are the NHS bodies in Wales responsible for the health of the population within their geographical area. This includes planning, designing, developing and securing the delivery of primary, community, in-hospital care services and specialised services. There are seven health boards in Wales, changed from 22 local health boards and seven NHS Trusts previously.

Healthy life expectancy (HLE) at birth

- Healthy life expectancy at birth is an estimate of the average number of years newborn babies could expect to live in good health, if the then current mortality rates and prevalence of good and very good health applied throughout their lives.

Life expectancy (LE) at birth

- Life expectancy at birth is an estimate of the average number of years newborn babies could expect to live if current age-specific mortality rates continue to apply.

Lower Super Output Area (LSOA)

- Defined geographical area based on Census output areas with an average of 1500 persons per LSOA. There are 1896 LSOAs in Wales, and the number of LSOAs can vary widely between health boards.

Mid-year estimates

- Annual ONS estimates of the resident population, based on the Census and taking into account population change (births, deaths and migration).

Outcome measure

- An outcome measure in this report refers to an indicator to assess the impact of a health-related behaviour e.g. death due to smoking is an outcome of smoking behaviour.

Public Health Wales NHS Trust

- Public Health Wales was established as an NHS Trust on 1 October 2009. The Trust incorporates the functions and services previously provided by the National Public Health Service for Wales, the Wales Centre for Health, the Welsh Cancer Intelligence and Surveillance Unit and Screening Services Wales

Rate ratio

- The rate ratio used in the inequalities profiles publications is the mortality rate in the most deprived fifth divided by the rate in the least deprived fifth (see section 3.1).

Respiratory diseases

- Diseases which occur in the upper and lower respiratory tract.

Slope Index of Inequality (SII)

- The Slope Index of Inequality is a single statistic that summarises the extent of health inequalities within an area. It is an estimate of the actual gap in life expectancy, healthy life expectancy or disability-free life expectancy between the least and most deprived areas, taking into account the life expectancies of the fifths in between (see section 2.4).

Statistical significance

- A result may be deemed statistically significant if it is considered unlikely to have occurred by chance alone. The basis for such judgements is a predetermined and arbitrary cut-off, usually taken as 5% or 0.05. In some circumstances this cut–off may be lowered to 1%, for example where there is a greater need for certainty over the safety of a drug or procedure. Statistical significance must not be confused with clinical or other significance. A result may be clinically significant whilst not being statistically significant and vice versa.

Welsh Index of Multiple Deprivation (WIMD)

- WIMD is a measure of multiple deprivation at lower super output area level. A WIMD deprivation score is calculated using eight domains i.e. income, employment, health, education, access to services, housing, physical environment and community safety.