Cause specific child and adolescent mortality in the UK and EU15+ countries

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Objectives

To compare cause specific UK mortality in children and young people (CYP) with EU15+ countries.

Design

Mortality estimates were coded from the WHO World Mortality Database. Causes of death were mapped using the Global Burden of Disease mortality hierarchy to 22 cause groups. We compared UK mortality by cause, age group and sex with EU15+ countries in 2015 (or latest available) using poisson regression models. We then ranked the UK compared with the EU15+ for each cause.

Setting

The UK and EU15+ countries (European Union countries pre 2004, Australia, Canada and Norway).

Participants

Children and young people aged 1-19

Main outcome measure

Mortality rate per 100 000 and number of deaths

Results

UK mortality in 2015 was significantly higher than the EU15+ for common infections (1-9 both sexes, 10-14 males and 15-19 females); chronic respiratory conditions (5-14 both sexes); and digestive, neurological, and diabetes/urological/blood or endocrine conditions (15-19 females). UK mortality was significantly lower for transport injuries (15-19 males). The UK had the worst to third worst mortality rank for common infections in both sexes and all age groups, and in 5 out of 8 NCD causes in both sexes in at least one age group. UK mortality rank for injuries in 2015 was in the top half of countries for most causes.

Conclusions

UK CYP mortality is higher than a group of comparable countries for common infections and multiple NCD causes. Excess UK CYP mortality may be amenable to health system strengthening.

Keywords

Child and adolescent health; mortality; EU15+

What is already known on this topic

- UK all-cause mortality outcomes for children and young people (CYP) are worse than in similar high-income nations
- Little is known about comparative differences in cause-specific mortality

What this study adds

- Although UK CYP mortality continues to decline, CYP mortality for common infections and multiple NCD causes is higher than a comparable group of high-income countries
- The UK continues to have lower injury mortality than most EU15+ countries.
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- Conditions where there is excess CYP mortality in the UK include those which may be amenable to health system strengthening.

INTRODUCTION

UK mortality outcomes for children and young people (CYP) are worse than in comparable high-income countries.[1-3] In 2014 we estimated excess UK mortality to result in around 1000 additional deaths in infants and young children, and 300 extra deaths in adolescents and young adults (10-24) each year,[4] when compared with median mortality in a group of similar countries (the EU15+: European Union countries pre-2004, Norway, Australia and Canada). Our recent updated analysis demonstrated continued poor UK outcomes for all-cause and non-communicable diseases (NCD), particularly in younger children.[5] Slower rates of decline in mortality in the UK will mean these differences are likely to widen; we estimated infant and 1-4 all-cause mortality could be 180% and 140% of the EU15+ median by 2030, if current trends continue.[5] Comparisons between the UK and countries with the lowest CYP mortality rates in Europe are particularly stark. In 2014 Wolfe et al. showed that reducing UK 0-14 mortality to the rate seen in Sweden would save 2000 lives a year[2] and Zylbersztejn et al. recently estimated there to be around 600 extra deaths 0-4 year olds from all causes in England compared with Sweden.[6]

Understanding differences in cause specific mortality in CYP in the UK is essential for designing effective solutions to improve survival. Yet the most recent systematic international comparative analysis of mortality by cause used data which are now a decade old.[4] To better understand the UK's continued poor performance, and so inform potential policy interventions to improve outcomes, a detailed assessment of mortality by cause group across the early life course is required.

This study aims to compare child and adolescent mortality outcomes by cause in the UK with the EU15+, a group of comparable high-income countries with similar health care systems and disease patterns used in previous benchmarking excercises.[4] We limited our analysis to 1-19 year olds as international comparisons of infant mortality are problematic due to differences in the classification of deaths, causes of death are distinct from those in older groups, and the UK's position within Europe has recently been described.[7] We use methods described in the recent Global Burden of Disease (GBD) study to categorize causes of death into 22 cause groups and redistribute inappropriately coded deaths ("garbage codes").[8] We then rank the UK relative to the EU15+ for mortality rate by cause, sex and age group.

