Why measurement matters
Imagine you were running a company, how will you measure your success/progress?
Why Measurement Matters | 2013 Annual Letter from Bill Gates | BillsLetter

WHY DOES MEASUREMENT MATTER?

Measuring Progress

https://www.youtube.com/watch?v=380sy5_ZQzo
Measurement is critical for global health

• To understand disease trends and to set priorities
• To assess progress towards elimination or other targets
• To evaluate the effectiveness of interventions
• To provide feedback to improve performance
• To advocate for resources and investments
• To measure impact of donor aid
• For granting agencies to evaluate their investments and strategies
To understand disease trends
Be sure to watch “The River of Myths”, a wonderful video on importance of measurement.

https://www.youtube.com/watch?v=OwII-dwh-bk
Violence prevention: Globally, interpersonal violence resulted in some 475,000 homicides in 2012, of which 60% were in males aged 15-44 years, making homicide the third leading cause of death for males in this age group. In addition, of all adults, one in four report having been physically abused as children; one in five women and one in 10 men report having been sexually abused as children; one in three women report having been victims of physical and/or sexual intimate partner violence in their lifetime, and one in 17 older people report being abused in the past month.

More data and analysis on violence prevention

<table>
<thead>
<tr>
<th>Homicides</th>
<th>Child maltreatment</th>
<th>Violence against women</th>
</tr>
</thead>
<tbody>
<tr>
<td>475,000</td>
<td>23%</td>
<td>30%</td>
</tr>
<tr>
<td>estimated deaths from homicide (92% male) in 2012, globally</td>
<td>of adults report having been a victim of physical abuse as children</td>
<td>of ever partnered women have experienced physical or sexual violence by a partner in their lifetime, globally</td>
</tr>
</tbody>
</table>

Homicide estimates, 2012
Child maltreatment, 2012–2014
Intimate partner violence, 2010
To understand shifts in disease trends

Global Burden of Disease (GBD)

Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013

Up-to-date evidence on levels and trends for age-sex-specific all-cause and cause-specific mortality is essential for the formation of global, regional, and national health policies. In the Global Burden of Disease Study 2013 (GBD 2013) we estimated yearly deaths for 188 countries between 1990 and 2013. We used the results to assess whether there is epidemiological convergence across countries.

Example Search: Ghana malaria females under 5 death 1990

http://www.healthdata.org/gbd
“Medical doctor and economist Christopher Murray began the Global Burden of Disease studies to gain a truer understanding of how we live and how we die. While it is one of the largest scientific projects ever attempted—as breathtaking as the first moon landing or the Human Genome Project—the questions it answers are meaningful for every one of us: What are the world’s health problems? Who do they hurt? How much? Where? Why?

Murray argues that the ideal existence isn’t simply the longest but the one lived well and with the least illness. Until we can accurately measure how people live and die, we cannot understand what makes us sick or do much to improve it. Challenging the accepted wisdom of the WHO and the UN, the charismatic and controversial health maverick has made enemies—and some influential friends, including Bill Gates who gave Murray a $100 million grant.”
The Million Death Study (MDS) involved two phases, 1997–2003 and 2004–2013, each of which surveyed a different selection of more than 1 million homes. Government surveyors visit the homes every six months.

50,000–58,000 verbal autopsies are collected each year.

800–900 trained doctors from a pool of 300 assign a cause of death on the basis of each autopsy.

Top Causes of Death

- **ALL VASCULAR**
  - Deaths per 100,000 people: 225
  - India: 185
  - Sub-Saharan Africa: 137
  - Latin America and Caribbean: 173
  - East Asia and Pacific: 101

- **CHRONIC RESPIRATORY DISEASE**
  - Deaths per 100,000 people: 94
  - India: 32
  - Sub-Saharan Africa: 20
  - Latin America and Caribbean: 28
  - East Asia and Pacific: 18

- **TUBERCULOSIS**
  - Deaths per 100,000 people: 87
  - India: 65
  - Sub-Saharan Africa: 5
  - Latin America and Caribbean: 14
  - East Asia and Pacific: 1

- **CANCER**
  - Deaths per 100,000 people: 83
  - India: 125
  - Sub-Saharan Africa: 118
  - Latin America and Caribbean: 158
  - East Asia and Pacific: 166

Source: http://www.nature.com/news/global-health-one-million-deaths-1.14269
To establish priorities
To establish priorities

http://www.dcp-3.org/
The objective is to be able to compare a portfolio of products using a consistent methodology to gain greater insights into the potential value of BMGF investments.
To assess progress towards elimination or other targets
To assess progress towards elimination or other targets

“Know the truth. Response requires knowing where the virus is.”

