Global burden of diseases, injuries, and risk factors for young people's health during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013

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Summary

Background Young people's health has emerged as a neglected yet pressing issue in global development. Changing patterns of young people's health have the potential to undermine future population health as well as global economic development unless timely and effective strategies are put into place. We report the past, present, and anticipated burden of disease in young people aged 10–24 years from 1990 to 2013 using data on mortality, disability, injuries, and health risk factors.

Methods The Global Burden of Disease Study 2013 (GBD 2013) includes annual assessments for 188 countries from 1990 to 2013, covering 306 diseases and injuries, 1233 sequelae, and 79 risk factors. We used the comparative risk assessment approach to assess how much of the burden of disease reported in a given year can be attributed to past exposure to a risk. We estimated attributable burden by comparing observed health outcomes with those that would have been observed if an alternative or counterfactual level of exposure had occurred in the past. We applied the same method to previous years to allow comparisons from 1990 to 2013. We cross-tabulated the quantiles of disability-adjusted life-years (DALYs) by quintiles of DALYs annual increase from 1990 to 2013 to show rates of DALYs increase by burden. We used the GBD 2013 hierarchy of causes that organises 306 diseases and injuries into four levels of classification. Level one distinguishes three broad categories: first, communicable, maternal, neonatal, and nutritional disorders; second, non-communicable diseases; and third, injuries. Level two has 21 mutually exclusive and collectively exhaustive categories, level three has 163 categories, and level four has 254 categories.

Findings The leading causes of death in 2013 for young people aged 10–14 years were HIV/AIDS, road injuries, and drowning (25·2%), whereas transport injuries were the leading cause of death for ages 15–19 years (14·2%) and 20–24 years (15·6%). Maternal disorders were the highest cause of death for young women aged 20–24 years (17·1%) and the fourth highest for girls aged 15–19 years (11·5%) in 2013. Unsafe sex as a risk factor for DALYs increased from the 13th rank to the second for both sexes aged 15–19 years from 1990 to 2013. Alcohol misuse was the highest risk factor for DALYs (7·0% overall, 10·5% for males, and 2·7% for females) for young people aged 20–24 years, whereas drug use accounted for 2·7% (3·3% for males and 2·0% for females). The contribution of risk factors varied between and within countries. For example, for ages 20–24 years, drug use was highest in Qatar and accounted for 4·9% of DALYs, followed by 4·8% in the United Arab Emirates, whereas alcohol use was highest in Russia and accounted for 21·4%, followed by 21·0% in Belarus. Alcohol accounted for 9·0% (ranging from 4·2% in Hong Kong to 11·3% in Shandong) in China and 11·6% (ranging from 10·1% in Aguascalientes to 14·9% in Chihuahua) of DALYs in Mexico for young people aged 20–24 years. Alcohol and drug use in those aged 10–24 years had an annual rate of change of >1·0% from 1990 to 2013 and accounted for more than 3·1% of DALYs.

Interpretation Our findings call for increased efforts to improve health and reduce the burden of disease and risks for diseases in later life in young people. Moreover, because of the large variations between countries in risks and burden, a global approach to improve health during this important period of life will fail unless the particularities of each country are taken into account. Finally, our results call for a strategy to overcome the financial and technical barriers to adequately capture young people's health risk factors and their determinants in health information systems.

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Research in context

Evidence before this study

The Global Burden of Disease Study 2010 (GBD 2010) became available in 2012. GBD 2010 reported on disability-adjusted life-years, health-adjusted life expectancy, and 67 risks and risk clusters by 21 world regions and 188 countries. GBD 2010 covered 20 age and sex groups.

Added value of this study

The Global Burden of Disease Study 2013 (GBD 2013) includes an annual assessment covering 188 countries, from 1990 to 2013. The study covers 306 diseases and injuries, 1233 sequelae, and 79 risk factors. GBD 2013 included key method changes, such as the inclusion of new data through updated systematic reviews and through the contribution of unpublished data sources from many collaborators; the use of a counterfactual approach for estimating causes of diarrhoea and pneumonia; elaboration of the sequelae list to include asymptomatic states; use of more detailed nature of injury codes (N-codes); improvements to the Bayesian meta-regression method; increased simulation size for comorbidity; estimation of the prevalence of injuries by cohort; and use of a novel method to estimate the distribution of mild, moderate, and severe anaemia by cause. In this study, we used GBD 2013 data and focused on the health of young people aged 10–24 years.

Implications of all the available evidence

This study provides a comprehensive description of burden of disease for young people worldwide. It shows that injuries, mental health disorders, and sexual and reproductive health problems are leading causes of morbidity and mortality in young people. Our study shows that young people face several health challenges. Moreover, there are wide variations in cause and burden by sex, age, country, regions, and within countries. Because many of the causes of death and their risk factors develop during adolescence, our study calls for renewed efforts to improve health and reduce the burden of disease in young people.

Introduction

The health of young people (defined here as those aged between 10 and 24 years)[1] has emerged as a neglected yet pressing issue in global development.[2,3] Young people's health has the potential to affect future population health as well as global economic development unless timely and effective strategies are put into place.[4–7] Rapid declines in fertility, increasing survival through infancy and childhood, and greater longevity in many parts of the world have led to this generation of young people in developing countries being the largest in human history.[8] In low-income countries, this cohort will decrease the dependency ratio and bring the prospect of a demographic dividend and economic prosperity. By contrast, many high-income countries that have already undergone a demographic transition now have a youth deficit that poses a threat to economic development.[9–11] In both contexts, the health and wellbeing of this generation of young people, as well as that of the generation they parent, will be an important determinant of the economic future of nations.

Maximisation of health at all stages of life has been framed as the overarching health objective for the Sustainable Development Goals (SDGs),[12] and youth activists (younger than 30 years) have been involved in the process of developing these goals during the past few years.[13] Despite commitments to all age groups in the SDGs, young people have traditionally been neglected in global health and health measurement. The decrease in mortality in young people was much lower than that of young children aged younger than 5 years over a recent 50-year period.[14] Greater emphasis is needed on the potential contribution that investments in youth health can provide in terms of health benefits and economic gains across generations.[15,16] Moreover, the Global Burden of Disease 2010 study[17–21] showed the significant burden of disease due to mental disorders, injuries, sexually transmitted diseases, and non-communicable disease (NCD) risks that arise during youth, but which increase their effect on health later in life. For example, the rates of sexually transmitted infections (STIs) are highest in people younger than 25 years. To address these health issues in young people will not only have benefits across the lifespan of the young people affected, but also the health and wellbeing of the next generation, given that many of these young people are about to enter into parenthood.

Our knowledge of many risk factors is lacking in this age group, especially for those associated with mental health. The major health and nutrition surveys have generally started from the age of 15 years (eg, household surveys) or in some instances, 25 years, with few data for the 10–14-year-old age group. The emphasis in many household surveys, such as the Demographic and Health Surveys (DHS), has been on married women, with unmarried girls and boys poorly represented. Many concerns about privacy in doing these surveys have been raised, which has reduced the extent to which sensitive information is collected from younger age groups. More recent school-based surveys, such as the ongoing Centers for Disease Control and Prevention's Global School-based Student Survey (GSHS), have given coverage to lower ages of young people attending school (ie, ages 10–17 years), but many young people who are out of school are still not included. This shortage of coverage is especially true in low-income and middle-income countries where retention rates, even for early secondary school, remain low. This is especially problematic because young people from poor backgrounds face higher health risks,

such as early pregnancies and poor outcomes from pregnancies.[22,23]

In this Article, we report the burden of diseases, injuries, and risk factors for individuals aged 10–24 years from 1990 to 2013 in 188 countries. This age range covers the groups defined by the United Nations Department of Economic and Social Affairs (UNDESA) as adolescents (ages 10–19 years), youths (ages 15–24 years), and young people (ages 10–24 years).[21]

Methods

Overview

The Global Burden of Disease Study 2013 (GBD 2013) includes annual assessments for 188 countries from 1990 to 2013. The study covers 306 diseases and injuries, 1233 sequelae, and 79 risk factors. Detailed descriptions of the methods and approach of GBD 2013 have been reported previously.[17–21,24–27] Key methodological changes from the Global Burden of Disease Study 2010 (GBD 2010) are the inclusion of new data from updated systematic reviews and from the contribution of unpublished data sources from many collaborators; the use of a counterfactual approach to estimate causes of diarrhoea and pneumonia; elaboration of the sequelae list to include asymptomatic states; use of more detailed nature of injury codes (N-codes); improvements to the Bayesian meta-regression method; increased simulation size for comorbidity; estimation of the prevalence of injuries by cohort; and use of a new method to estimate the distribution of mild, moderate, and severe anaemia by cause.

Mortality

Wang and colleagues' method[28] was used to calculate the child mortality rate and adult mortality rate under the influence of natural disasters and armed conflicts. We used the comparative risk assessment approach to assess how much of the burden of disease reported in a given year can be attributed to past exposure to a risk.[17,21,27]

Risk factors

We estimated attributable burden by comparing observed health outcomes with those that would have been observed if an alternative or counterfactual level of exposure had occurred in the past. We used the exposure level that minimises risk for the population, termed the theoretical minimum risk exposure level (TMREL). We avoided double counting in the presentation of overall results by computing the overlap for joint risk distributions: behavioural risks alone, environmental and occupational risks alone, metabolic risks alone, behavioural and environmental or occupational risks together, behavioural and metabolic risks together, environmental and occupational and metabolic risks together, and all three groups together.[17,21,27] We report 95% uncertainty intervals (UI) for each quantity in our analysis.[17–21,24–27] We applied the same method to previous years to allow comparisons from 1990 to 2013.

Disability-adjusted life years (DALY)

We cross-tabulated the quantiles of disability-adjusted life-years (DALYs) by quintiles of DALYs annual increase from 1990 to 2013 to show rates of DALYs increase by burden. Figure 1 shows the number of unique data sources used in GBD 2013 for risk factors. Most of the data sources for people aged 15–19 years were from school-based surveys. Children younger than 5 years had the most data available and adolescents aged 10–14 years had the fewest data sources, hence we have been unable to provide as much information on coverage and risk factors for this age group.

GBD cause level

GBD 2013 uses a hierarchy of causes that organises 306 diseases and injuries into four levels of classification, the rationale for which has been described previously in our Global Burden of Disease (GBD) articles.[21] Level one distinguishes three broad categories: first, communicable, maternal, neonatal, and nutritional disorders; second, non-communicable diseases; and third, injuries. Level two has 21 mutually exclusive and collectively exhaustive categories, level three has 163 categories, and level four has 254 categories. In our study we present level three findings.

