Big Data in Global Health:
The Global Burden of Disease Study - Mental & Neurological Disorders -

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Institute for Health Metrics and Evaluation

• Independent research center at the University of Washington
• Core funding by Bill & Melinda Gates Foundation and State of Washington
• 185 faculty, researchers and staff
• Providing independent, rigorous, and scientific measurement and evaluations
  – Health outcomes
  – Performance of health systems, programs & interventions
  – Maximizing resources
• “Our goal is to improve the health of the world’s populations by providing the best information on population health”
The Global Burden of Disease Study

• A systematic scientific effort to quantify the comparative magnitude of health loss due to diseases, injuries and risk factors

• GBD 2010 results published in The Lancet in 2012
  – 291 causes, 67 risk factors
  – 187 countries
  – 1990-2010
  – By age and sex

• GBD 2013 update in process
  – Expanded list of causes
  – 1000+ collaborators from 100+ countries
Measuring the burden of diseases and injuries

- Deaths
- Years of Life Lost
- Years Lived with Disability
- Disability-Adjusted Life Years (DALYs)

Health

Age

Death

Ideal life expectancy
Big data in health

**Variety**
- Surveys
- Censuses
- Disease registries
- Vital registration
- Verbal autopsy
- Mortuaries / burial sites
- Police records

**Volume**
- Hospital / ambulatory / primary care records
- Claims data
- Surveillance systems
- Administrative data

**Velocity**
- Literature reviews
- Sensor data
- Social media
- Quantified self
1. Accessing the data

- Systematic identification of all relevant data sources
  - Lit reviews
  - Data Indexer team

- Challenges
  - Data are not shared consistently
  - Data on paper, PDF, proprietary & obsolete formats
  - Identifiers & confidentiality
  - Cost
2. Preparing data for analysis

• Data extraction (databases, tables, papers)
• Analysis of microdata
• Correction for bias
• Data quality issues, e.g. garbage codes
• Cross-walks, e.g. between ICDs
3. Analyzing data

• Using all available data
  – Use covariates: indicators related to quantity of interest
• Testing the modeling approach, e.g. predictive validity testing (CODEm)
• Applying appropriate corrections, e.g. causes of death to match all-cause mortality
• Quantifying uncertainty
• Review: 1000+ experts, peer-reviewed publication
4. Data translation

- Academic papers
- Policy reports
- Data search engine
- Data visualizations
  - Input data
  - Comprehensive results
  - Key insights
GBD brought attention to mental health

• Policy discussion about mental health used to be limited to severe cases, e.g. schizophrenia, bipolar disorder

• GBD 1990 first quantified burden from high prevalence disorders such as depression and anxiety

• GBD 2010 includes more detailed break-down
  – 12 mental & behavioral disorders
  – 6 neurological conditions

• GBD quantifies fatal and non-fatal health outcomes
Mental & neurological health: input data

- Mental health surveys
- Health service contact records
- Household surveys with medical exam
Mental & neurological health: key insights

• Mental disorders leading cause of non-fatal burden, ahead of musculoskeletal / back pain (both primary reasons for workplace absence)

• Prevalence of depression / anxiety not increasing

• Data sources show increase in dementia mortality, mostly due to improvements in cause of death certification

• Women have more depression & anxiety

• Men have more substance abuse and childhood conditions such as autism, ADHD and conduct disorder
Outlook

- Annual updates
- Sub-national analyses
- Disease expenditures
- Forecasts