“Appropriate response requires good epidemiologic analysis. The epidemiology, in turn, can be no better than the facts assembled. Knowledge is dependent on the information system; in public health, the surveillance system forms the foundation of knowledge.”
To assess progress towards elimination or other targets

Polio – the final push!

MDGs: Global Health Report Card
To evaluate the effectiveness of interventions
Global health interventions: failures are common

Archives of Failures in Global Health

Global health seeks to solve big problems. We’re bound to fail. Although failures can help us learn, we rarely seem to publish or discuss failed products and strategies in global health. This blog post aims to crowd source and compile a list of failures in global health.

How do we know what works?

A hard look at global health measures
Researchers seek convincing evidence that large-scale projects save lives

Cohen J. Science 2014
Impact evaluation: a new industry within global health

Sources: 3ie and William Savedoff
Using evidence to find out what works in development

JrE funds impact evaluations and systematic reviews that generate high quality evidence on what works in development and why. Evidence on development effectiveness can inform policy and improve the lives of poor people.

Search evidence database

Systematic Review Series

What factors affect sustained adoption of safe water, hygiene and sanitation technologies?

Drawing on a full systematic review, this systematic review summary, by Hulland et al., reviews the evidence on factors that motivate sustained adoption of WASH technologies.

Performance Metrics

JrE's performance against its strategic objectives

As an organisation, we are committed to the values of accountability and transparency. Here is a snapshot of JrE's performance...
To provide feedback to improve performance
To provide feedback to improve performance

The Feedback Intervention Trial (FIT) — Improving Hand-Hygiene Compliance in UK Healthcare Workers: A Stepped Wedge Cluster Randomised Controlled Trial

Christopher Fuller1, Susan Michie1, Joanne Savage1, John McAlister2, Sarah Bessey3, André Charlett4, Andrew Hayward5, Barry D. Cockson6, Ben S. Cooper7,8, Georgia Duckworth9, Annette Jeans1

1 Royal Free Campus, University College London Medical School, University College, London, United Kingdom
2 University College London, London, United Kingdom
3 Health Protection Agency, London, United Kingdom
4University College London Hospitals, London, United Kingdom
5London School of Hygiene and Tropical Medicine, London, United Kingdom
6University of Warwick, Coventry, United Kingdom
7University of Oxford, United Kingdom

Abstract

Introduction: Achieving a sustained improvement in hand-hygiene compliance is the WHO’s first global patient safety challenge. There is no RCT evidence showing how to do this. Systematic reviews suggest feedback is most effective and call for long-term well-designed RCTs applying behavioural theory to intervention design to optimise effectiveness.

Methods: Three-year stepped wedge cluster RCT of a feedback intervention testing hypothesising that the intervention was more effective than routine practice in 16 English/Welsh Hospitals (16 Intensive Therapy Units [ITU]; 44 Acute Care of the Elderly [ACE] wards) routinely implementing a national cleanliness-hand hygiene campaign. Intervention based on Goal & Control theories. Repeating a 4-week cycle (20 mins/wk) of observation, feedback and personalised action planning, recorded on forms. Computer-generated stepwise entry of all hospitals to intervention. Hospitals aware of only own allocation. Primary outcome: direct blinded hand hygiene compliance (%).

Results: All 16 units (90 wards) randomised, 33 wards implemented intervention (11 ITU, 22 ACE). Mixed effects regression analysis (all wards) accounting for confounders, temporal trends, ward type and fidelity to intervention (forms/month usage).