Results

The leading causes of death for ages 10–14 years, 15–19 years, and 20–24 years by sex and total (ages 10–24 years) for the years 1990, 2005, and 2013 are presented in table 1 and the appendix p 1). The leading cause of death in 2013 for males aged 10–24 years was road injuries (18·3% [95% UI 16·6–19·7]) followed by self-harm (7·8% [5·9–9·3]), whereas HIV/AIDS was the leading cause for females (7·5% [6·7–8·5]) followed by self-harm (7·4% [5·8–9·4]). Causes of death in young people varied by age and sex. The leading causes of death in 2013 for young people aged 10–14 years were HIV/AIDS, road injuries,

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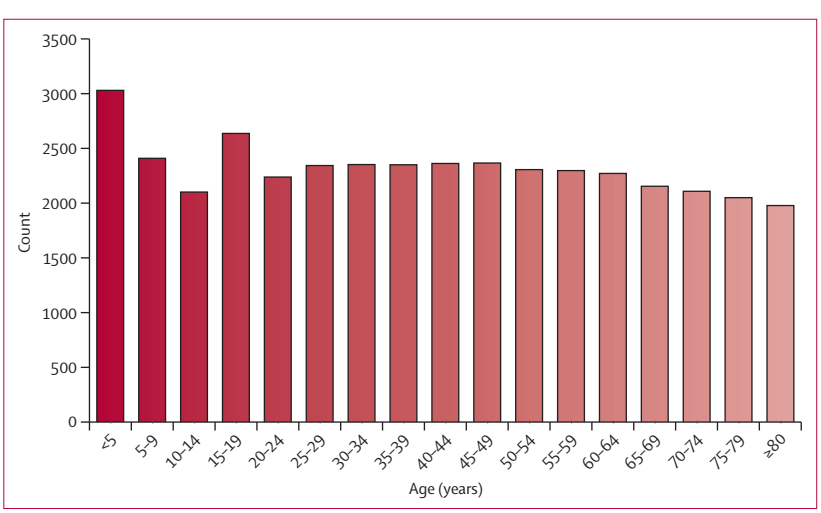

Figure 1: **Number of unique risk factor data sources by age group**

	Deaths in 10–14 year olds			Deaths in 15–19 year olds			Deaths in 20–24 year olds		
	1990	2005	2013	1990	2005	2013	1990	2005	2013
Males									
1	Drowning 10·8% (8·4–13·0)	Road injuries 10·0% (8·6–11·2)	Road injuries 9·8% (8·5–11·1)	Road injuries 17·5% (16·1–19·5)	Road injuries 19·6% (18·0–21·4)	Road injuries 18·7% (16·8–20·8)	Road injuries 18·2% (16·9–20·3)	Road injuries 20·7% (18·7–22·2)	Road injuries 21·1% (18·8–23·0)
2	Road injuries 9·4% (8·5–10·5)	Drowning 9·5% (7·9–11·4)	HIV/AIDS 9·5% (8·8–10·3)	Self-harm 7·3% (6·0–8·6)	Self-harm 7·9% (6·0–9·4)	Interpersonal violence 7·8% (5·3–9·3)	Self-harm 9·4% (7·3–10·6)	Self-harm 10·1% (7·4–11·9)	Self-harm 10·1% (7·6–12·4)
3	Diarrhoeal diseases 6·4% (5·4–7·6)	Intestinal infectious diseases 6·5% (3·6–10·4)	Drowning 8·3% (6·7–11·4)	Drowning 7·2% (5·7–8·7)	Interpersonal violence 7·6% (5·3–9·3)	Self-harm 7·4% (5·7–9·4)	Interpersonal violence 8·2% (6·0–10·1)	Interpersonal violence 9·3% (6·6–10·9)	Interpersonal violence 9·2% (6·4–11·0)
4	Intestinal infectious diseases 5·8% (3·2–9·3)	HIV/AIDS 5·9% (5·4–6·5)	Intestinal infectious diseases 6·5% (3·5–10·5)	Interpersonal violence 6·8% (4·9–8·6)	Drowning 6·3% (5·2–7·9)	Drowning 5·9% (4·7–7·9)	Tuberculosis 6·6% (5·7–7·8)	Tuberculosis 5·4% (4·5–6·3)	Tuberculosis 4·8% (3·8–5·8)
5	Lower respiratory infections 5·7% (4·6–6·8)	Malaria 5·7% (4·6–6·9)	Lower respiratory infections 4·7% (3·6–6·3)	Tuberculosis 4·6% (3·8–5·4)	Intestinal infectious diseases 3·2% (1·6–5·6)	HIV/AIDS 5·4% (4·6–6·2)	Drowning 4·8% (3·7–5·7)	Drowning 4·1% (3·3–5·3)	Drowning 4·1% (3·2–5·6)
6	Malaria 5·3% (4·3–6·3)	Diarrhoeal diseases 5·0% (3·9–6·3)	Diarrhoeal diseases 4·2% (3·0–5·8)	Diarrhoeal diseases 3·6% (3·0–4·2)	Tuberculosis 3·2% (2·7–3·9)	Intestinal infectious diseases 3·1% (1·5–5·5)	Ischaemic heart disease 2·8% (2·4–3·3)	Ischaemic heart disease 2·7% (2·3–3·3)	Ischaemic heart disease 3·0% (2·5–3·7)
7	Meningitis 2·9% (2·3–3·5)	Lower respiratory infections 4·6% (3·6–6·0)	Malaria 3·9% (2·7–6·1)	Intestinal infectious diseases 3·3% (1·8–5·5)	Lower respiratory infections 2·7% (2·1–3·5)	Tuberculosis 2·9% (2·2–3·7)	Diarrhoeal diseases 2·6% (2·1–3·0)	Exposure to mechanical forces 2·4% (2·1–2·9)	HIV/AIDS 2·5% (2·1–3·1)
8	Tuberculosis 2·7% (2·3–3·3)	Haemoglobinopathies and haemolytic anaemias 2·6% (0·8–5·8)	Haemoglobinopathies and haemolytic anaemias 3·2% (0·8–7·5)	Lower respiratory infections 3·0% (2·4–3·5)	Malaria 2·6% (2·1–3·2)	Lower respiratory infections 2·9% (2·1–3·8)	Exposure to mechanical forces 2·5% (2·1–3·2)	HIV/AIDS 2·4% (1·8–3·3)	Exposure to mechanical forces 2·4% (2·0–3·0)
9	Leukaemia 2·4% (2·2–2·7)	Congenital anomalies 2·6% (2·2–3·0)	Congenital anomalies 2·9% (2·4–3·5)	Malaria 2·3% (1·9–2·9)	Diarrhoeal diseases 2·4% (1·9–3·0)	Ischaemic heart disease 2·2% (1·7–2·7)	Cerebrovascular disease 2·2% (1·8–2·7)	Malaria 2·2% (1·8–2·8)	Lower respiratory infections 2·1% (1·7–2·7)
10	Measles 2·3% (1·2–4·0)	Leukaemia 2·4% (2·1–2·6)	Meningitis 2·4% (1·8–3·0)	Exposure to mechanical forces 2·3% (1·9–3·0)	Exposure to mechanical forces 2·2% (1·9–2·6)	Exposure to mechanical forces 2·1% (1·7–2·6)	Lower respiratory infections 2·2% (1·8–2·5)	Lower respiratory infections 2·1% (1·7–2·6)	Falls 2·1% (1·7–2·7)
Females									
1	Diarrhoeal diseases 9·3% (7·5–11·1)	Diarrhoeal diseases 7·1% (5·5–9·3)	HIV/AIDS 11·6% (10·7–12·6)	Self-harm 8·8% (7·5–10·1)	Self-harm 9·9% (7·5–12·9)	Self-harm 9·8% (7·1–12·9)	Tuberculosis 9·1% (7·8–10·8)	Tuberculosis 8·5% (6·9–9·9)	Self-harm 8·1% (5·8–11·1)
2	Lower respiratory infections 7·7% (6·4–9·2)	HIV/AIDS 7·1% (6·5–7·6)	Intestinal infectious diseases 6·7% (3·6–10·7)	Tuberculosis 6·8% (5·7–8·2)	Road injuries 8·0% (6·8–9·0)	Road injuries 7·6% (6·3–8·8)	Self-harm 9·0% (7·4–10·4)	Self-harm 7·7% (5·9–9·9)	Road injuries 7·0% (5·7–8·1)
3	Intestinal infectious diseases 5·9% (3·3–9·7)	Malaria 7·0% (5·8–8·5)	Road injuries 6·1% (4·9–7·1)	Road injuries 6·6% (5·9–7·8)	Tuberculosis 5·6% (4·2–6·7)	HIV/AIDS 7·5% (6·4–8·7)	Road injuries 5·3% (4·7–6·3)	Road injuries 6·3% (5·3–7·1)	Tuberculosis 6·8% (5·2–8·4)
4	Drowning 5·7% (4·3–7·0)	Intestinal infectious diseases 6·2% (3·4–10·3)	Lower respiratory infections 5·6% (4·3–7·0)	Fire, heat, and hot substances 5·6% (4·1–7·6)	Diarrhoeal diseases 4·2% (3·3–5·4)	Tuberculosis 4·4% (3·3–5·6)	Fire, heat, and hot substances 4·9% (3·6–6·6)	HIV/AIDS 5·3% (4·1–7·0)	HIV/AIDS 5·7% (4·8–7·0)
5	Malaria 5·6% (4·5–6·7)	Lower respiratory infections 5·9% (4·8–7·5)	Malaria 5·4% (3·3–7·2)	Diarrhoeal diseases 5·2% (4·3–6·3)	Fire, heat, and hot substances 4·0% (2·7–6·1)	Fire, heat, and hot substances 3·9% (2·5–6·1)	Diarrhoeal diseases 4·8% (4·0–5·7)	Diarrhoeal diseases 4·1% (3·3–5·0)	Fire, heat, and hot substances 3·8% (2·5–5·9)
6	Road injuries 5·3% (4·6–6·3)	Road injuries 5·9% (4·8–6·8)	Diarrhoeal diseases 5·3% (3·8–7·3)	Lower respiratory infections 3·5% (2·9–4·2)	Malaria 3·6% (2·9–4·6)	Intestinal infectious diseases 3·8% (2·0–6·7)	Other maternal disorders 3·6% (2·9–4·6)	Fire, heat, and hot substances 3·4% (2·4–4·9)	Other maternal disorders 3·3% (2·7–4·1)
7	Tuberculosis 4·7% (3·9–5·8)	Drowning 5·1% (4·0–6·8)	Drowning 4·6% (3·6–6·6)	Intestinal infectious diseases 3·2% (1·6–5·4)	Intestinal infectious diseases 3·5% (1·8–6·0)	Diarrhoeal diseases 3·3% (2·4–4·6)	Maternal haemorrhage 3·5% (3·1–4·1)	Lower respiratory infections 3·3% (2·7–4·1)	Diarrhoeal diseases 3·3% (2·5–4·2)

(Table 1 continues on next page)