METHODS

Data

National mortality estimates for the UK and EU15+ countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Australia, Canada, and Norway), available by year, sex and 5-year group (1-4, 5-9, 10-14 and 15-19), were accessed from WHO World Mortality Database (WMD) on 9th Oct 2017 (http://www.who.int/healthinfo/mortality_data/en/). We limited this analysis to country-years using ICD10 codes to improve comparability between countries and over time. Estimates were available to 2015 for the UK and all other countries except Belgium, France, Greece, Ireland, Italy and Portugal (2014) and Canada (2013).

We used the GBD mortality hierarchy to map ICD10 coded cause of death to cause groups. The GBD classifies deaths across 4 levels. For example, acute lymphoblastic leukaemia (level 4) is classified within leukaemias (level 3), neoplasms (level 2) and non-communicable diseases (NCD) (level 1). We mapped causes in the WMD to the three level 1 categories: (communicable, maternal, neonatal, and nutritional diseases; NCD; injuries) and 21 level 2 categories (7 communicable disease causes; 10 NCD causes; 4 injury causes). We then separated the level 2 cause "self-harm and interpersonal violence" into self-harm and violence, as these causes of death have different policy responses.

A significant proportion of deaths within the WMD were assigned ambiguous or inappropriate underlying causes. We use a minimally modified version of the GBD methodology for redistributing these "garbage codes" to each level 2 cause group. We first classified garbage codes (level 1-4) as described by the GBD 2016, and then proportionately redistributed deaths within each level for all causes, avoiding the need for detailed target cause lists for specific codes as used in the GBD.[9]

Procedures

To account for the large annual variation in mortality and low numbers of deaths for some causes, we first calculated three year lagged mean number of deaths and mortality rate per

100,000 for each cause, age group, sex and country-year available. We then excluded causes contributing less than 1% of the total UK mortality burden within each age and sex group. We examined current differences in mortality between the UK and EU15+ using poisson regression models. We calculated incidence rate ratios (IRR) with 95% confidence intervals to compare the three year lagged mean number of deaths by cause in the UK with all 17 EU15+ countries in 2015 amongst 1-4, 5-9, 10-14 and 15-19 year olds. If countries did not have data for 2015, we used the latest available data year. We were unable to use lagged mean estimates for Greece, as data were only available for 2014. We used mid-year population denominators provided by the WMD as an offset in each model (meaned over the same three-year period as number of deaths). Where population data were not available from the WMD we used estimates provided by national statistics databases. As patterns of cause of death are similar for both sexes during early childhood (1-9), but with large differences during adolescence, we present results for both sexes for 1-4 and 5-9 year olds, and by sex for 10-14 and 15-19 year olds.

To account for multiple comparisons, we defined significant differences in mortality between the UK and EU15+ as $p< 0.005$. This approximates to a modified Bonferroni correction for 10 comparisons per age-group/sex but avoids using different significance thresholds for each group. We then ranked the UK compared with EU15+ countries using the three year lagged mean mortality rate per 100,000 in 2015 (or latest date available). We then performed a sensitivity analysis repeating the procedures described above but excluding all garbage coded deaths. All analyses were performed in Stata 14 (StataCorp, College Station TX).

RESULTS

The three year lagged mean number of deaths in children and young people 1-19 in 2015 in the UK was 2110 (1281 males and 829 females), and the three year lagged all cause mortality rate was 14.6 per 100,000. 44.8% of deaths were among 15-19 year olds, 15.7% were among 10-14 year olds, 14.6% were among 5-9 year olds and 24.9% were among 1-4 year olds. Cause of death was inappropriately assigned and redistributed for 613 deaths (29.1%).

Tables 1 - 3 shows the three year lagged mean annual number of deaths in the UK in 2015 and the proportion of total mortality, for 1-4 and 5-9 (both sexes) and 10-14 and 15-19 by sex. The incidence rate ratio (IRR) for UK mortality compared with EU15+ countries is also shown, with 95% confidence intervals. Significant ($p<0.005$) differences in mortality are highlighted in red.