Intention to Treat Analysis: Estimated odds ratio (OR) for hand hygiene compliance rose post randomisation (1.14; 95% CI 1.18, 1.76; p<0.001) in ITUs but not ACE wards, equivalent to 7% absolute increase in compliance.

Per-Protocol Analysis for Implementing Wards: OR for compliance rose for both ACE (1.67; 1.28-2.22; p=0.001) & ITUs (2.09; 1.55-2.81; p<0.001) equating to absolute increases of 10-13% and 13-18% respectively. Fidelity to intervention closely related to compliance on ITUs (OR 1.12; 1.04-1.20; p=0.001) compared form but not ACE wards.

Conclusion: Despite difficulties in implementation, intention-to-treat, per-protocol and fidelity to intervention, analysis showed an intervention coupling feedback to personalised action planning produced moderate but significant sustained improvements in hand-hygiene compliance. In wards implementing a national hand-hygiene campaign. Further implementation studies are needed to maximise the intervention’s effect in different settings.

Trial Registration: ControlledTrials.com [ISRCTN53248861]


The effect of report cards on the coverage of maternal and neonatal health care: a factorial, cluster-randomised controlled trial in Uttar Pradesh, India

Camilla Fairlie, Varun Dutta, Vasudha Shukla, Kultar Singh, Nehal Shah, Timothy Powell-Jackson

Summary

Background Report cards are a prominent strategy to increase the ability of citizens to express their view, improve public accountability, and foster community participation in the provision of health services in low-income and middle-income countries. In India, social accountability interventions that incorporate report cards and community meetings have been implemented at scale, attracting considerable policy attention, but there is little evidence on their effectiveness in improving health. We aimed to evaluate the effect of report cards, which contain information on village-level indicators of maternal and neonatal health care, and participatory meetings targeted at health providers and community members (including local leaders) on the coverage of maternal and neonatal health care in Uttar Pradesh, India.

Methods We conducted a repeated cross-sectional, 2 × 2 factorial, cluster-randomised controlled trial, in which each cluster was a village (rural) or ward (urban). The clusters were randomly assigned to one of four groups: the provider group, in which we shared report cards and held participatory meetings with providers of maternal and neonatal health services; the community group, in which we shared report cards and held participatory meetings with community members (including local leaders); the providers and community group, in which report cards were targeted at both health providers and the community; and the control group, in which report cards were not shared with anyone. We generated these report cards by collating data from household surveys and shared the report cards with the recipients (as determined by their assigned groups) in participatory meetings. The primary outcome was the proportion of women who had at least four antenatal care visits (i.e., attended a clinic or were visited at home by a health-care worker) during their last pregnancy. We measured outcomes with cross-sectional household surveys that were taken at baseline, at a first follow-up (after 8 months of the intervention), and at a second follow-up (21 months after the start of the intervention). Analyses were by intention to treat. This trial is registered with ISRCTN, number ISRCTN11070792.
To advocate for resources
To advocate for resources

http://www.treatmentactiongroup.org/content/tbrd2018
FIGURE 2

Progress toward Global Plan 5-Year TB Research Funding Targets

The Global Plan to End TB did not set funding targets for TB basic science, operational research, or pediatric TB R&D.
To measure impact of donor aid
“Our country is littered with the bones of successful pilot projects”

African Health Minister
For granting agencies to evaluate their grantees and their own strategy