	Deaths in 10–14 year olds			Deaths in 15–19 year olds			Deaths in 20–24 year olds		
	1990	2005	2013	1990	2005	2013	1990	2005	2013
(Continued from previous page)									
8	Meningitis 3·5% (2·8–4·3)	Tuberculosis 3·6% (2·6–4·4)	Haemoglobinopathies and haemolytic anaemias 3·9% (1·7–6·9)	Drowning 3·0% (2·1–3·7)	Lower respiratory infections 3·2% (2·7–4·0)	Malaria 3·1% (2·1–4·4)	Lower respiratory infections 2·9% (2·4–3·5)	Malaria 3·3% (2·6–4·2)	Lower respiratory infections 3·1% (2·5–3·8)
9	Measles 2·9% (1·5–5·1)	Haemoglobinopathies and haemolytic anaemias 3·1% (1·3–5·5)	Congenital anomalies 3·5% (2·8–4·2)	Malaria 2·7% (2·1–3·3)	HIV/AIDS 3·1% (2·5–3·8)	Lower respiratory infections 3·1% (2·4–3·9)	Complications of abortion 2·6% (2·3–3·0)	Other maternal disorders 3·2% (2·8–3·7)	Malaria 2·8% (1·6–4·1)
10	Congenital anomalies 2·6% (2·1–3·3)	Congenital anomalies 3·0% (2·5–3·7)	Meningitis 2·9% (2·2–3·7)	Other maternal disorders 2·5% (1·9–3·3)	Drowning 2·4% (1·9–3·5)	Drowning 2·3% (1·6–3·6)	Late maternal deaths 2·4% (1·8–3·1)	Maternal haemorrhage 2·8% (2·3–3·3)	Complications of abortion 2·6% (2·2–3·1)
Total									
1	Drowning 8·4% (6·5–9·7)	Road injuries 8·1% (7·1–9·0)	HIV/AIDS 10·4% (9·7–11·2)	Road injuries 12·6% (11·7–13·9)	Road injuries 14·7% (13·6–15·8)	Road injuries 14·2% (12·9–15·6)	Road injuries 12·6% (11·8–14·0)	Road injuries 14·6% (13·5–15·5)	Road injuries 15·6% (14·1–16·9)
2	Diarrhoeal diseases 7·8% (6·7–8·9)	Drowning 7·5% (6·5–8·7)	Road injuries 8·1% (7·2–9·0)	Self-harm 7·9% (7·0–9·0)	Self-harm 8·8% (7·3–10·3)	Self-harm 8·4% (6·8–10·2)	Self-harm 9·2% (8·0–10·1)	Self-harm 9·1% (7·4–10·4)	Self-harm 9·3% (7·4–11·3)
3	Road injuries 7·5% (6·9–8·3)	HIV/AIDS 6·4% (5·9–7·0)	Drowning 6·7% (5·6–9·1)	Tuberculosis 5·6% (4·9–6·3)	Interpersonal violence 5·3% (3·9–6·2)	HIV/AIDS 6·2% (5·4–7·2)	Tuberculosis 7·7% (6·9–8·6)	Tuberculosis 6·7% (5·9–7·5)	Interpersonal violence 6·6% (4·9–7·9)
4	Lower respiratory infections 6·6% (5·7–7·6)	Intestinal infectious diseases 6·3% (3·6–10·1)	Intestinal infectious diseases 6·6% (3·7–10·4)	Drowning 5·3% (4·2–6·1)	Drowning 4·7% (4·0–5·8)	Interpersonal violence 5·5% (3·9–6·5)	Interpersonal violence 5·5% (4·3–6·7)	Interpersonal violence 6·4% (4·7–7·4)	Tuberculosis 5·6% (4·7–6·5)
5	Intestinal infectious diseases 5·9% (3·4–9·4)	Malaria 6·2% (5·4–7·2)	Lower respiratory infections 5·1% (4·3–6·1)	Interpersonal violence 4·6% (3·5–5·6)	Tuberculosis 4·2% (3·5–4·8)	Drowning 4·4% (3·7–6·0)	Diarrhoeal diseases 3·5% (3·1–4·0)	HIV/AIDS 3·6% (2·8–4·8)	HIV/AIDS 3·8% (3·2–4·5)
6	Malaria 5·4% (4·5–6·2)	Diarrhoeal diseases 6·0% (5·0–7·2)	Diarrhoeal diseases 4·7% (3·7–6·0)	Diarrhoeal diseases 4·3% (3·8–4·9)	Intestinal infectious diseases 3·3% (1·7–5·7)	Tuberculosis 3·5% (2·9–4·2)	Drowning 3·4% (2·7–4·0)	Drowning 2·9% (2·5–3·7)	Drowning 3·0% (2·4–4·3)
7	Tuberculosis 3·7% (3·2–4·3)	Lower respiratory infections 5·2% (4·4–6·2)	Malaria 4·6% (3·6–6·0)	Intestinal infectious diseases 3·3% (1·7–5·4)	Diarrhoeal diseases 3·2% (2·7–3·8)	Intestinal infectious diseases 3·4% (1·8–5·7)	Fire, heat, and hot substances 2·9% (2·3–3·6)	Malaria 2·7% (2·3–3·2)	Ischaemic heart disease 2·8% (2·3–3·4)
8	Meningitis 3·2% (2·7–3·7)	Tuberculosis 2·8% (2·2–3·3)	Haemoglobinopathies and haemolytic anaemias 3·5% (1·4–6·9)	Lower respiratory infections 3·2% (2·8–3·7)	Malaria 3·0% (2·6–3·6)	Lower respiratory infections 2·9% (2·4–3·6)	Ischaemic heart disease 2·6% (2·2–3·0)	Diarrhoeal diseases 2·7% (2·3–3·1)	Lower respiratory infections 2·5% (2·2–2·9)
9	Measles 2·6% (1·3–4·5)	Haemoglobinopathies and haemolytic anaemias 2·8% (1·2–5·3)	Congenital anomalies 3·2% (2·7–3·6)	Fire, heat, and hot substances 3·2% (2·5–4·1)	Lower respiratory infections 2·9% (2·5–3·4)	Diarrhoeal diseases 2·6% (2·0–3·2)	Lower respiratory infections 2·5% (2·2–2·8)	Lower respiratory infections 2·6% (2·3–3·1)	Fire, heat, and hot substances 2·2% (1·6–3·1)
10	Congenital anomalies 2·4% (2·0–2·8)	Congenital anomalies 2·8% (2·4–3·2)	Meningitis 2·6% (2·1–3·1)	Malaria 2·5% (2·1–3·0)	HIV/AIDS 2·4% (1·9–3·0)	Malaria 2·3% (1·8–3·1)	Cerebrovascular disease 2·1% (1·8–2·4)	Ischaemic heart disease 2·5% (2·1–3·0)	Diarrhoeal diseases 2·2% (1·8–2·6)

Data are proportion of deaths out of all deaths (95% uncertainty interval).

Table 1: **Top ten causes of death in males, females, and both for ages 10–14 years, 15–19 years, and 20–24 years, 1990, 2005, and 2013**

and drowning (25·2%), whereas transport injuries were the leading cause for ages 15–19 (14·2%) and 20–24 (15·6%; table 1, appendix p 4). Road injuries, HIV/AIDS, and drowning were the leading causes for males aged 10–14 (27·6%), whereas transport injuries were the leading cause for males aged 15–19 years (18·7%) and 20–24 years (21·1%) in 2013. Although HIV/AIDS, intestinal infectious diseases, and road injuries were the leading causes of death for females aged 10–14 years (24·4%), self-harm, road injuries, and HIV/AIDS were the leading causes of death for females aged 15–19 years (24·9%) in 2013, and self-harm, road injuries, and tuberculosis were the leading causes for ages 20–24 years (21·9%). It is important to note that if we combine all maternal disorders (ie, present our results at level two instead of level three), maternal disorders are the highest cause of death for females aged 20–24 years (17·1%) and the fourth highest for females aged 15–19 years (11·5%) in 2013.[29]

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	YLDs in 10–14 year olds			YLDs in 15–19 year olds			YLDs in 20–24 year olds		
	1990	2005	2013	1990	2005	2013	1990	2005	2013
Males									
1	Iron-deficiency anaemia 20·7% (18·7–22·3)	Iron-deficiency anaemia 19·4% (17·2–21·2)	Iron-deficiency anaemia 18·8% (16·6–20·5)	Skin and subcutaneous diseases 11·8% (8·2–17·2)	Skin and subcutaneous diseases 12·5% (8·5–18·3)	Skin and subcutaneous diseases 12·7% (8·8–18·7)	Low back and neck pain 13·3% (11·3–15·6)	Low back and neck pain 13·4% (11·5–15·8)	Low back and neck pain 14·0% (12·0–16·5)
2	Skin and subcutaneous diseases 9·3% (7·0–12·5)	Skin and subcutaneous diseases 10·1% (7·4–14·1)	Skin and subcutaneous diseases 10·3% (7·5–14·3)	Low back and neck pain 10·3% (8·6–12·3)	Low back and neck pain 10·5% (8·7–12·6)	Low back and neck pain 10·9% (9·1–13·1)	Skin and subcutaneous diseases 9·1% (6·3–13·3)	Depressive disorders 9·7% (6·7–12·8)	Depressive disorders 10·1% (6·9–13·4)
3	Conduct disorder 8·3% (5·7–11·2)	Conduct disorder 8·9% (6·2–11·9)	Conduct disorder 9·2% (6·5–12·2)	Depressive disorders 8·0% (5·2–11·0)	Depressive disorders 8·7% (5·8–12·0)	Depressive disorders 9·3% (6·2–12·7)	Depressive disorders 8·8% (6·0–11·8)	Skin and subcutaneous diseases 9·0% (6·3–13·2)	Skin and subcutaneous diseases 9·5% (6·6–14·0)
4	Intestinal nematode infections 5·0% (3·1–7·6)	Depressive disorders 5·5% (3·6–7·8)	Depressive disorders 5·9% (3·9–8·3)	Conduct disorder 7·6% (5·4–10·3)	Conduct disorder 8·1% (5·7–10·8)	Conduct disorder 8·3% (6·0–11·1)	Drug use disorders 5·1% (3·8–6·6)	Drug use disorders 5·0% (3·7–6·3)	Other mental and substance use disorders 4·9% (3·6–6·4)
5	Depressive disorders 5·0% (3·2–7·1)	Low back and neck pain 4·9% (3·9–6·1)	Low back and neck pain 5·1% (4·2–6·3)	Iron-deficiency anaemia 6·6% (5·3–8·1)	Iron-deficiency anaemia 4·3% (3·3–5·5)	Anxiety disorders 4·3% (2·8–6·4)	Other mental and substance use disorders 4·6% (3·4–6·1)	Other mental and substance use disorders 4·8% (3·5–6·2)	Drug use disorders 4·9% (3·7–6·3)
6	Low back and neck pain 4·7% (3·7–5·8)	Sense organ diseases 4·2% (3·4–5·3)	Sense organ diseases 4·2% (3·3–5·2)	Anxiety disorders 4·0% (2·5–6·1)	Anxiety disorders 4·1% (2·7–6·2)	Migraine 4·2% (2·8–5·8)	Migraine 3·9% (2·6–5·4)	Migraine 4·3% (2·9–5·8)	Migraine 4·3% (2·9–6·0)
7	Sense organ diseases 4·4% (3·5–5·3)	Asthma 4·0% (3·3–4·9)	Anxiety disorders 3·4% (1·9–5·4)	Sense organ diseases 3·8% (3·0–4·7)	Migraine 4·0% (2·7–5·6)	Sense organ diseases 3·6% (2·8–4·5)	Anxiety disorders 3·9% (2·4–6·0)	Anxiety disorders 3·9% (2·5–6·0)	Anxiety disorders 4·1% (2·5–6·3)
8	Asthma 3·6% (2·9–4·4)	Migraine 3·3% (2·1–4·6)	Asthma 3·4% (2·7–4·1)	Migraine 3·7% (2·4–5·3)	Sense organ diseases 3·6% (2·9–4·5)	Iron-deficiency anaemia 3·6% (2·7–4·6)	Alcohol use disorders 3·8% (3·0–4·8)	Alcohol use disorders 3·8% (3·0–4·8)	Alcohol use disorders 3·6% (2·8–4·5)
9	Migraine 3·1% (2·0–4·5)	Anxiety disorders 3·2% (1·8–5·2)	Migraine 3·3% (2·2–4·7)	Drug use disorders 3·5% (2·6–4·6)	Drug use disorders 3·5% (2·6–4·6)	Drug use disorders 3·4% (2·5–4·4)	Iron-deficiency anaemia 3·7% (2·9–4·8)	Sense organ diseases 3·4% (2·6–4·2)	Sense organ diseases 3·3% (2·6–4·2)
10	Anxiety disorders 3·1% (1·7–5·0)	Autistic spectrum disorders 3·2% (2·6–3·7)	Autistic spectrum disorders 3·2% (2·7–3·7)	Autistic spectrum disorders 2·9% (2·4–3·3)	Autistic spectrum disorders 3·0% (2·5–3·5)	Autistic spectrum disorders 3·0% (2·6–3·5)	Sense organ diseases 3·5% (2·7–4·3)	Autistic spectrum disorders 2·5% (2·1–2·8)	Autistic spectrum disorders 2·5% (2·2–2·9)
Females									
1	Iron-deficiency anaemia 17·5% (15·4–19·3)	Iron-deficiency anaemia 16·2% (13·9–18·0)	Iron-deficiency anaemia 15·6% (13·3–17·5)	Depressive disorders 11·8% (8·0–15·7)	Depressive disorders 12·3% (8·5–16·3)	Depressive disorders 13·0% (9·1–17·1)	Depressive disorders 12·7% (8·9–16·5)	Depressive disorders 13·4% (9·5–17·3)	Depressive disorders 13·8% (9·8–17·8)
2	Skin and subcutaneous diseases 9·0% (6·7–11·9)	Skin and subcutaneous diseases 9·8% (7·2–13·3)	Skin and subcutaneous diseases 9·8% (7·2–13·4)	Iron-deficiency anaemia 10·2% (8·4–12·0)	Skin and subcutaneous diseases 10·5% (7·3–15·1)	Skin and subcutaneous diseases 10·4% (7·2–15·0)	Low back and neck pain 11·9% (10·2–13·9)	Low back and neck pain 12·0% (10·4–14·0)	Low back and neck pain 11·8% (10·2–13·8)
3	Depressive disorders 8·0% (5·4–11·2)	Depressive disorders 8·6% (6·0–11·8)	Depressive disorders 9·1% (6·5–12·4)	Skin and subcutaneous diseases 10·1% (7·1–14·5)	Low back and neck pain 9·6% (8·1–11·3)	Low back and neck pain 9·1% (7·7–10·9)	Iron-deficiency anaemia 8·2% (6·6–9·9)	Skin and subcutaneous diseases 7·3% (5·2–10·4)	Skin and subcutaneous diseases 7·5% (5·3–10·8)
4	Anxiety disorders 6·2% (3·8–9·4)	Anxiety disorders 6·3% (3·9–9·5)	Anxiety disorders 6·7% (4·1–10·1)	Low back and neck pain 9·2% (7·7–11·0)	Iron-deficiency anaemia 8·1% (6·6–9·7)	Iron-deficiency anaemia 7·4% (5·9–8·9)	Skin and subcutaneous diseases 7·4% (5·3–10·6)	Iron-deficiency anaemia 6·7% (5·3–8·2)	Migraine 6·7% (4·5–9·1)
5	Migraine 5·7% (3·6–8·0)	Migraine 5·9% (3·8–8·3)	Migraine 6·2% (4·0–8·9)	Anxiety disorders 6·8% (4·7–10·0)	Anxiety disorders 6·9% (4·8–10·0)	Anxiety disorders 7·3% (5·1–10·5)	Migraine 6·3% (4·3–8·7)	Migraine 6·6% (4·5–9·0)	Anxiety disorders 6·5% (4·4–9·6)
6	Intestinal nematode infections 5·4% (3·5–8·2)	Low back and neck pain 5·0% (4·1–6·0)	Low back and neck pain 4·9% (4·0–6·0)	Migraine 6·1% (4·1–8·6)	Migraine 6·3% (4·2–8·6)	Migraine 6·5% (4·4–9·0)	Anxiety disorders 6·3% (4·2–9·4)	Anxiety disorders 6·3% (4·2–9·3)	Iron-deficiency anaemia 6·1% (4·8–7·5)