The UK had significantly higher mortality for common infections in 1-4 and 5-9 year olds (both sexes), 10-14 year olds males and 15-19 year olds females, and for chronic respiratory conditions in 5-9 and 10-14 year olds in both sexes. Amongst females 15-19, the UK also had significantly higher mortality than the EU15+ for digestive disorders, neurological disorders and diabetes/urological/blood/endocrine disorders (DUBE). UK mortality was significantly lower than the EU15+ for transport injuries amongst males 15-19.

Table 4 shows most recent UK mortality rank by age group and sex compared to the other EU15+ countries using the three year lagged mortality rate per 100 000 in 2015 (or latest available date) for each country. In order to demonstrate the UK's position relative to other EU15 countries, cells in this table are shaded green (lowest mortality) to yellow (median mortality) to red (highest mortality). The UK ranked 17th or 18th (highest or second highest mortality) for childhood infections across all age groups in males, and between 16th and 18th for females. The UK ranked 15th-18th for chronic respiratory diseases in males and females in all age groups, and in the bottom 5 countries for most other NCD mortality groups except neoplasms. All causes of injury mortality in the UK were ranked in the top 10 countries in males and females for all age groups except transport injuries in males 10-14 (11th) and self-harm in males 15-19 (11th).

Results from the sensitivity analyses showed a similar pattern of mortality differences between the UK and EU15+. After excluding redistributed deaths, the UK still had significantly higher mortality for common infections in 1-4 (both sexes), chronic respiratory diseases in 10-14 (both sexes), and neurological conditions in 15-19 females. The UK had significantly lower mortality than the EU15+ for transport injuries in 15-19 males, unintentional injuries in 1-4 (both sexes) and self-harm in 15-19 females. The IRR for other age/cause groups identified in the main analysis as having higher mortality in the UK compared to the EU15+ were similar in the sensitivity analysis, but no longer reached significance using the reduced number of deaths. There were no substantial differences between UK mortality rank by cause of death compared to EU15+ countries within the sensitivity analysis (see supplementary material).

DISCUSSION

We found CYP mortality in the UK to be significantly higher than the EU15+ for multiple causes across all age groups and both sexes. If the UK were to reduce its mortality rate in these conditions to the EU15+ median, around 145 deaths would be avoided each year. The UK also ranked between highest or third highest for mortality from common infections across age-groups, and ranked poorly for most NCD causes, particularly amongst adolescents.

Comparison with the literature

Previous studies have shown a significant proportion of excess UK mortality to result from poor outcomes in younger children.[2 6 10] The results shown here build on this evidence, but further demonstrate stark differences in outcomes for older children and adolescents,[5] particularly amongst females. UK mortality for girls 15-19 was found to be significantly higher than EU15+ countries for conditions accounting for around a quarter of total deaths in this age group. Adolescent females in the UK also ranked 17th or 18th in 5 out of the 8 NCD groups. Worryingly, total mortality has actually increased year on year since 2013 amongst adolescent females 15-19 in the UK, and is plateauing amongst adolescent males, in contrast to the EU15+ median, which is continuing to improve (data not shown).

NCD causes appear to be a major contributor to higher than expected CYP mortality in the UK.[4 5 10 11] Similar to our findings, Viner et al. found the UK to have higher CYP mortality than the EU15+ for endocrine, respiratory, digestive, and particularly neuropsychiatric causes (epilepsy, cerebral palsy and substance misuse).[4] In our analysis, UK mortality for neurological causes (predominantly epilepsy) was significantly higher amongst adolescent girls, with around twice the number of deaths in the UK compared to the EU15+ average. The UK also ranked 17th out of 18 countries for neurological conditions amongst 15-19 year olds in both sexes. UK outcomes from chronic respiratory conditions, of which the majority were deaths due to asthma, were significantly worse amongst males and females 5-14. UK mortality for asthma in CYP has previously been shown to be up to 11 times higher than comparable countries,[11] and these differences persist after adjustment for variation in prevalence.[12] Although we also found mortality for digestive conditions and DUBE to be significantly higher

in the UK than the EU15+ in females aged 15-19, both of these cause-groups contain a wide range of level 3 causes, and so these results are difficult to interpret.