• Evaluation is the systematic, objective assessment of an ongoing or completed intervention, project, policy, program, or partnership. Evaluation is best used to answer questions about what actions work best to achieve outcomes, how and why they are or are not achieved, what the unintended consequences have been, and what needs to be adjusted to improve execution.
Dashboards and score cards
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<tr>
<td>Overall Patient Satisfaction</td>
<td>64.4</td>
<td>29.9</td>
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<td>49.0</td>
<td>56.2</td>
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<td>24.0</td>
<td>58.2</td>
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<td>67.6</td>
<td>79.4</td>
<td>82.4</td>
<td>75.0</td>
<td>80.4</td>
<td>79.0</td>
<td>87.5</td>
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<td>Written Short-a set of articles in community</td>
<td>73.3</td>
<td>3.8</td>
<td>73.3</td>
<td>68.0</td>
<td>70.4</td>
<td>83.4</td>
<td>89.8</td>
<td>87.5</td>
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<td>7.3</td>
<td>74.0</td>
<td>68.0</td>
<td>70.0</td>
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<td>Health Worker Satisfaction Index</td>
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<td>76.9</td>
<td>97.6</td>
<td>92.4</td>
<td>89.0</td>
<td>78.4</td>
<td>91.1</td>
<td>85.3</td>
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<td>87.9</td>
<td>97.6</td>
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<td>89.0</td>
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<td>Patient and Family Satisfaction Index</td>
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<td>78.4</td>
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<td>75.9</td>
<td>65.4</td>
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<td>Revised BMIS Use Index</td>
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<td>Overall Means (Provincial)</td>
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<td>-</td>
<td>50.0</td>
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<td>50.0</td>
<td>75.0</td>
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</table>

/domain A: Client and Community

| Overall Patient Satisfaction | 64.4 | 29.9 | 52.2 | 49.0 | 56.2 | 72.4 | 75.2 | 80.4 | 75.4 | 79.4 | 87.5 |
| Patient Perception of Quality Index | 66.0 | 24.0 | 58.2 | 52.0 | 67.6 | 79.4 | 82.4 | 75.0 | 80.4 | 79.0 | 87.5 |
| Written Short-a set of articles in community | 73.3 | 3.8 | 73.3 | 68.0 | 70.4 | 83.4 | 89.8 | 87.5 | 70.4 | 89.8 | 87.5 |
| Community Involvement and Decision Making Index | 74.0 | 7.3 | 74.0 | 68.0 | 70.0 | 83.4 | 84.4 | 87.5 | 68.0 | 84.4 | 87.5 |

/domain B: Human Resources

| Health Worker Satisfaction Index | 56.1 | 76.9 | 97.6 | 92.4 | 89.0 | 78.4 | 91.1 | 85.3 | - | - | - |
| Revised Health Worker Satisfaction Index | 67.7 | 87.9 | 97.6 | 92.4 | 89.0 | 78.4 | 91.1 | 85.3 | - | - | - |

/domain C: Physical Capacity

| Equipment Functionality Index | 49.3 | 64.1 | 75.9 | 65.4 | 67.6 | 83.9 | 81.3 | 91.8 | 92.1 | - | - |
| Revised Equipment Functionality Index | 76.7 | 86.1 | 75.9 | 65.4 | 67.6 | 83.9 | 81.3 | 91.8 | 92.1 | - | - |

/domain D: Quality of Service Provision

| Patient and Family Satisfaction Index | 37.1 | 68.1 | 78.4 | 72.5 | 72.2 | 72.1 | 72.0 | 72.1 | - | - | - |
| Revised Patient and Family Satisfaction Index | 67.7 | 88.1 | 78.4 | 72.5 | 72.2 | 72.1 | 72.0 | 72.1 | - | - | - |

/domain E: Management Systems

| BMIS Use Index | 49.6 | 62.0 | 75.9 | 65.4 | 67.6 | 83.9 | 81.3 | 91.8 | 92.1 | - | - |
| Revised BMIS Use Index | 76.7 | 86.1 | 75.9 | 65.4 | 67.6 | 83.9 | 81.3 | 91.8 | 92.1 | - | - |

/domain F: Overall Mission

| Overall Means (Provincial) | - | - | 50.0 | 50.0 | 50.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 |

Some challenges with measurement
Challenges

• Routinely collected data are often unreliable in LMICs
• Insufficient planning and funding for measurement (MLE)
  • There are many projects with impact never quantified!
• Denialism: do we really want to know the truth?
• Pressure to succeed can result in biased/fabricated data
• There is no guarantee that evidence will change policy
• Advocacy, sometimes, is more impactful than measurement and evidence!
China and the SARS cover-up

China accused of Sars 'cover-up'

China has been urged to reveal the full extent of its Sars outbreak amid claims that true case numbers are being concealed.