(Table 2 continues on next page)

	YLDs in 10–14 year olds			YLDs in 15–19 year olds			YLDs in 20–24 year olds		
	1990	2005	2013	1990	2005	2013	1990	2005	2013
(Continued from previous page)									
7	Low back and neck pain 4·7% (3·7–5·8)	Asthma 4·7% (3·8–5·7)	Conduct disorder 4·1% (2·9–5·5)	Sense organ diseases 3·0% (2·4–3·7)	Conduct disorder 3·1% (2·2–4·2)	Conduct disorder 3·1% (2·2–4·2)	Gynaecological diseases 3·7% (2·9–4·6)	Gynaecological diseases 3·7% (2·9–4·7)	Gynaecological diseases 3·9% (3·0–4·9)
8	Asthma 4·1% (3·3–5·0)	Conduct disorder 4·0% (2·8–5·4)	Asthma 3·8% (3·1–4·7)	Conduct disorder 3·0% (2·1–4·2)	Asthma 3·0% (2·4–3·6)	Sense organ diseases 2·8% (2·3–3·5)	Drug use disorders 3·0% (2·2–3·9)	Drug use disorders 2·9% (2·1–3·7)	Drug use disorders 2·8% (2·1–3·6)
9	Sense organ diseases 4·0% (3·2–4·8)	Sense organ diseases 3·9% (3·1–4·7)	Sense organ diseases 3·8% (3·0–4·6)	Asthma 2·7% (2·2–3·4)	Sense organ diseases 2·9% (2·4–3·6)	Asthma 2·7% (2·2–3·4)	Sense organ diseases 2·7% (2·2–3·3)	Sense organ diseases 2·6% (2·1–3·3)	Other mental and substance use disorders 2·5% (1·8–3·4)
10	Conduct disorder 3·8% (2·6–5·3)	Haemoglobinopathies and haemolytic anaemias 3·3% (2·9–3·6)	Haemoglobinopathies and haemolytic anaemias 3·5% (3·1–3·9)	Drug use disorders 2·3% (1·7–3·0)	Drug use disorders 2·2% (1·6–3·0)	Drug use disorders 2·1% (1·6–2·8)	Other mental and substance use disorders 2·5% (1·8–3·3)	Other mental and substance use disorders 2·5% (1·8–3·4)	Sense organ diseases 2·5% (2·0–3·2)
Total									
1	Iron-deficiency anaemia 19·2% (17·1–20·8)	Iron-deficiency anaemia 17·8% (15·6–19·7)	Iron-deficiency anaemia 17·2% (15·0–19·1)	Skin and subcutaneous diseases 10·9% (7·7–15·7)	Skin and subcutaneous diseases 11·5% (7·9–16·6)	Skin and subcutaneous diseases 11·5% (8·0–17·0)	Low back and neck pain 12·6% (10·8–14·7)	Low back and neck pain 12·7% (10·9–14·8)	Low back and neck pain 12·9% (11·1–15·0)
2	Skin and subcutaneous diseases 9·1% (6·9–12·2)	Skin and subcutaneous diseases 9·9% (7·3–13·7)	Skin and subcutaneous diseases 10·1% (7·4–13·8)	Depressive disorders 9·9% (6·6–13·4)	Depressive disorders 10·6% (7·2–14·2)	Depressive disorders 11·2% (7·6–15·1)	Depressive disorders 10·8% (7·5–14·3)	Depressive disorders 11·6% (8·1–15·3)	Depressive disorders 12·1% (8·4–15·8)
3	Depressive disorders 6·5% (4·3–9·1)	Depressive disorders 7·0% (4·8–9·6)	Depressive disorders 7·4% (5·2–10·3)	Low back and neck pain 9·7% (8·2–11·5)	Low back and neck pain 10·0% (8·5–11·9)	Low back and neck pain 10·0% (8·4–11·9)	Skin and subcutaneous diseases 8·2% (5·8–11·9)	Skin and subcutaneous diseases 8·1% (5·7–11·7)	Skin and subcutaneous diseases 8·4% (5·9–12·3)
4	Conduct disorder 6·1% (4·2–8·4)	Conduct disorder 6·5% (4·6–8·8)	Conduct disorder 6·7% (4·7–9·0)	Iron-deficiency anaemia 8·5% (6·9–10·1)	Iron-deficiency anaemia 6·3% (5·1–7·6)	Anxiety disorders 5·8% (4·0–8·5)	Iron-deficiency anaemia 6·0% (4·8–7·5)	Migraine 5·5% (3·8–7·5)	Migraine 5·6% (3·8–7·6)
5	Intestinal nematode infections 5·2% (3·3–7·9)	Low back and neck pain 4·9% (4·0–6·0)	Low back and neck pain 5·0% (4·1–6·2)	Anxiety disorders 5·4% (3·7–8·1)	Anxiety disorders 5·5% (3·8–8·1)	Conduct disorder 5·6% (4·0–7·6)	Migraine 5·1% (3·5–7·0)	Anxiety disorders 5·2% (3·4–7·8)	Anxiety disorders 5·4% (3·5–8·0)
6	Low back and neck pain 4·7% (3·7–5·7)	Anxiety disorders 4·7% (2·8–7·2)	Anxiety disorders 5·0% (3·0–7·6)	Conduct disorder 5·3% (3·7–7·2)	Conduct disorder 5·5% (3·9–7·4)	Iron-deficiency anaemia 5·5% (4·4–6·8)	Anxiety disorders 5·1% (3·3–7·8)	Iron-deficiency anaemia 4·6% (3·6–5·8)	Iron-deficiency anaemia 4·0% (3·2–5·1)
7	Anxiety disorders 4·6% (2·6–7·1)	Migraine 4·5% (3·0–6·4)	Migraine 4·7% (3·1–6·7)	Migraine 5·0% (3·3–6·9)	Migraine 5·2% (3·5–7·1)	Migraine 5·4% (3·6–7·5)	Drug use disorders 4·0% (2·9–5·2)	Drug use disorders 3·9% (2·9–4·9)	Drug use disorders 3·8% (2·9–4·9)
8	Migraine 4·3% (2·8–6·2)	Asthma 4·3% (3·5–5·3)	Sense organ diseases 4·0% (3·1–4·9)	Sense organ diseases 3·4% (2·8–4·2)	Sense organ diseases 3·3% (2·6–4·0)	Sense organ diseases 3·2% (2·5–3·9)	Other mental and substance use disorders 3·5% (2·7–4·5)	Other mental and substance use disorders 3·6% (2·7–4·6)	Other mental and substance use disorders 3·7% (2·8–4·7)
9	Sense organ diseases 4·2% (3·4–5·1)	Sense organ diseases 4·1% (3·3–5·0)	Asthma 3·6% (2·9–4·4)	Drug use disorders 2·9% (2·1–3·8)	Asthma 3·0% (2·4–3·6)	Asthma 2·7% (2·2–3·4)	Sense organ diseases 3·1% (2·4–3·8)	Sense organ diseases 3·0% (2·3–3·7)	Sense organ diseases 2·9% (2·3–3·6)
10	Asthma 3·8% (3·1–4·7)	Haemoglobinopathies and haemolytic anaemias 2·7% (2·4–3·0)	Haemoglobinopathies and haemolytic anaemias 2·9% (2·5–3·1)	Asthma 2·7% (2·2–3·4)	Drug use disorders 2·8% (2·1–3·7)	Drug use disorders 2·7% (2·0–3·5)	Alcohol use disorders 2·3% (1·8–2·9)	Bipolar disorder 2·4% (1·5–3·4)	Bipolar disorder 2·4% (1·6–3·5)

Data are percentage proportion of YLDs out of all YLDs (95% uncertainty intervals).

Table 2: **Top ten causes of years lost due to disability (YLDs) in males, females, and both for ages 10–14 years, 15–19 years, and 20–24 years, 1990, 2005, and 2013**

The causes of death varied by country and region for young people, with the most marked variations for communicable, nutritional, and maternal disorders (appendix p 8).[29] Mortality decreased for all age groups from 1990 to 2013. However, the slowest decline was observed in young males, and the difference in decrease by sex started at age 10 years (appendix p 5). Global mortality decreased for young people aged 10–24 years but at a lower rate than that of those aged 0–9 years. The difference in mortality decrease for females and males, especially in young adults and young people, is striking.

