IHME

UNIVERSITY of WASHINGTON

Decisions of the GBD Scientific Council

Global Burden of Diseases, Injuries, and Risk Factors Study 2013

Last updated: September, 2014

The Council voted to approve the updated methodology for calculating relative risks for physical inactivity

> Cohort studies examining the risk of physical activity and disease outcomes have used a variety of approaches to measure exposure; particularly the older studies used imprecisely defined exposure categories and tended to concentrate on leisure activity rather than all forms of activity; also, for newer studies there are considerable differences in how physical activity has been measured. The current method tries to take a more rigorous approach to making exposure levels between studies more comparable by converting all measures into MET units, adjusting sources for the number of domains of activity included (leisure, work, transport, home). We apply a Bayesian meta-regression approach to pooling estimates across studies. Similarly, we are imposing the same rigorous structure onto the exposure measurement from surveys and published studies from which we derive our prevalence estimates.

The Council voted to approve the approach to estimating the burden attributable to reduced estimated glomerular filtration rate

> Prospective observational studies have demonstrated an association between reduced glomerular filtration rate and increased risk of key cardiovascular outcomes. Collaboration with experts in the field has enabled us to determine the degree of increased risk of cardiovascular outcomes per stage of chronic kidney disease (CKD) through analysis of combined microdata of international cohorts. We apply these relative risks to prevalent stages of chronic kidney disease from the Global Burden of Disease database to determine the population-attributable fraction of stroke, ischemic heart disease, and peripheral arterial disease to chronic kidney disease for CKD stages 3-5.

The Council voted to approve the updated estimation approach to injuries

> The approach to estimating non-fatal health outcomes from injuries has changed in several ways from GBD 2010 to GBD 2013. First, we use a disaggregated list of nature-of-injury categories (47 in GBD 2013 vs. 23 in GBD 2010). Second, we assume a 1:1 relationship between injury case and N-code. This addresses an inconsistency in the GBD 2010 approach by which an injury was allowed to have multiple N-codes in some aspects of the model pipeline and not in others. To achieve this 1:1 relationship, we develop a ranking of injury severity by N-code and keep only the most severe N-code in datasets where patients are coded with multiple N-codes. Third, we now separately estimate the duration of short-term health loss and the probability of

developing long-term health loss for treated and untreated injuries. Previously, the difference in treated and untreated injuries was captured only in assigned disability weight. Fourth, we now empirically derive a duration for short-term outcomes of treated injuries, rather than relying purely on expert opinion. Fifth, we incorporate the latest disability weight survey, which estimates a lower weight for fractures and a higher weight for spinal cord lesion, as well as adding a couple of previously missing disability weight estimates for specific health states.

The Council voted against using bias-adjusted relative risks for water and sanitation estimation

While there is an advantage to using bias-adjusted relative risks for water and sanitation, doing so would result in important ramifications for the comparative risk assessment framework of GBD. Despite known sources of bias, at present we are unable to make similar adjustments to relative risks for other risk factors. Using bias-adjusted relative risks for some and not others would create an inconsistency and reduce comparability between risk factors. Moreover, the bias adjustment factor is relatively uncertain, so these adjustments would have a significant impact on the uncertainty of our results. The extent, limitations, feasibility, and data availability for this procedure will be considered and implemented systematically for all risk factors in future iterations of GBD.

The Council voted to update the age standard we use to generate age-standardized rates

For GBD 2013, we updated the standard population structure used by GBD since 2003 to reflect the recent development in demographic transition around the world, using the same methodology that generated the current GBD standard population structure. We use the estimated population by age for 2010 to 2035 from the World Population Prospects 2012 revision to get age structure for each country. Then we use the simple arithmetic mean of all country-level age structures to generate the new GBD standard population structure.

The Council approved the updated methodology for all-cause mortality estimation

In GBD 2013, we have made the following changes to the all-cause mortality estimation process compared to GBD 2010: 1. Data bias adjustment for raw child mortality data based on source-type specific fixed effects and source-specific random effects within country. By making such an adjustment, we are able to make more consistent child mortality estimates for countries with multiple overlapping estimates of child mortality that differ in levels. 2. Improved functional form for both child mortality rate and adult mortality rate estimation that reflect the correct functional relationship between mortality rates in the child and adult age groups and death rates due to HIV/AIDS in the corresponding age groups. 3. Improved relational model life table system. For GBD 2013, we developed a unified standard life table selection process that utilizes empirical weights for the selected life tables. In addition, we redistribute excess mortality rate due to HIV/AIDS based on the observed excess mortality pattern from ICD-10-coded vital registration data from around the world.