The appeal came after a team of epidemiologists from the World Health Organization ended a six-day tour of Guangdong province in southern China, where the illness is believed to have first appeared.

South Africa has now reported a "probable" Sars case - which, if confirmed by the WHO, would be the first on the continent.

A spokesman asked the Chinese authorities to be transparent about the numbers of people affected by the bug.

"We are always insisting that to address this outbreak you need full and open reporting," said Chris Powell, a spokesman for the organisation.

The Chinese authorities have been accused of a slow and secretive handling of the Sars outbreak in order to avoid spreading panic.

China hid SARS patients - report

BEIJING, China -- Beijing authorities have gone to staggering lengths to hide SARS patients from visiting World Health Organization (WHO) inspectors, according to TIME magazine.

At one of the most reputable of the city's hospitals, 31 patients suffering the potentially lethal disease were driven around in ambulances for the duration of the WHO visit, said TIME.

And at a military hospital, 40 SARS patients were said to have been moved to a hotel for the duration of the WHO tour, in an apparent attempt to deceive inspectors about the true extent of the outbreak.

The timing of the revelations could prove a major embarrassment to the Chinese government.
India and the drug-resistant TB denial

Correspondence

Totally Drug-Resistant Tuberculosis in India

To the Editors—Three years after extensively drug-resistant (XDR) tuberculosis was first described in 2006, Velázquez et al. [1] drew attention to the emergence of totally drug-resistant (TDR) tuberculosis in India. Since the first cases of XDR tuberculosis in India were reported from the P. D. indvidually and often in incorrect doses, from multiple private practitioners (mean, 4 physicians during a 18-month period) in an attempt to cure their multidrug-resistant (MDR) tuberculosis (Table 1). The latest WHO global resistance report estimated 110 332 cases of MDR tuberculosis from India in 2006, which accounts for 29% of the world’s MDR tuberculosis load [2]. Although India’s RNTCP has been a tremendous success,

Note

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMB Form for Disclosure of Potential Conflicts of Interest. Conflict that the editors consider relevant to the content of the manuscript have been disclosed:

Zarin F. Udwadia, Rohit A. Amole, Kanchan K. Abhidhan, and Camilla Rodrigues
P.P. Hinduja National Hospital and Medical Research Centre, Mumbai, India

An update to the news two weeks ago of totally drug-resistant tuberculosis, TDR-TB, being identified in India (and earlier in Italy and Iran): The Indian government has announced that it doesn’t exist, and is putting pressure on the physicians who identified it to say they made a mistake.
Differing views of poverty in Rwanda

Variations in 2011 figure based on inflation measure used in calculation

- **Official figures**: Decreased
  - Implies cumulative inflation of no more than 4.7%

- **Published rate**: Decreased
  - Based on weighted food and non-food inflation in NISR report

- **Official CPI**: Increased
  - Rwandan government says this is inappropriate as it is skewed towards urban households

- **Household survey**: Increased
  - Official data show price rises of 30%, says academic Sam Desiere

- **e-SOKO**: Increased
  - Agriculture ministry data show even greater price rises

* Food inflation only; sources' estimates derived from price data
** Government initiative to inform farmers' market pricing decisions

Graphic: David Blood  Source: FT research
© FT

https://www.ft.com/content/683047ac-b857-11e9-96bd-8e884d3ea203
BURDEN OF DISEASE
Key Health Indicators

Terms

• Prevalence - number of people suffering from a certain health condition over a specified time period

• Incidence - the rate at which new cases of a disease occur in a population
SNAPSHOT OF GLOBAL HEALTH STATUS: KEY HEALTH STATUS INDICATORS

- Maternal mortality ratio
- Neonatal mortality rate
- Infant mortality rate
- Under-five mortality
- Life expectancy
- All-cause mortality rate
Measuring the Burden of Disease

**Health-Adjusted Life Expectancy (HALE)**

- Summarizes expected number of years to be lived in what might be termed the equivalent of good health
- A health-expectancy measure
- To calculate the HALE: the years of ill health are weighted according to severity and subtracted from the overall life expectancy
Measuring the Burden of Disease

Disability-Adjusted Life Year (DALY)

• The sum of years lost due to premature death (YLLs) and years lived with disability (YLDs). DALYs are also defined as years of healthy life lost.