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	DALYs in 10–14 year olds			DALYs in 15–19 year olds			DALYs in 20–24 year olds		
	1990	2005	2013	1990	2005	2013	1990	2005	2013
Males									
1	Iron-deficiency anaemia 10·1% (8·1–12·4)	Iron-deficiency anaemia 10·4% (8·3–12·6)	Iron-deficiency anaemia 10·7% (8·7–12·9)	Road injuries 11·0% (9·5–12·7)	Road injuries 11·7% (10·1–13·5)	Road injuries 10·7% (9·1–12·5)	Road injuries 12·2% (10·8–13·9)	Road injuries 13·6% (12·0–15·3)	Road injuries 13·1% (11·2–14·9)
2	Drowning 5·7% (4·3–7·1)	Skin and subcutaneous diseases 5·3% (3·6–7·7)	Skin and subcutaneous diseases 5·8% (4·0–8·2)	Skin and subcutaneous diseases 4·8% (3·1–7·3)	Skin and subcutaneous diseases 5·4% (3·5–8·2)	Skin and subcutaneous diseases 5·8% (3·7–8·6)	Self-harm 5·9% (4·6–7·0)	Self-harm 6·3% (4·7–7·6)	Self-harm 6·0% (4·3–7·5)
3	Road injuries 5·2% (4·4–6·2)	Road injuries 5·1% (4·1–6·0)	Conduct disorder 5·1% (3·5–6·9)	Self-harm 4·4% (3·5–5·2)	Self-harm 4·6% (3·5–5·6)	Low back and neck pain 4·9% (3·7–6·2)	Interpersonal violence 5·3% (3·9–6·5)	Interpersonal violence 5·9% (4·2–7·1)	Low back and neck pain 5·7% (4·3–7·2)
4	Skin and subcutaneous diseases 4·5% (3·1–6·4)	Conduct disorder 4·6% (3·2–6·3)	Road injuries 4·5% (3·7–5·6)	Drowning 4·4% (3·3–5·3)	Interpersonal violence 4·5% (3·0–5·6)	Interpersonal violence 4·3% (2·9–5·4)	Low back and neck pain 4·9% (3·7–6·2)	Low back and neck pain 5·1% (3·8–6·4)	Interpersonal violence 5·5% (3·9–6·8)
5	Conduct disorder 3·9% (2·7–5·4)	Drowning 4·6% (3·6–5·7)	HIV/AIDS 4·3% (3·6–5·2)	Interpersonal violence 4·1% (2·9–5·3)	Low back and neck pain 4·5% (3·4–5·7)	Depressive disorders 4·2% (2·8–5·9)	Tuberculosis 4·4% (3·7–5·2)	Depressive disorders 3·6% (2·4–5·1)	Depressive disorders 4·1% (2·7–5·7)
6	Diarrhoeal diseases 3·9% (3·2–4·7)	Malaria 3·3% (2·8–4·0)	Drowning 3·7% (2·8–5·1)	Low back and neck pain 4·1% (3·1–5·2)	Depressive disorders 3·7% (2·4–5·3)	Self-harm 4·1% (3·0–5·4)	Skin and subcutaneous diseases 3·4% (2·2–5·2)	Tuberculosis 3·6% (3·0–4·2)	Skin and subcutaneous diseases 3·9% (2·6–6·0)
7	Malaria 3·2% (2·6–3·8)	Intestinal infectious diseases 3·1% (1·7–5·1)	Depressive disorders 3·3% (2·2–4·5)	Depressive disorders 3·2% (2·0–4·5)	Drowning 3·7% (2·9–4·7)	Conduct disorder 3·7% (2·6–5·1)	Depressive disorders 3·2% (2·1–4·5)	Skin and subcutaneous diseases 3·4% (2·2–5·2)	Tuberculosis 3·1% (2·5–3·8)
8	Intestinal infectious diseases 3·1% (1·7–5·1)	HIV/AIDS 3·0% (2·4–3·5)	Intestinal infectious diseases 2·9% (1·5–4·9)	Conduct disorder 3·1% (2·1–4·3)	Conduct disorder 3·4% (2·3–4·8)	Drowning 3·3% (2·5–4·4)	Drowning 3·1% (2·3–3·7)	Drug use disorders 2·9% (2·4–3·5)	Drug use disorders 3·0% (2·5–3·6)
9	Lower respiratory infections 3·0% (2·3–3·7)	Depressive disorders 2·9% (1·9–3·9)	Low back and neck pain 2·9% (2·2–3·6)	Iron-deficiency anaemia 2·9% (2·2–3·9)	Drug use disorders 2·1% (1·7–2·6)	HIV/AIDS 3·1% (2·5–3·7)	Drug use disorders 2·5% (2·0–3·0)	Drowning 2·6% (2·1–3·4)	Drowning 2·4% (1·9–3·5)
10	Intestinal nematode infections 2·4% (1·4–3·8)	Diarrhoeal diseases 2·8% (2·2–3·6)	Haemoglobinopathies and haemolytic anaemias 2·7% (1·6–4·6)	Tuberculosis 2·9% (2·3–3·5)	Iron-deficiency anaemia 2·1% (1·5–2·7)	Drug use disorders 2·1% (1·7–2·6)	Exposure to mechanical forces 2·0% (1·7–2·5)	Exposure to mechanical forces 1·9% (1·6–2·2)	Other mental and substance use disorders 2·0% (1·4–2·7)
Females									
1	Iron-deficiency anaemia 9·2% (7·4–11·3)	Iron-deficiency anaemia 9·4% (7·6–11·4)	Iron-deficiency anaemia 9·7% (7·7–11·7)	Depressive disorders 5·4% (3·6–7·5)	Depressive disorders 6·4% (4·4–8·7)	Depressive disorders 7·3% (5·0–9·8)	Depressive disorders 5·7% (3·9–7·9)	Depressive disorders 6·4% (4·4–8·6)	Depressive disorders 7·5% (5·2–10·0)
2	Diarrhoeal diseases 5·2% (4·1–6·4)	Skin and subcutaneous diseases 5·5% (3·8–7·7)	Skin and subcutaneous diseases 5·9% (4·1–8·3)	Iron-deficiency anaemia 5·2% (4·0–6·5)	Skin and subcutaneous diseases 5·5% (3·7–8·1)	Skin and subcutaneous diseases 5·9% (3·9–8·8)	Low back and neck pain 5·4% (4·2–6·7)	Low back and neck pain 5·7% (4·4–7·1)	Low back and neck pain 6·4% (5·0–7·9)
3	Skin and subcutaneous diseases 4·5% (3·1–6·4)	Depressive disorders 4·7% (3·3–6·4)	Depressive disorders 5·4% (3·9–7·3)	Skin and subcutaneous diseases 4·8% (3·2–7·1)	Low back and neck pain 5·0% (3·9–6·1)	Low back and neck pain 5·1% (4·1–6·4)	Tuberculosis 5·2% (4·3–6·4)	Tuberculosis 4·7% (3·7–5·7)	Skin and subcutaneous diseases 4·1% (2·8–6·1)
4	Lower respiratory infections 3·9% (3·1–4·9)	Malaria 4·2% (3·6–5·1)	HIV/AIDS 4·8% (4·0–5·7)	Self-harm 4·7% (3·8–5·8)	Self-harm 4·8% (3·5–6·6)	Iron-deficiency anaemia 4·5% (3·5–5·6)	Self-harm 4·9% (3·9–6·1)	Self-harm 4·1% (3·0–5·4)	Iron-deficiency anaemia 3·7% (2·9–4·7)
5	Depressive disorders 3·9% (2·6–5·4)	Diarrhoeal diseases 3·6% (2·7–4·7)	Anxiety disorders 4·0% (2·4–6·0)	Low back and neck pain 4·2% (3·3–5·3)	Iron-deficiency anaemia 4·6% (3·6–5·9)	Self-harm 4·3% (2·9–6·0)	Iron-deficiency anaemia 4·2% (3·2–5·3)	Iron-deficiency anaemia 3·8% (2·9–4·7)	Self-harm 3·7% (2·5–5·3)
6	Malaria 3·6% (3·0–4·2)	Anxiety disorders 3·5% (2·1–5·2)	Haemoglobinopathies and haemolytic anaemias 3·7% (2·7–4·9)	Road injuries 3·9% (3·3–4·7)	Road injuries 4·1% (3·4–4·9)	Anxiety disorders 4·1% (2·8–5·9)	Skin and subcutaneous diseases 3·4% (2·3–5·0)	Road injuries 3·6% (3·0–4·2)	Migraine 3·6% (2·3–5·0)

(Table 3 continues on next page)

	DALYs in 10–14 year olds			DALYs in 15–19 year olds			DALYs in 20–24 year olds		
	1990	2005	2013	1990	2005	2013	1990	2005	2013
(Continued from previous page)									
7	Intestinal infectious diseases 3·1% (1·7–5·1)	HIV/AIDS 3·3% (2·7–3·9)	Migraine 3·7% (2·4–5·2)	Tuberculosis 3·8% (3·1–4·7)	Anxiety disorders 3·6% (2·4–5·3)	Migraine 3·7% (2·4–5·1)	Road injuries 3·2% (2·8–3·9)	Skin and subcutaneous diseases 3·5% (2·4–5·2)	Anxiety disorders 3·5% (2·3–5·3)
8	Anxiety disorders 3·0% (1·8–4·6)	Migraine 3·2% (2·1–4·5)	Malaria 3·4% (2·5–4·2)	Diarrhoeal diseases 3·2% (2·6–3·9)	Migraine 3·2% (2·1–4·6)	Road injuries 3·6% (2·8–4·4)	Diarrhoeal diseases 2·9% (2·3–3·5)	Migraine 3·1% (2·0–4·4)	Road injuries 3·5% (2·8–4·2)
9	Road injuries 2·9% (2·4–3·6)	Haemoglobinopathies and haemolytic anaemias 3·2% (2·4–4·3)	Low back and neck pain 2·9% (2·3–3·6)	Anxiety disorders 3·1% (2·1–4·7)	Tuberculosis 2·9% (2·2–3·6)	HIV/AIDS 3·4% (2·7–4·2)	Migraine 2·9% (1·8–4·0)	HIV/AIDS 3·0% (2·3–4·0)	Tuberculosis 3·4% (2·5–4·3)
10	Drowning 2·9% (2·2–3·8)	Asthma 2·9% (2·3–3·6)	Intestinal infectious diseases 2·7% (1·5–4·6)	Fire, heat, and hot substances 3·1% (2·2–4·2)	Diarrhoeal diseases 2·3% (1·8–3·0)	Tuberculosis 2·1% (1·6–2·8)	Anxiety disorders 2·9% (1·8–4·4)	Anxiety disorders 3·0% (1·9–4·5)	HIV/AIDS 2·9% (2·3–3·5)
Total									
1	Iron-deficiency anaemia 9·7% (7·8–11·9)	Iron-deficiency anaemia 9·9% (8·0–12·1)	Iron-deficiency anaemia 10·2% (8·3–12·4)	Road injuries 7·6% (6·6–8·7)	Road injuries 8·2% (7·0–9·4)	Road injuries 7·4% (6·3–8·7)	Road injuries 8·0% (7·1–9·2)	Road injuries 8·9% (7·8–10·0)	Road injuries 8·7% (7·5–10·0)
2	Diarrheal diseases 4·5% (3·7–5·3)	Skin and subcutaneous diseases 5·4% (3·7–7·6)	Skin and subcutaneous diseases 5·9% (4·1–8·2)	Skin and subcutaneous diseases 4·8% (3·1–7·2)	Skin and subcutaneous diseases 5·5% (3·6–8·1)	Skin and subcutaneous diseases 5·9% (3·8–8·6)	Self-harm 5·5% (4·6–6·4)	Low back and neck pain 5·4% (4·1–6·7)	Low back and neck pain 6·0% (4·7–7·5)
3	Skin and subcutaneous diseases 4·5% (3·1–6·4)	Road injuries 4·0% (3·3–4·7)	HIV/AIDS 4·6% (3·8–5·4)	Self-harm 4·5% (3·8–5·4)	Depressive disorders 4·9% (3·3–6·9)	Depressive disorders 5·6% (3·8–7·7)	Low back and neck pain 5·1% (3·9–6·5)	Self-harm 5·3% (4·2–6·3)	Depressive disorders 5·6% (3·8–7·7)
4	Drowning 4·4% (3·4–5·4)	Malaria 3·7% (3·3–4·3)	Depressive disorders 4·3% (3·0–5·8)	Depressive disorders 4·2% (2·8–5·9)	Low back and neck pain 4·7% (3·6–5·9)	Low back and neck pain 5·0% (3·9–6·3)	Tuberculosis 4·8% (4·1–5·5)	Depressive disorders 4·9% (3·3–6·8)	Self-harm 5·0% (3·9–6·2)
5	Road injuries 4·2% (3·5–4·8)	Depressive disorders 3·7% (2·5–5·1)	Conduct disorder 3·9% (2·7–5·2)	Low back and neck pain 4·2% (3·2–5·3)	Self-harm 4·7% (3·7–5·7)	Self-harm 4·2% (3·3–5·2)	Depressive disorders 4·4% (2·9–6·1)	Tuberculosis 4·1% (3·5–4·7)	Skin and subcutaneous diseases 4·0% (2·7–6·0)
6	Lower respiratory infections 3·5% (2·8–4·2)	Drowning 3·5% (2·8–4·3)	Road injuries 3·6% (3·0–4·4)	Iron-deficiency anaemia 4·0% (3·1–5·1)	Iron-deficiency anaemia 3·3% (2·5–4·2)	HIV/AIDS 3·2% (2·6–3·9)	Skin and subcutaneous diseases 3·4% (2·2–5·1)	Interpersonal violence 3·7% (2·8–4·5)	Interpersonal violence 3·5% (2·6–4·4)
7	Malaria 3·4% (2·9–3·9)	Conduct disorder 3·5% (2·4–4·8)	Haemoglobinopathies and haemolytic anaemias 3·1% (2·2–4·6)	Tuberculosis 3·3% (2·8–3·9)	Interpersonal violence 2·9% (2·0–3·5)	Iron-deficiency anaemia 3·0% (2·3–3·9)	Interpersonal violence 3·3% (2·5–4·1)	Skin and subcutaneous diseases 3·5% (2·3–5·2)	Tuberculosis 3·2% (2·6–3·9)
8	Depressive disorders 3·1% (2·0–4·3)	Diarrhoeal diseases 3·2% (2·6–3·9)	Low back and neck pain 2·9% (2·3–3·6)	Drowning 3·1% (2·4–3·7)	Anxiety disorders 2·6% (1·7–3·9)	Anxiety disorders 2·9% (1·9–4·3)	Iron-deficiency anaemia 2·8% (2·2–3·6)	Drug use disorders 2·3% (1·9–2·8)	Migraine 2·6% (1·7–3·7)
9	Intestinal infectious diseases 3·1% (1·7–5·1)	HIV/AIDS 3·1% (2·6–3·7)	Anxiety disorders 2·9% (1·7–4·4)	Diarrhoeal diseases 2·8% (2·4–3·3)	Conduct disorder 2·6% (1·8–3·6)	Conduct disorder 2·8% (1·9–3·9)	Diarrhoeal diseases 2·3% (2·0–2·7)	Iron-deficiency anaemia 2·3% (1·8–3·0)	Anxiety disorders 2·5% (1·6–3·8)
10	Conduct disorder 3·0% (2·0–4·1)	Intestinal infectious diseases 3·0% (1·7–5·0)	Drowning 2·8% (2·2–3·9)	Interpersonal violence 2·7% (2·0–3·3)	Drowning 2·5% (2·0–3·2)	Interpersonal violence 2·8% (1·9–3·4)	Migraine 2·1% (1·3–2·9)	Migraine 2·3% (1·5–3·2)	Drug use disorders 2·5% (2·0–3·0)

Data are percentage proportion of DALYs out of all DALYs (95% uncertainty interval).