The Council approved the updated methodology for modeling diarrhea and lower respiratory infection etiologies using a counterfactual approach

The new approach to estimating the burden attributable to lower respiratory infection (LRI) and diarrhea is based on the fact that observational studies do not have enough sensitivity and specificity to determine the true causes of LRI and diarrhea. Diagnostic methods to detect LRI pathogens including respiratory syncytial virus (RSV), influenza, *Streptococcus pneumoniae*, and *Haemophilus influenzae* type b (Hib) are not sensitive. Moreover, vaccine clinical trials showed a significant decrease in invasive pneumonia by other pathogens, indicating a significant interaction between pathogens. So, in this counterfactual approach, the relative risks from vaccine efficacy trials and before-after studies are adjusted for efficacy using invasive disease as a marker as well as serotype coverage for pneumococcal conjugate vaccine (PCV) as previously described (Klugman KP. Contribution of vaccines to our understanding of pneumococcal disease. *Philosophical Transactions of the Royal Society B: Biological Sciences*. 2011; 366: 2790–8. Watt JP, Wolfson LJ, O'Brien KL, et al. Burden of disease caused by Haemophilus influenzae type b in children younger than 5 years: global estimates. *The Lancet*. 2009; 374: 903–11. O'Brien KL, Wolfson LJ, Watt JP, et al. Burden of disease caused by Streptococcus pneumoniae in children younger than 5 years: global estimates. *The Lancet*. 2009; 374: 893–902.). We estimated the PAF for RSV and influenza similar to the diarrhea pathogens explained below.

To estimate the burden of diarrhea by pathogens (and RSV and influenza) we used an alternative PAF formula using the distribution of pathogens from published literature and the relative risks of diarrhea in patients versus non-patients (control group).

Miettinen's formula: paf = P(pathogen in cases)* (1-1/RR)

The distribution of pathogens in patients is estimated using a meta-regression of published studies for all countries, sexes, ages, and years. Diarrhea pathogens' relative risks were estimated by the reanalysis of GEMS (Global Enteric Multicenter Study) in a mixed effect conditional logistic regression model.

The Council approved the addition of intimate partner violence-HIV as a risk-outcome pair

In GBD 2010, the expert group on intimate partner violence (IPV) and child sexual abuse proposed to include HIV as an outcome of intimate partner violence. After evaluating the evidence for a causal relationship between IPV and HIV/AIDS, the GBD core team decided that evidence from a single cohort study in South Africa with supportive evidence from cross-sectional studies was insufficient to warrant inclusion of the risk-outcome pair. Subsequently, the IPV experts have included a second cohort study from Uganda which shows similar magnitude of the relative risk as in the South African study and showed evidence for a dose-response relationship with a higher RR for more severe categories of violence.

As the RR is for incident HIV disease and we need to apply attributable fractions to prevalence and death, we will estimate for each age cohort (by country, sex, and year of estimation) the past cumulative risk of HIV infection that can be attributed to IPV (using the RR on incidence, the prevalence of IPV at the appropriate age for years prior to the index year, and the estimated incidence of HIV in each year for the appropriate age group) as a fraction of total cumulative risk of HIV infection.

The Council approved the proposal to remove cannabis-psychosis as a risk-outcome pair

In GBD 2010, regular cannabis use (defined as use more than once weekly) was included as a risk factor for an earlier onset of schizophrenia and a greater severity. As the estimates were very small (6,500 DALYs in 2010) it was decided to drop this risk factor from GBD 2013.

The Council rejected a proposal to add "harmful alcohol use" as a category in GBD 2013

The estimates for alcohol use disorders in GBD 2010 included alcohol dependence and fetal alcohol syndrome. Alcohol experts asked for inclusion of an additional category for harmful alcohol use, a recognized category in ICD-10 and DSM-IV classification systems. Prevalence data are available from most of the mental health and alcohol and drug surveys used for the alcohol dependence estimates. The experts suggested a lay description to derive a disability weight: "this person regularly gets drunk, putting the person at risk of injuries and other harm to health." It was decided that this health state is not consistent with the construct of health loss we apply to all other health states for two reasons. First, the risk of harm does not constitute actual health loss. The health loss from alcohol-related injuries or other harm is captured as part of those outcomes. Second, getting drunk is a health behavior akin to tobacco smoking or physical inactivity, neither of which we consider a cause of health loss per se. The decision was, therefore, not to include harmful alcohol use as a sequela in GBD.

The Council voted to approve the addition of new disability weights data in GBD 2013

Additional disability weight surveys have been conducted in the Netherlands, Sweden, Italy, and Hungary, funded by the ECDC and IHME. The surveys included 172 of the 220 lay descriptions that were used in the GBD 2010 disability surveys, 33 reformulated lay descriptions addressing issues with the original wording, 32 new health states (11 for inclusion in GBD 2013 and 21 in anticipation of inclusion of new conditions in GBD 2014). The results from the GBD 2010 surveys and the new surveys have been analyzed together to create an updated set of weights. GBD 2013 will use the results of the combined analysis. Of the 33 health states with reformulated lay descriptions, we will adopt 32. The only exception is the rewritten lay description for blindness, which resulted in a lower weight in the European surveys than the disability weight for severe vision loss in the combined analysis. We decided not to use the new blindness disability weight as it would be inconsistent to have a lower weight for blindness than for severe vision loss.

The Council voted to approve updates to the GBD 2013 risk factor cause list

The GBD 2013 will report 72 risk factors, an increase from the 67 risk factors that were reported in the GBD Study 2010. The additions for the GBD 2013 include:

- Aggregate burden of all risk factors
- Aggregate burden of air pollution
- Aggregate burden of physiological risk factors
- Low glomerular filtration rate
- Unsafe sex

Risk factors are categorized at different levels of detail, so there is a need to aggregate their effects at the main categories for a better understanding of the contribution of different risk factors to disease burden. Being able to show the fraction of each disease that can be attributed to a risk factor helps us understand where we have very little knowledge of causes of diseases and morbidities. We have accordingly added three categories of aggregates as part of this update.