• A health-gap measure.

• Indicates losses due to illness, disability and premature death in a population, accounting for health conditions like mental illness that rarely cause death.
Measuring the Burden of Disease

Quality-Adjusted Life Year (QALY)

A measure of the state of health of a person or group in which the benefits, in terms of length of life, are adjusted to reflect the quality of life.

One QALY is equal to 1 year of life in perfect health.

To be dead is associated with 0 QALYs.
The DALY Show, Disability-Adjusted Life Year (DALY)

https://www.youtube.com/watch?v=Exce4gy7aOk
Understanding burden

Disability Weight

YLDs

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

YLLs

Death
Maximum life expectancy

IHME
Burden of Disease Data

Important to gain an understanding of:

• Leading causes of illness, disability, and death in the world
• Variations in these causes by age, sex, ethnicity, and socioeconomic status
• Changes over time and how these causes might change in the future
Examples

- Trends in global poverty
- Trends in life expectancy
- Trends in under 5 mortality
- Trends in maternal mortality
Global Burden of Diseases, Injuries, and Risk Factors Study: over 1,000 people from over 100 countries put together all the world’s data on more than 1,000 different clinical outcomes

Life expectancy, 2017

Years someone can expect to live in full health in 2017 (Healthy life expectancy at birth)

Leading causes of early death, 1990 and 2017

Total Number of Global Deaths, 1950-2017

Leading causes of early death and disability‡ at lowest and highest levels of development, 2017

<table>
<thead>
<tr>
<th>Low Socio-demographic Index (SDI)§ countries</th>
<th>High SDI countries</th>
<th>Communicable, maternal, neonatal, and nutritional diseases</th>
<th>Non-communicable diseases</th>
</tr>
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<tbody>
<tr>
<td>1 Neonatal disorders</td>
<td>1 Ischemic heart disease</td>
<td></td>
<td></td>
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<tr>
<td>2 Lower respiratory infections</td>
<td>2 Low back pain</td>
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<tr>
<td>3 Diarrheal diseases</td>
<td>3 Stroke</td>
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<tr>
<td>4 Malaria</td>
<td>4 Lung cancer</td>
<td></td>
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<tr>
<td>5 Congenital defects</td>
<td>5 COPD</td>
<td></td>
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</tr>
</tbody>
</table>


Leading risk factors causing early death and disability, by sex, 2017

Males*

1 Smoking
2 High systolic blood pressure
3 High fasting plasma glucose
4 Alcohol use
5 Short gestation for birth weight

Females*

1 High systolic blood pressure
2 High fasting plasma glucose
3 High body mass index
4 Short gestation for birth weight
5 Low birth weight for gestation

Metabolic risks
Behavioral risks
Forecast: Leading causes of early death, 2016 and 2040


Forecast: Potential loss of life averted through reduction of exposure to key risk factors, 2040
SDG index score, 2017

Progress towards SDG targets

Global under-5 mortality rate, 1990–2030

Global maternal mortality ratio, 1990–2030

Global prevalence of overweight in children aged 2 to 4, 1990–2030


Socio-demographic Index (SDI), based on income per capita, average level of educational attainment, and fertility rate
Criticisms of GBD

• Black box and methods are hard to understand; lack of transparency

• Uses modeling and extrapolation to counteract systematic biases or inaccurate reporting in country collected data
  • “even the best recipes and best chefs in the world can’t make a meal out of spoiled (or non-existent) ingredients” Victoria Fan

• Data from all sorts of sources are combined (mixing apples and oranges)

• Confusing for policy makers when GBD estimates diverge from WHO or other sources

• Too reliant on DALYs, which has limitations

• Heavily funded by Gates Foundation
Great resources to explore

http://ourworldindata.org/

http://www.healthdata.org/results/data-visualizations

http://www.gapminder.org/