Table 3: **Top 10 causes of disability-adjusted life-years (DALYs) in males, females, and both for ages 10–14 years, 15–19 years, and 20–24 years, 1990, 2005, and 2013**

The leading causes of YLDs for young people aged 10–14 years, 15–19 years, and 20–24 years by sex and total for the years 1990, 2005, and 2013 are presented in table 2 (appendix p 2). Iron-deficiency anaemia was the leading cause of YLDs in 2013 for males (18·8%, 95% UI 16·6–20·5) and females (15·6%, 13·3–17·5) aged 10–14 years and depressive disorders were the leading cause of YLDs for females aged 15–19 years (13·0%, 9·1–17·1) and 20–24 years (13·8%, 9·8–17·8; table 2). Depressive disorders affected females more than males in all age groups. The YLDs varied by age, year, region, and country (appendix pp 9–23).[29] For example, mental

M P Zuñiga PhD); **and The Lancet Youth, *Lancet* Commission on Adolescent Health and Wellbeing, London, UK** (K Taiwo BSc)

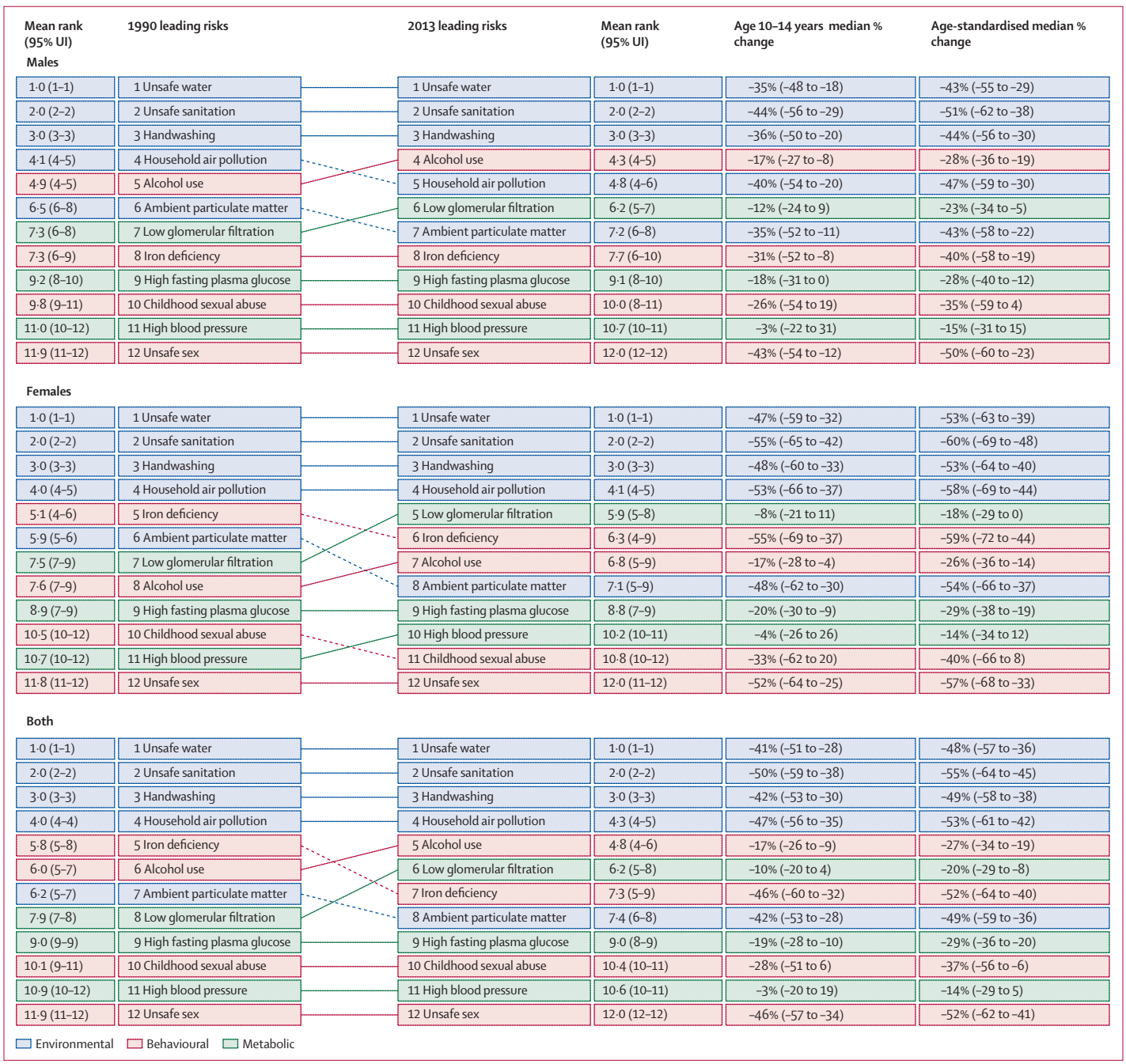

***Figure 2*: Leading global risk factors for death for ages 10–14 in males, females, and both sexes combined in 1990 and 2013**
There are a total of 12 risk factors at this level for this age group. Risk factors that had less than 1 estimated death globally were not included.

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See Online for appendix

and substance use disorders were the highest in Colombia and accounted for 44·8% of YLDs for young people aged 20–24 years.[29]

The leading causes of DALYs for young people aged 10–14 years, 15–19 years, and 20–24 years by sex and total for the years 1990, 2005, and 2013 are presented in table 3 (appendix p 3). Mental health disorders and substance misuse was the leading cause for ages 10–24 for both sexes, whereas for ages 15–19 and 20–24 , road injuries were the leading cause for males and depressive disorders were the leading cause for females (appendix pp 24–38, table 3). Skin and subcutaneous diseases were a major cause of burden for young adults.[29] Acne vulgaris accounted for 1·9% of DALYs for 10–14 year olds, 2·6% for 15–19 year olds, and 1·4% for 20–24 year olds, followed by dermatitis with 1·2% of DALYs for

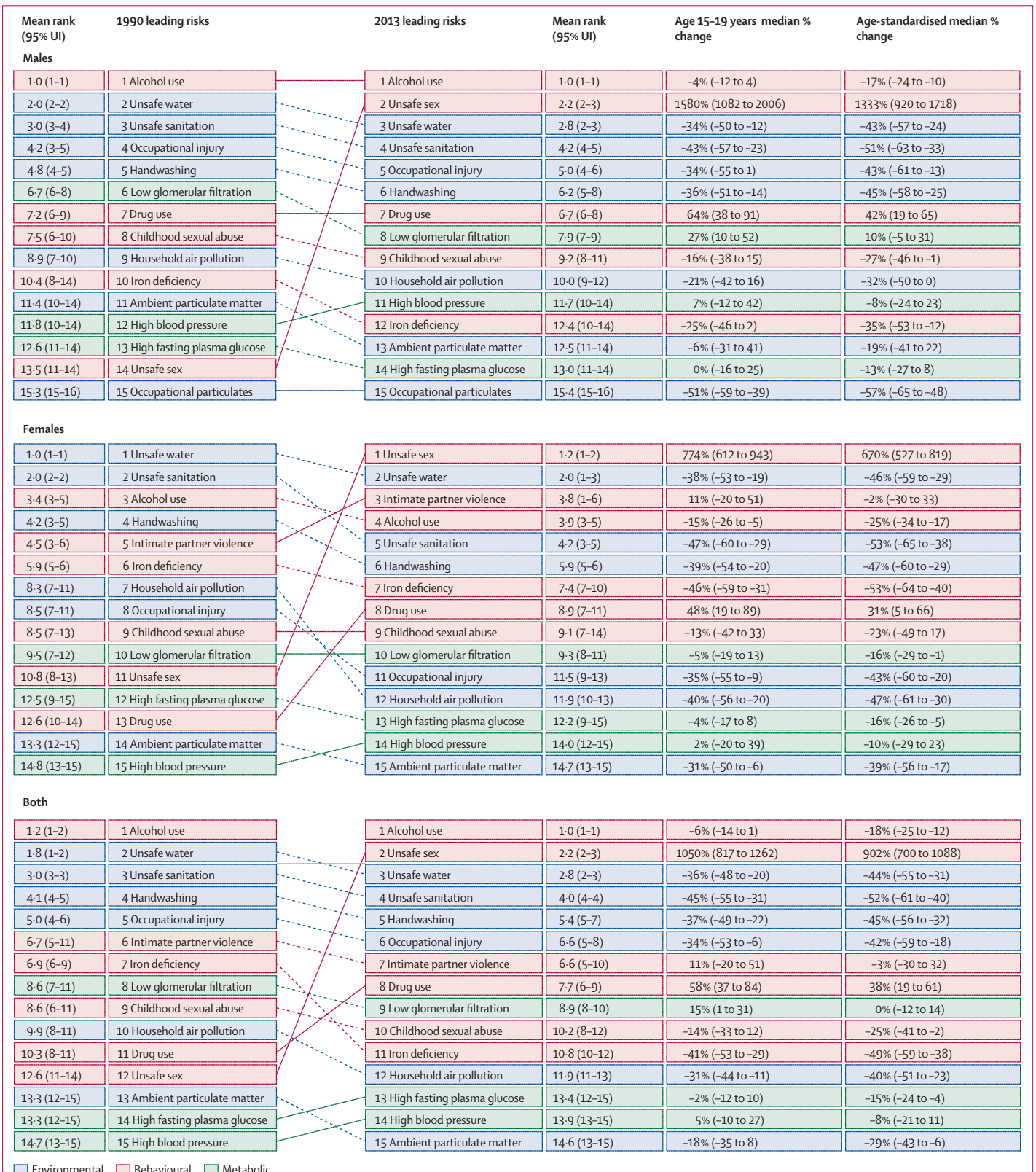

***Figure 3*: Leading global risk factors for death for ages 15–19 in males, females, and both sexes combined in 1990 and 2013**
UI=uncertainty interval.