These findings also highlight the contribution of communicable diseases to excess mortality amongst CYP. Similar to our findings, Tambe et. al found higher CYP mortality rates for infections in the UK compared with Sweden[10 11], and others have shown poor UK outcomes and slow rates of decline for childhood infections such as pneumonia and meningococcal disease.[12-15] We found the UK to have significantly higher mortality for common infections than the EU15+ in 1-9 year olds (both sexes), males 10-14 and females 15-19, and ranked in the bottom three countries across all age groups and both sexes. Although common infections account for a relatively small proportion of total CYP deaths, reducing UK mortality to the EU15+ median would save around 85 lives a year in 1-19 year olds (see appendix).

The UK has historically performed well for injury mortality compared with other high-income nations.[4] Our findings support this, showing significantly lower mortality for transport injuries amongst males 15-19, which account for around 21% of all injury related deaths in 1-19. We also found the UK mortality rank for most causes of death due to injury to be in the top half of countries for all age groups.

Strengths and weaknesses

We used high quality mortality estimates provided by the WHO WMD and compared outcomes with a group of countries similar to the UK (the EU15+) used in previous benchmarking exercises.[3-5 12 16] To improve comparability between countries and over time, we only included deaths coded to ICD 10, and we used mean number of deaths and mortality rates over a three-year period to account for large annual variability in mortality for some causes. All countries had data available within 1 year of the latest UK data release (2015), except Canada where data were available to 2013.

Differences in the way countries compile mortality statistics, and whether deaths are reported by registration year or death year, may have affected our results, particularly towards the end of the study period.[17] The use of broad GBD level 2 cause-groups reduces

the risk of coding differences between countries and over time, but also has limitations due to the large number of conditions included in some groups. We considered outcomes to be significantly different if p<0.005 to account for multiple testing. We used this threshold to approximate a Bonferroni correction for 10 comparisons but maintain consistency across all age/sex groups. However, our results may have differed using alternative approaches and we may have underestimated UK excess mortality, particularly in adolescent males. The IRR for number of deaths from common infections, liver, neurological conditions and DUBE were all higher in the UK than EU15+ amongst males 15-19, with p <0.05 but >0.005.

Using alternative methods to redistribute deaths may have affected our results. However, our sensitivity analysis using only appropriately coded deaths found the same pattern of mortality differences as the main analysis, with the UK having higher mortality for common infections, neurological and respiratory conditions, and good outcomes for injuries. Our results may have also been influenced by other errors in death certification. Deaths due to self-harm are known to be under-reported,[18] and mortality due to common infections may be over-reported, with a large proportion potentially attributable to underlying medical conditions.[2 14 19] However, as our results show excess UK mortality across a range of conditions in all age groups, they are unlikely to be fully explained by differences in coding alone.

Meaning, mechanisms, and policy responses

This study aimed to identify cause specific differences in CYP mortality in the UK compared to the EU15+. In order to explain why the UK performs poorly, we should consider the many determinants of child health and survival, how these differ between the UK and comparable countries, and what policy responses are needed to improve outcomes.

At the macro level, the social and economic environment in which CYP live are likely to be important contributors to poor health outcomes in the UK.[1,2 3 21] A recent study found that characteristics at birth and socioeconomic factors explain over 80% of the excess all-cause mortality amongst children 2 days - 4 years in England compared with Sweden.[6] Risk factors for CYP mortality such as prematurity and low birth weight, which are strongly associated with social deprivation, are also higher in the UK than many other EU15+ countries.[22] UK relative child poverty levels are higher than the best performing EU15+ countries for child

mortality, and levels are predicted to increase.[23] In response, the Royal College of Paediatrics & Child Health (RCPCH) has argued that in addition to direct fiscal measures, actions to reduce the impact of poverty on child health outcomes should include developing an overarching cross-government cross-country child health strategy for the UK, and developing a child-health-in-all-policies approach to reduce health and educational inequities.[1] Many of the intermediate determinants of UK CYP survival are shaped by local government, and so recent reductions in funding levels, in particular spending on public health, risks impeding progress in improving mortality.[24 25] At the individual level, personal, family, and community conditions are strongly affected by the distal factors described above, but some may also be realised through health behaviours. Policy responses to these should be considered in the context of wider social determinants.

