

**ERRATUM: GLOBAL, REGIONAL, AND NATIONAL
COMPARATIVE RISK ASSESSMENT OF 84
BEHAVIOURAL, ENVIRONMENTAL AND
OCCUPATIONAL, AND METABOLIC RISKS OR
CLUSTERS OF RISKS FOR 195 COUNTRIES AND
TERRITORIES, 1990–2017: A SYSTEMATIC ANALYSIS
FOR THE GLOBAL BURDEN OF DISEASE STUDY 2017
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GBD 2016 Alcohol Collaborators

Abstract

Background The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2017 comparative risk assessment (CRA) is a comprehensive approach to risk factor quantification that offers a useful tool for synthesising evidence on risks and risk–outcome associations. With each annual GBD study, we update the GBD CRA to incorporate improved methods, new risks and risk–outcome pairs, and new data on risk exposure levels and risk–outcome associations. Methods We used the CRA framework developed for previous iterations of GBD to estimate levels and trends in exposure, attributable deaths, and attributable disability-adjusted life-years (DALYs), by age group, sex, year, and location for 84 behavioural, environmental and occupational, and metabolic risks or groups of risks from 1990 to 2017. This study included 476 risk–outcome pairs that met the GBD study criteria for convincing or probable evidence of causation. We extracted relative risk and exposure estimates from 46 749 randomised controlled trials, cohort studies, household surveys, census data, satellite data, and other sources. We used statistical models to pool data, adjust for bias, and incorporate covariates. Using the counterfactual scenario of theoretical minimum risk exposure level (TMREL), we estimated the portion of deaths and DALYs that could be attributed to a given risk. We explored the relationship between development and risk exposure by modelling the relationship between the Socio-demographic Index (SDI) and risk-weighted exposure prevalence and estimated expected levels of exposure and risk-attributable burden by SDI. Finally, we explored temporal changes in risk-attributable DALYs by decomposing those changes into six main component drivers of change as follows: (1) population growth; (2) changes in population age structures; (3) changes in exposure to environmental and occupational risks; (4) changes in exposure to behavioural risks; (5) changes in exposure to metabolic

risks; and (6) changes due to all other factors, approximated as the risk-deleted death and DALY rates, where the risk-deleted rate is the rate that would be observed had we reduced the exposure levels to the TMREL for all risk factors included in GBD 2017. Findings In 2017, 34.1 million (95% uncertainty interval [UI] 33.3–35.0) deaths and 1.21 billion (1.14–1.28) DALYs were attributable to GBD risk factors. Globally, 61.0% (59.6–62.4) of deaths and 48.3% (46.3–50.2) of DALYs were attributed to the GBD 2017 risk factors. When ranked by risk-attributable DALYs, high systolic blood pressure (SBP) was the leading risk factor, accounting for 10.4 million (9.39–11.5) deaths and 218 million (198–237) DALYs, followed by smoking (7.10 million [6.83–7.37] deaths and 182 million [173–193] DALYs), high fasting plasma glucose (6.53 million [5.23–8.23] deaths and 171 million [144–201] DALYs), high body-mass index (BMI; 4.72 million [2.99–6.70] deaths and 148 million [98.6–202] DALYs), and short gestation for birthweight (1.43 million [1.36–1.51] deaths and 139 million [131–147] DALYs). In total, risk-attributable DALYs declined by 4.9% (3.3–6.5) between 2007 and 2017. In the absence of demographic changes (ie, population growth and ageing), changes in risk exposure and risk-deleted DALYs would have led to a 23.5% decline in DALYs during that period. Conversely, in the absence of changes in risk exposure and risk-deleted DALYs, demographic changes would have led to an 18.6% increase in DALYs during that period. The ratios of observed risk exposure levels to exposure levels expected based on SDI (O/E ratios) increased globally for unsafe drinking water and household air pollution between 1990 and 2017. This result suggests that development is occurring more rapidly than are changes in the underlying risk structure in a population. Conversely, nearly universal declines in O/E ratios for smoking and alcohol use indicate that, for a given SDI, exposure to these risks is declining. In 2017, the leading Level 4 risk factor for age-standardised DALY rates was high SBP in four super-regions: central Europe, eastern Europe, and central Asia; north Africa and Middle East; south Asia; and southeast Asia, east Asia, and Oceania. The leading risk factor in the high-income super-region was smoking, in Latin America and Caribbean was high BMI, and in sub-Saharan Africa was unsafe sex. O/E ratios for unsafe sex in sub-Saharan Africa were notably high, and those for alcohol use in north Africa and the Middle East were notably low. Interpretation By quantifying levels and trends in exposures to risk factors and the resulting disease burden, this assessment offers insight into where past policy and programme efforts might have been successful and highlights current priorities for public health action. Decreases in behavioural, environmental, and occupational risks have largely offset the effects of population growth and ageing, in relation to trends in absolute burden. Conversely, the combination of increasing metabolic risks and population ageing will probably continue to drive the increasing trends in non-communicable diseases at the global level, which presents both a public health challenge and opportunity. We see considerable spatiotemporal heterogeneity in levels of risk exposure and risk-attributable burden. Although levels of development underlie some of this heterogeneity, O/E ratios show risks for which countries are overperforming or underperforming relative to their level of development. As such, these ratios provide a benchmarking tool to help to focus local decision making. Our findings reinforce the importance of both risk exposure monitoring and epidemiological research to assess causal connections between

risks and health outcomes, and they highlight the usefulness of the GBD study in synthesising data to draw comprehensive and robust conclusions that help to inform good policy and strategic health planning.

Keywordse: erratum, factor, spatiotemporal

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