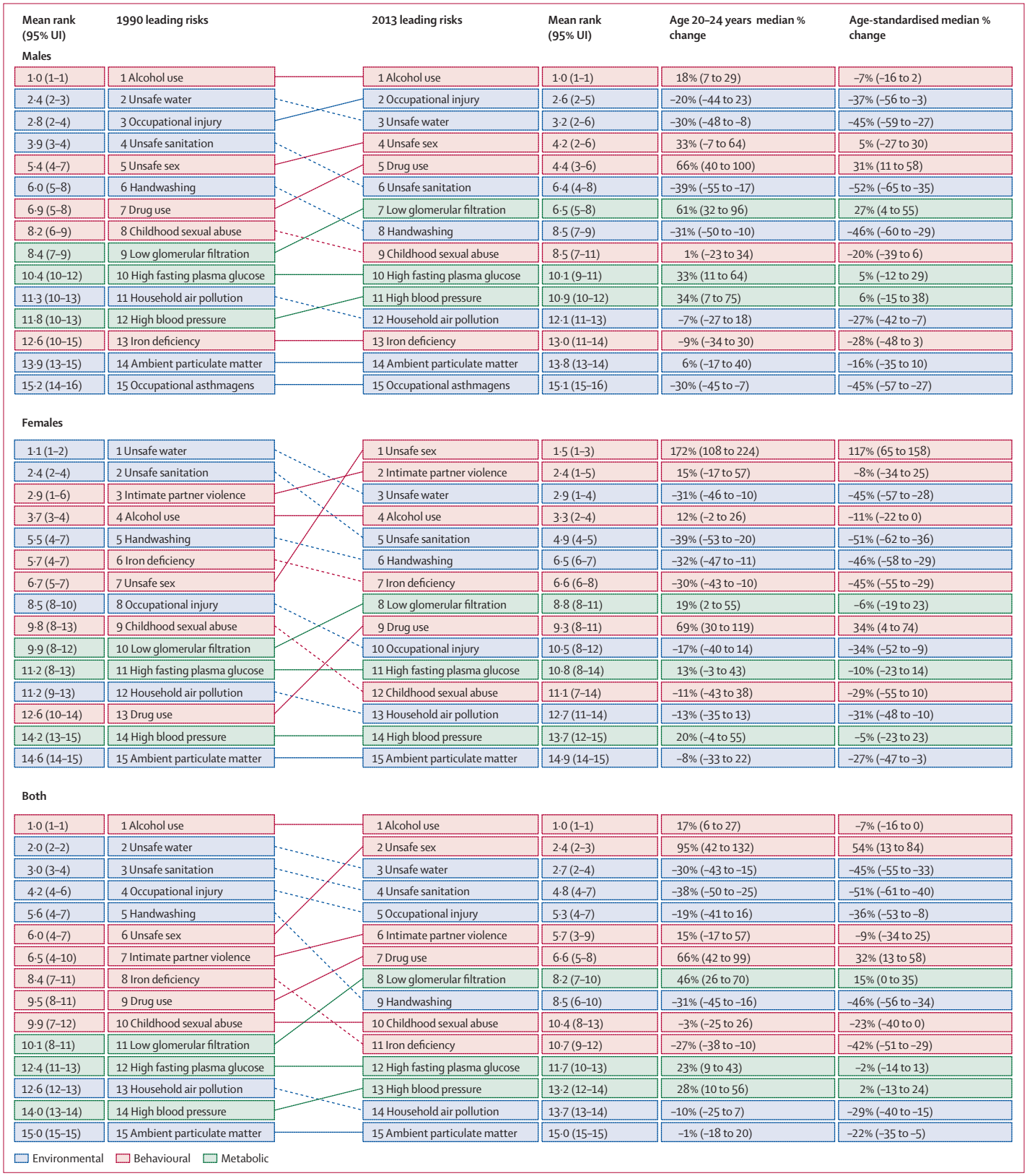

Figure 4: **Leading global risk factors for death for ages 20–24 in males, females, and both sexes combined in 1990 and 2013**
UI=uncertainty interval.

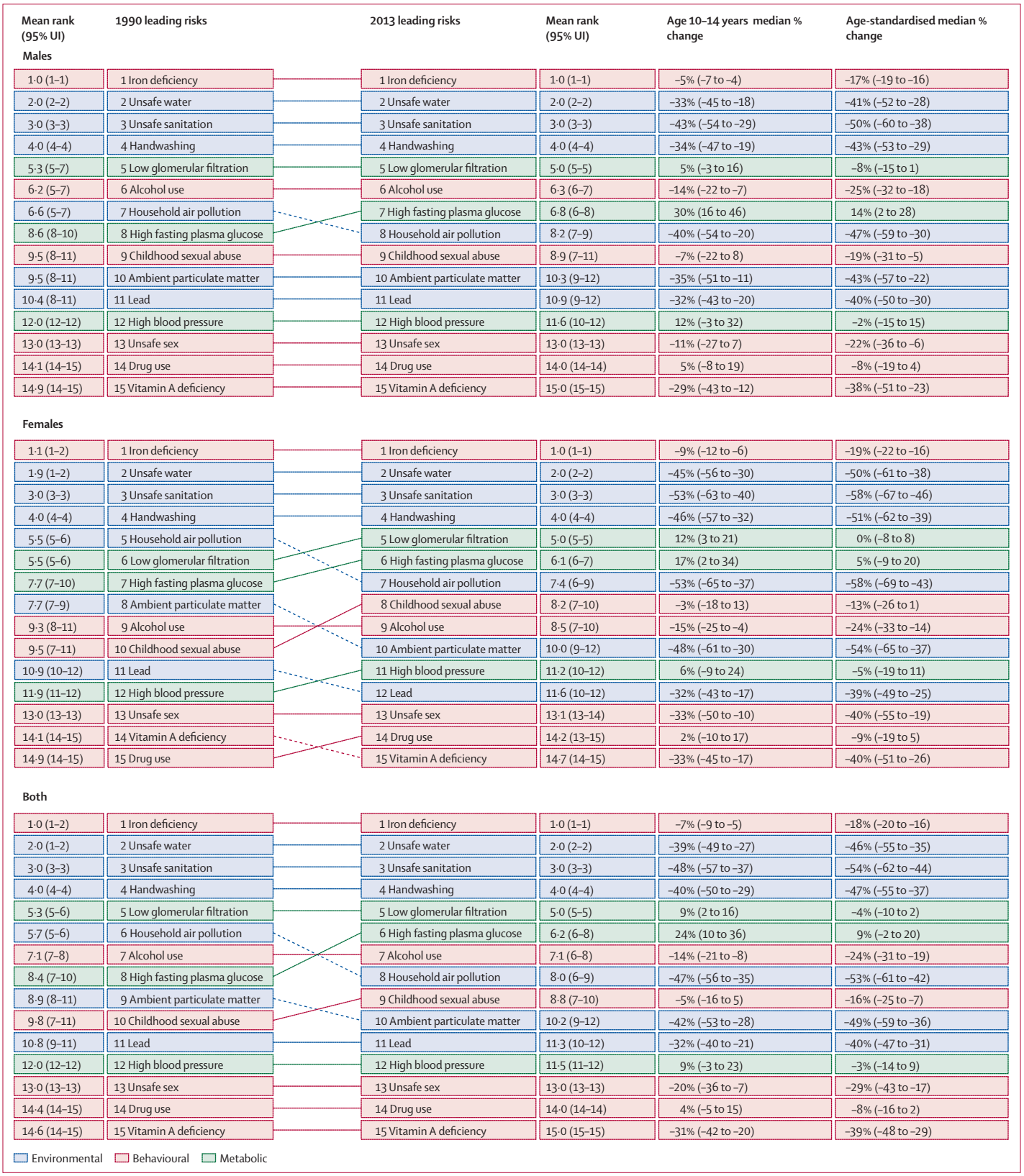

Figure 5:**Leading global risk factors for DALYs for ages 10–14 in males, females, and both sexes combined in 1990 and 2013**
UI=uncertainty interval.

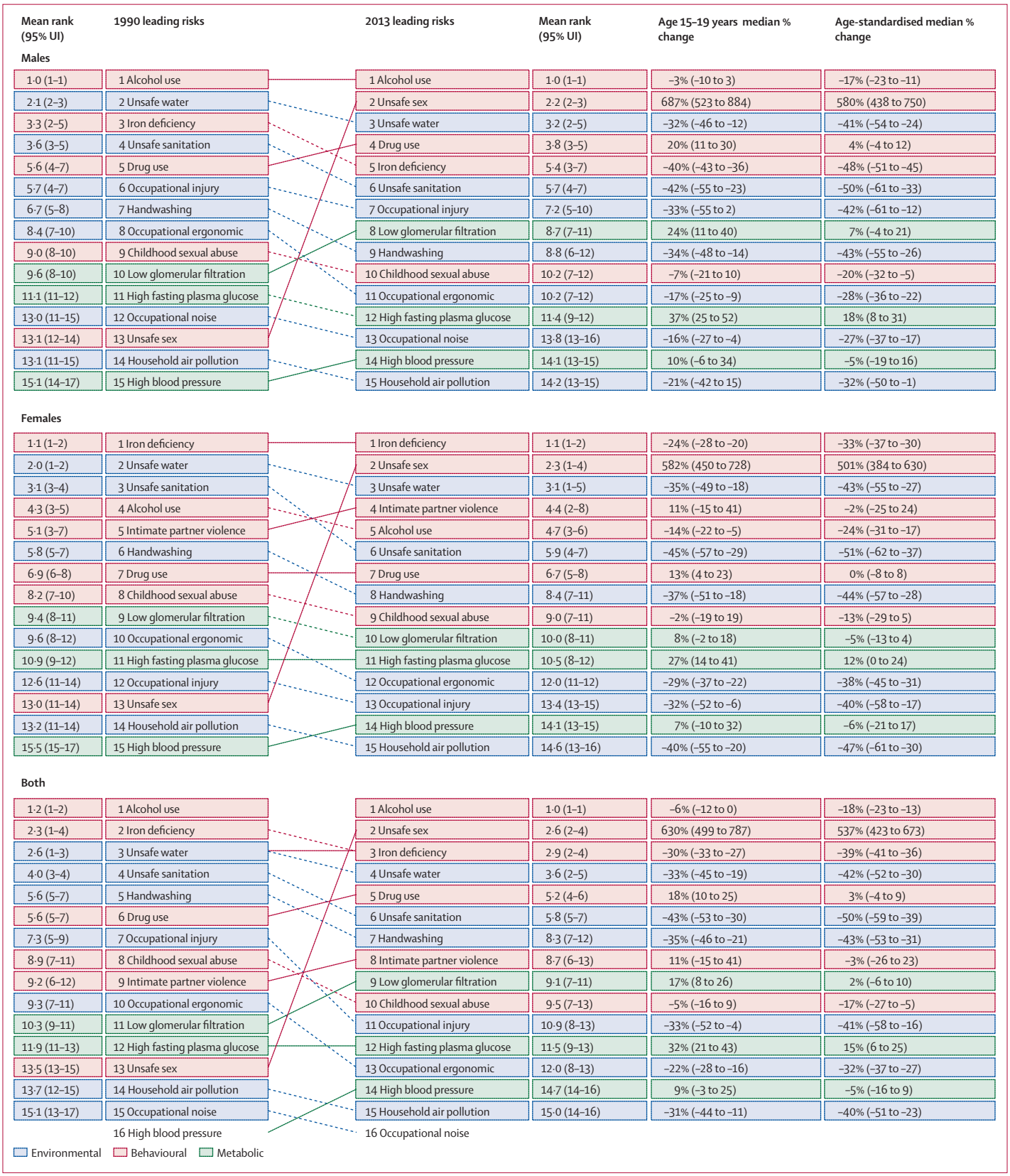

Figure 6: **Leading global risk factors for DALYs for ages 15–19 in males, females, and both sexes combined in 1990 and 2013**
UI=uncertainty interval.