Our data show the UK has excess mortality for cause groups which are sensitive to healthcare improvement. For example, it is estimated that there are avoidable factors in two thirds of UK deaths due to asthma[26] and a quarter of deaths in children with epilepsy.[27] Modifiable factors were also identified in 27% of deaths assessed by child death overview panels in England in 2016/17, and has been increasing since 2012.[28] UK mortality rates amongst 1-14 for causes of death which are thought to be amenable to healthcare also appear to be higher than most OECD countries.[29]

The NHS Long Term Plan in England,[30] and similar strategies in devolved nations, offer real opportunities to modify the operation of health services to reduce the impact of social deprivation and other social determinants on child health outcomes. Improving co-ordination between primary and secondary care in the UK, which is worse than comparable countries,[31] also has the potential to improve child health outcomes.[32] This may include bringing paediatric expertise closer to the front line, as the failure to recognise serious illness by health professionals not trained in paediatrics is a recurring factor in childhood deaths.[33]

Focusing on high burden causes would direct efforts to improve child survival where they are most needed. For example, the planned development of paediatric clinical networks for long term conditions within the NHS Long Term plan should focus on conditions where the UK has excess mortality.[30] Investment in data systems relating to child mortality is also needed across

the UK. The launch of the National Child Mortality Database for England provides a mechanism to analyse national trends in the circumstances around CYP deaths and identify patterns in modifiable factors. Establishing similar unified data systems for CYP mortality in Scotland, Wales and Northern Ireland should be a priority. Finally, continuing to monitor the UK's progress compared with other high-income countries will provide accountability and a powerful incentive to improve outcomes.[5]

CONCLUSIONS

We found UK mortality amongst CYP to be higher than a comparable group of high-income countries for common infections and multiple NCD causes. There is an urgent need for further analyses to assess how social, economic and health system determinants to survival in the UK contribute to excess CYP mortality, and factors specific to the causes of death we have identified.

Words: 3166

Ethics

Ethical approval was not required for this analysis of publicly available data

Funding

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Author contributions

All authors conceptualised the paper. JLW and RMV planned the analyses and JLW downloaded the data and undertook the analysis. All authors contributed to interpreting the results. JLW lead the writing of the paper with contributions from RMV and IW

Transparency statement

We affirm that this manuscript is an honest, accurate and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Dissemination declaration

Dissemination of the results to study participants is not applicable for this population level analysis

Table 1 *Incidence rate ratio (IRR) with 95% confidence intervals for three year lagged mean number of deaths in UK compared with EU15+ in 2015[i] for 1-4 and 5-9 year olds (both sexes)*

	Both sexes 1 to 4						Both sexes 5 to 9					
	Deaths[ii]	% of total	IRR	p	lower CI	upper CI	Deaths[ii]	% of total	IRR	p	lower CI	upper CI
Communicable / neonatal												
Common infections	85	16.2	2.08	<0.001	1.61	2.67	25	8.0	2.38	<0.001	1.48	3.83
Neonatal disorders	11	2.1	1.45	0.28	0.74	2.85	3	1.0	1.12	0.86	0.32	3.90
Other communicable	7	1.3	2.27	0.07	0.92	5.56						
Non-communicable diseases												
Neoplasms	93	17.8	0.94	0.58	0.75	1.17	106	34.4	0.91	0.34	0.74	1.11
Cardiovascular diseases	23	4.4	1.22	0.40	0.77	1.91	13	4.4	1.26	0.45	0.69	2.28
Chronic respiratory diseases	13	2.4	1.76	0.08	0.93	3.31	14	4.4	3.25	<0.001	1.66	6.37
Digestive diseases	11	2.0	1.85	0.09	0.91	3.74	9	2.8	2.52	0.02	1.12	5.65
Neurological disorders	50	9.5	1.23	0.20	0.90	1.67	19	6.2	0.87	0.56	0.53	1.40
DUBE[iii]	52	9.9	1.01	0.94	0.75	1.36	28	9.1	1.12	0.60	0.74	1.68
Other NCD	87	16.5	1.00	0.99	0.79	1.26	38	12.4	1.26	0.20	0.89	1.79
Injuries												
Transport injuries	23	4.4	0.60	0.02	0.39	0.93	23	7.5	0.68	0.08	0.44	1.05
Unintentional injuries	58	11.0	0.71	0.01	0.54	0.94	18	6.0	0.56	0.02	0.35	0.90
Interpersonal Violence	6	1.2	0.46	0.06	0.20	1.02	4	1.4	0.53	0.21	0.20	1.44

Causes contributing to less than 1% of total deaths are not shown. Causes where there were significant differences in mortality between the UK and EU15+ are highlighted in red.

[i] For EU15+ countries without data to 2015, we used lagged mean number of deaths over the three years prior to the latest available data year in poisson regression models for all countries except Greece, where data were only available for 2014. [ii]Mean annual number of deaths between 2013 and 2015 in the UK. [iii] Diabetes, urogenital, blood, endocrine disorders.

Table 2 *Incidence rate ratio (IRR) with 95% confidence intervals for three year lagged mean number of deaths in UK compared with EU15+ in 2015[i] for 10-14 year olds by sex*

	Males 10 to 14						Females 10 to 14					
	Deaths[ii]	% of total	IRR	p	lower CI	upper CI	Deaths[ii]	% of total	IRR	p	lower CI	upper CI
Communicable / maternal												
Common infections	12	6.3	3.02	<0.001	1.51	6.06	6	4.6	1.75	0.21	0.73	4.21
Non-communicable diseases												
Neoplasms	52	27.2	0.94	0.68	0.70	1.26	36	25.9	0.80	0.21	0.57	1.13
Cardiovascular diseases	11	5.9	1.24	0.52	0.65	2.35	8	5.6	1.10	0.81	0.51	2.36
Chronic respiratory diseases	11	5.7	3.65	<0.001	1.72	7.77	9	6.7	4.29	<0.001	1.85	9.95
Digestive diseases	3	1.6	2.45	0.18	0.66	9.15	4	3.2	3.87	0.03	1.17	12.77
Neurological disorders	13	6.7	1.13	0.69	0.62	2.05	12	8.2	1.26	0.47	0.67	2.38
DUBE[iii]	14	7.5	1.25	0.45	0.70	2.20	15	10.9	1.34	0.31	0.77	2.32
Other NCD	15	7.8	1.03	0.91	0.59	1.79	16	11.7	1.12	0.68	0.66	1.89
Injuries												
Transport injuries	30	15.8	1.04	0.85	0.70	1.53	13	9.3	0.79	0.42	0.44	1.41
Unintentional injuries	15	7.9	0.87	0.62	0.51	1.50	8	5.3	0.96	0.91	0.44	2.07
Self-harm	10	5.2	0.56	0.08	0.29	1.06	9	6.7	0.61	0.15	0.31	1.19
Interpersonal Violence	2	1.0	0.61	0.52	0.14	2.74	2	1.2	0.51	0.41	0.10	2.54

Causes contributing to less than 1% of total deaths are not shown. Causes where there were significant differences in mortality between the UK and EU15+ are highlighted in red.

[i] For EU15+ countries without data to 2015, we used lagged mean number of deaths over the three years prior to the latest available data year in poisson regression models for all countries except Greece, where data were only available for 2014. [ii] Mean annual number of deaths between 2013 and 2015 in the UK. [iii] Diabetes, urogenital, blood, endocrine disorders.