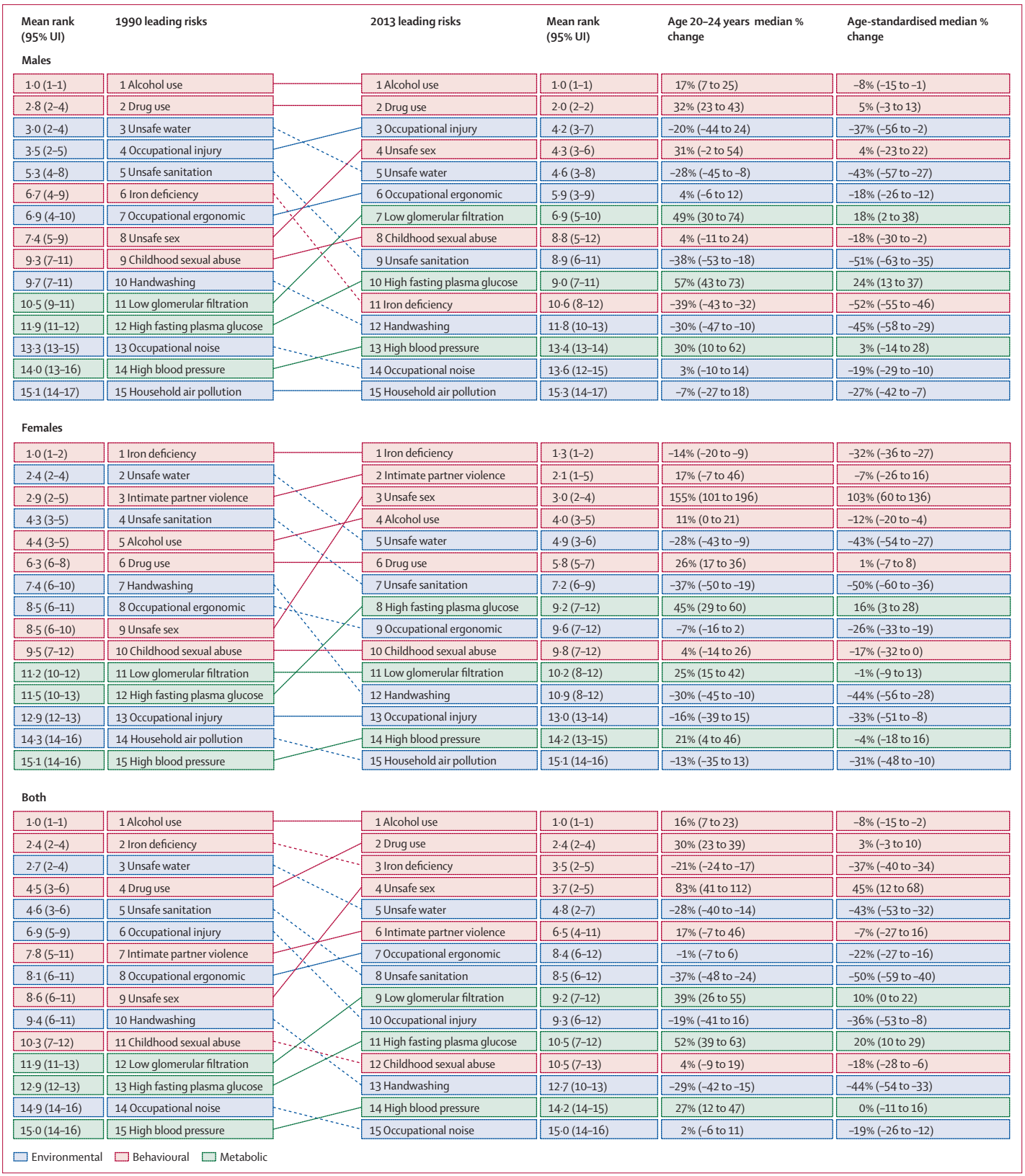

***Figure 7*: Leading global risk factors for DALYs for ages 20–24 in males, females, and both sexes combined in 1990 and 2013**
UI=uncertainty interval.

10–14 year olds, 1·0% for 15–19 year olds, and 0·8% for 20–24 year olds.[29] DALYs varied greatly by country and regions. For ages 20–24 years, mental disorders and substance use disorders were highest in Qatar, accounting for 30·5% of DALYs, followed by 25·1% of DALYs in the United Arab Emirates, whereas self-harm and interpersonal violence were highest in El Salvador, accounting for 40·3% of DALYs, followed by 34·3% of DALYs in Colombia.[29]

The leading risk factors for death for young people aged 10–14 years, 15–19 years, 20–24 years, and total are presented in figures 2–4 (appendix p 6). Unsafe water was the leading cause of deaths for young people aged 10–14 years, and alcohol use was for those aged 15–19 years and 20–24 years. The leading risk factors for DALYs for ages 10–14 years, 15–19 years, 20–24 years, and total are presented in figures 5–7 (appendix p 7). Iron deficiency was the leading cause of DALYs for females from all age groups. Unsafe sex increased from the 13th rank to the second for both males and females aged 15–19 years from 1990 to 2013 (figure 3). Alcohol and drug use were the highest risk factor for DALYs lost (9·7%) for young people aged 20–24 years, followed by occupational risks (3·2%).[29] Risk factors for DALYs varied by sex, age, and country (appendix pp 39–56). For males aged 20–24 years, alcohol and drug use accounted for 13·8% of DALYS lost, whereas unsafe sex accounted for 1·8%. However, unsafe sex accounted for 3·0% of DALYs lost for females, and alcohol and drug use accounted for 4·7%.[29] For ages 20–24 years, drug use was highest in Qatar and accounted for 4·9% of DALYs lost, followed by 4·8% of DALYs lost for United Arab Emirates, whereas alcohol use was highest in Russia, accounting for 21·41% of DALYs there and 21·0% in Belarus. Risk factors varied within countries as well. GBD 2013 included regional estimates for Mexico, England, and China. For example, for young people aged 20–24 years, alcohol accounted for 9·0% of DALYs for China and 11·6% for Mexico.[29] DALYs due to alcohol use varied from 10·1% in Aguascalientes to 14·9% in Chihuahua, Mexico, compared with a variation from 4·2% in Hong Kong to 11·3% in Shandong, China. For both sexes, transport injuries and mental disorders were the main outcomes from alcohol and drug use.[29] Sexual abuse was a higher cause of DALYs for women than for men.

The appendix (pp 57–65) shows the rate of change in risk factors compared with the magnitude of burden as measured by DALYs. Alcohol and drug use in young people aged 10–24 years had an annual rate of change of more than 1·0% from 1990 to 2013 and accounted for more than 3·1% of DALYs. Unsafe sex and high fasting plasma glucose had an annual rate of change of more than 1%, but unsafe sex had a higher burden. Moreover, unsafe sex had a higher burden and similar increase for young people aged 15–19 years than any other risk facotr for both sexes.

Discussion

Young people face challenges that affect their health now and in the future, as well as that of future generations. These data show a clear need for renewed efforts to improve health and reduce the burden of disease in young people. Investment in successful programmes, policies, and interventions targeted at young people is key to improve health and maximise future population health and global economic development. This study can play a key part in raising awareness of the health issues faced during this early period of life; can provide health professionals, donors, and governments with means to prioritise interventions, programmes, and policies; and can also be used to measure the effect of action on burden.

Cause and burden of disease by sex, age, country, and regions within countries vary widely. It is crucial for policy makers, health professionals, funding bodies, and governments to take these variations into consideration as they plan future health activities and policies. Indeed, a global approach to the improvement of health during this important period of life will fail unless the needs of each country are taken into account. Huge disparities in risk and burden of disease within countries also have to be accounted for.[30–32]

In this study we present the burden and risk factors in young people, and our aim is to increase awareness of the health issues faced during this period of life. Moreover, the present burden will provide a baseline to measure the effect of action on burden. Future GBD estimates will enable health professionals and others to examine the effect of their policies and programmes to address the burden of diseases in this age group.

The data available for young people are not adequate. The major household surveys exclude individuals under the age of 15 years. School-based surveys are often not representative of the young population because they exclude many young people in low-income and middle-income countries who leave school at a young age. Where secondary school retention is low, school-based surveys will not provide an accurate indicator of health need in young people. These surveys also tend to be poorly harmonised and infrequent due to insufficient funding, and many exclude the major health risk behaviours that we have shown account for the largest causes of disease burden in this age group, namely alcohol misuse, illicit drug use, sexual behaviours, and mental health disorders.[33]

In order to improve GBD data for young adults, health information systems should include all young people and the leading risk factors they face. The barriers to this approach are in some part financial and political, but also technical. First, the measurement strategies for younger adolescents are underdeveloped in terms of the balance between parental informants and direct responses because some aspects of health are best assessed with information from parents and some directly with young people. Second, we need further progress on a consensus set of

indicators reflecting the burden of disease, with variations based on different country contexts. Third, we need further progress on indicator and measurement development. For example, we do not have comparable data for mental health for those younger than 18 years, in large part because there is no consensus about indicators for mental health or mental health problems. In particular, instruments that measure these risk factors adequately in different cultures are a challenge to find. And in many surveys for young people, questions designed for adults are used. Fourth, attention to risk factors that are differentially associated with gender and gender norms is needed. Indeed, girls, boys, young men, and young women all face different health risks due to their physiology as well as sociocultural factors. Any measurements and strategy to address health in this population will need to attend to these differences. Furthermore, young people visit health services less frequently than other age groups, so we might be learning about problems affecting their health later in the course of illness, thus under-representing their real importance. Until we deal with the technical barriers, we will have trouble making progress on the political and funding barriers. In this Article, to overcome these data shortages for some countries, we used our standard GBD method and modelling techniques to borrow strength from neighbouring countries and countries with similar characteristics.

Previous studies have shown that young people's mental disorders predict later adult mental disorders, but the continuities (predictive validity) are less than at older ages.[34–36] This finding might be true of self-harm and probably functional somatic symptoms. Therefore, in addition to our scarce data on young people's health, the long-term effects of some conditions on health are unknown. Few longitudinal studies are available that show the effect of several health factors during this young age on older ages.[37–40] This shortfall has also impeded the ability of young people's health advocacy groups to rally the needed and deserved support for their work. Clearly, there is a consensus on preventing risk factors that cause deaths (eg, drinking and driving, unsafe sex, and smoking), but less so for other risk factors that are also likely to be harming this age group or affecting their future.

In this study we have not addressed all the important issues that young people face. Many of the determinants of health in young people are rooted in the social context of their lives. For example, early marriage, child labour, gang membership, military conscription, sexual orientation, gender identity issues, and bullying are some of the established influences on adolescent health that have been poorly captured in surveys so far. The data for these factors are neither adequate nor available for many countries, but several studies have pointed to their importance. Moreover, we did not capture learning disabilities, including attention deficit hyperactivity disorder, dyslexia, or any other developmental difficulties that require special accommodations in a school setting, which are largely unavailable globally or even in most high-income countries.

We have little information on stress, mental health, and other related factors for this age group of 10–24 years.[33] Young people face stress in terms of worrying about school performance, admissions to tertiary education, or securing a job and an income.[41–44] We also have little information on how interpersonal relationships, social support, and loneliness affect young people. The rapid and widespread changes in how young people manage their social relationships through social media is another aspect of youth health that will need careful assessment in the future. Also, stress related to perceptions of masculinity and femininity, or fear of sexual violence, for example, are very real for young people. The causes of such stress might vary by country and context, but the effect is the same on health and prosperity. These factors are usually not discussed by young people or properly addressed by their parents or health systems; however, they are key drivers for many risky behaviours and can limit young people's development.

One of our main arguments for the importance of interventions during this period of life is the effect and cost-effectiveness on later-life disease burden. Future work is needed to show the effect of interventions in this age group on future burden, which requires the ability to forecast the future burden and simulate the effect of interventions on young people's health, as well as determine their cost-effectiveness. Such work requires a systematic approach to gather evidence of effective interventions targeted at this age group and a consistent approach to assess cost-effectiveness. The need for multicomponent responses that target the different social and environmental determinants of young people's health and issues of scalability and equity should be key considerations to estimate the potential of interventions to reduce burden of disease later in life. Hence, our study calls for such an analysis and perhaps a visualisation to show the effect and cost-effectiveness of interventions in young people's health.

Young people often have no official outlet for their voice. In most countries, individuals younger than 18 years cannot vote and need parental approval for many activities. Youth participation at various levels is urgently needed. Moreover, this age group does not have the same level of advocacy and support as we see for infant or maternal health. Therefore, young people's health needs the same energy and support.

Our analysis shows that more robust disease burden indicators, harmonised data collection tools, and forecasting are needed. Despite the need for improved data collection methods and the absence of precision data on some topics, our data clearly show that injuries, mental health conditions, common infectious diseases, and sexual and reproductive health problems are leading causes of morbidity and mortality in young people. The public health community has been successful in improving the health of infants and children younger than 5 years in the

past decades. Ages 10–24 years represent a period of life when behaviours related to non-communicable diseases, as well as many other disorders, get ingrained, as do many other health-related behavioural patterns. Furthermore, this group of young people represents the future parents of the next generation, and as such, their health and wellbeing is crucial to that of the next generation of 0–5 year olds. Now is time for us to ask the right questions, and for us to collect the right data and information. It is time for us to act and invest in our future.

Contributors

AHM, CJLM, and GP prepared the first draft of the manuscript. AHM, CJLM, and GP finalised the draft based on comments from other authors and reviewer feedback. All other authors provided data, developed models, analysed data, reviewed results, provided guidance on methods, and reviewed the manuscript.

Declaration of interests

FM is on the speakers' bureau of Eli Lilly and Company. All other authors declare no competing interests.

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