Table 3 *Incidence rate ratio (IRR) with 95% confidence intervals for three year lagged mean number of deaths in UK compared with EU15+ in 2015[i] for 15-19 year olds by sex*

	Males 15-19						Females 15-19					
	Deaths[ii]	% of total	IRR	p	lower CI	upper CI	Deaths[ii]	% of total	IRR	p	lower CI	upper CI
Communicable / maternal												
Common infections	15	2.5	2.14	0.01	1.19	3.86	17	5.3	2.91	<0.001	1.62	5.21
Non-communicable diseases												
Neoplasms	81	13.1	0.94	0.60	0.74	1.19	63	19.6	1.04	0.75	0.80	1.37
Cardiovascular diseases	29	4.7	1.18	0.43	0.79	1.75	16	5.0	1.18	0.54	0.69	2.02
Chronic respiratory diseases	8	1.3	1.54	0.28	0.70	3.37	8	2.6	2.68	0.02	1.17	6.09
Digestive diseases	7	1.1	2.19	0.08	0.90	5.32	8	2.6	3.60	0.0041	1.50	8.62
Neurological disorders	43	6.9	1.60	0.01	1.14	2.25	27	8.4	2.02	0.002	1.30	3.12
DUBE[iii]	30	4.7	1.74	0.01	1.15	2.62	30	9.4	1.81	0.0045	1.20	2.72
MSK[iv]							4	1.4	3.42	0.04	1.05	11.12
Other NCD	16	2.6	0.85	0.54	0.50	1.43	18	5.5	1.15	0.58	0.69	1.93
Injuries												
Transport injuries	152	24.4	0.70	<0.001	0.59	0.83	57	17.8	0.77	0.07	0.59	1.02
Unintentional injuries	53	8.5	0.92	0.56	0.69	1.23	13	4.1	1.05	0.87	0.59	1.89
Self-harm	168	27.0	1.05	0.55	0.89	1.24	51	15.7	0.70	0.02	0.52	0.94
Interpersonal Violence	8	1.2	0.46	0.04	0.22	0.96						

Causes contributing to less than 1% of total deaths are not shown. Causes where there were significant differences in mortality between the UK and EU15+ are highlighted in red.

[i] For EU15+ countries without data to 2015, we used lagged mean number of deaths over the three years prior to the latest available data year in poisson regression models for all countries except Greece, where data were only available for 2014. [ii] Mean annual number of deaths between 2013 and 2015 in the UK. [iii] Diabetes, urogenital, blood, endocrine disorders; [iv] Musculoskeletal disorders

Table 4 *UK rank for three year lagged mean mortality rate per 100,000 compared with 17 EU15+ countries in 2015*[i]

	1 to 4 Both sexes	5 to 9 Both sexes	10 to 14 Male	10 to 14 Female	15 to 19 Male	15 to 19 Female
Communicable / maternal						
Common infections	17	18	17	16	18	18
Neonatal disorders	15	11				
Other communicable	15					
Non-communicable diseases						
Neoplasms	12	6	7	6	9	14
Cardiovascular diseases	16	15	13	12	15	12
Chronic respiratory diseases	15	18	18	18	16	18
Digestive diseases	17	18	17	16	15	18
Neurological disorders	13	7	14	13	17	17
DUBE[ii]	13	10	14	14	17	17
MSK[iii]						18
Other NCD	10	15	12	13	7	10
Injuries						
Transport injuries	5	5	11	8	7	8
Unintentional injuries	6	3	9	10	9	10
Self-harm			6	7	11	6
Interpersonal violence	3	6	7	8	6	

Causes contributing to less than 1% of total deaths are not shown. Cells are shaded according to UK mortality rank compared with 17 EU15+ countries from green (1 = lowest mortality) to yellow/orange (9.5 = median mortality) to red (18 = highest mortality) [i] Rank was calculated using three year lagged mean mortality rate per 100,000 for 2015 in the UK compared with all EU15+ countries except Greece. For EU15+ countries without data to 2015, we used lagged mean mortality rate over the three years prior to the latest available data year. [ii]Diabetes, urogenital, blood, endocrine disorders; [iii]Musculoskeletal disorders.

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