Use of Cost-effectiveness Analysis as a Policymaking Tool to Identify “Best-Buy” Interventions for Non-Communicable Diseases

Dan Ollendorf, PhD
Director, Value Measurement & Global Health Initiatives
Research Team

Tufts Medical Center

Center for the Evaluation of Value and Risk in Health

Funding from:

Bill & Melinda Gates Foundation
Background
1. Cost-effectiveness in global health resource prioritization
How to prioritize resources to improve population health?

What are the biggest health problems?

What are the most efficient solutions?
Identifying the biggest problems

Global Burden of Disease:

Institute for Health Metrics and Evaluation
Finding the most efficient solutions

Cost-Effectiveness:

DCP³
Disease Control Priorities

economic evaluation for health
Finding the most efficient solutions

• WHO CHOICE
  — “Generalized” CEA: standard sets of costs, disability weights and epidemiological data for 14 distinct regions
Aggregate, curate, and improve the world’s cost-effectiveness information to enhance global health
The GH CEA builds on other efforts...

- Published global cost-per-DALY analyses
- Continually-updated
- Open access and available for download
- Public can help build and improve the resource
2. Non-communicable diseases (NCDs) and cost-effectiveness
NCD burden: worldwide

• 40 million deaths/year
• Top contributors account for 82% of deaths:
  — Cardiovascular disease
  — Cancer
  — Chronic respiratory diseases
  — Diabetes
• Economic impact: estimated at $30 trillion over next 20 years
  — Mental illness a major contributor

Sources: WHO, World Economic Forum
NCD burden: LMICs

- 67% of deaths from NCDs occur in LMICs
- Disproportionate rise in mortality compared to high income countries
- Substantial economic impact
  - High costs of tertiary treatment for NCDs
  - 15 million deaths from preventable NCDs occur in the working age population (age 30-69)
  - Lost earnings from NCDs in LMICs total $500 billion annually
    - Exceeds public health spending regardless of country income level

Sources: IHME; Nugent et al. 2018; World Economic Forum
Methods
A database of published cost-per-DALY studies

- Reflects local geography and context
- Has built-in tools and filters
Growth of cost-per-DALY studies

Publication Year

# of Articles

- Non-Communicable Diseases
- All disease areas
GH CEA Contents

~5,000 Total cost-per-DALY ratios (through 2017)

649 English-language Cost-per-DALY analyses
82 countries
86 diseases
2,000+ health interventions
Registry contents

- 3,242 Primary prevention ratios
- 981 Secondary prevention ratios
- 2,009 Tertiary treatment ratios

Examples:
- Rotavirus vaccination in Congo ($32/DALY averted)
- Aspirin + beta blockers for prevention of myocardial infarction ($2,000/DALY averted)
- Cataract surgery in Nepal ($8/DALY averted)
Registry contents

Interventions for 86 diseases

39 Communicable diseases
- HIV/AIDS & TB
- Diarrhea & common infectious diseases
- Neglected tropical diseases
- ...

47 Non-communicable diseases
- Neoplasms
- Cardiovascular disease
- Chronic respiratory disease
- ...

86 diseases in GH CEA Registry
Interventions for 86 diseases
- 39 Communicable diseases
  - HIV/AIDS & TB
  - Diarrhea & common infectious diseases
  - Neglected tropical diseases
  - ...
- 47 Non-communicable diseases
  - Neoplasms
  - Cardiovascular disease
  - Chronic respiratory disease
  - ...
Registry Contents

Geographic density of cost/DALY averted CEAs for Non-Communicable Diseases
COST-EFFECTIVENESS OF SELECTED GLOBAL HEALTH NCD INTERVENTIONS

Cost-saving

- Alcohol advertising bans in Australia
- Price increase on cigarettes internationally
- Antipsychotic medication in Thailand

-$600/DALY
- Screening adults for hearing loss in Zambia
- Knee replacement surgery in Australia

$3,500/DALY
- Stage IV breast cancer systemic chemotherapy in Mexico

$39,000/DALY

Source: Global Health Cost-effectiveness Analysis Registry
Methods

• GH CEA Registry Search
  — Articles:
    • Intervention target population in LMICs (defined by WHO and World Bank)
    • Narrowed to top 4 NCD areas:
      — Cardiovascular disease
      — Cancer
      — Chronic respiratory diseases
      — Diabetes
  — Intervention focus (i.e. ratios):
    • Cost-saving
    • Highly cost-effective: < US$100/DALY-verted
Results
NCD Studies in LMICs

1,273
Cost-per-DALY NCD ratios in LMICs (through 2017)

82
Cost-per-DALY NCD analyses in LMICs
Ratios: Cost-saving & cost-effective in LMICs

N= 149 intervention comparison ratios; n= 21 studies

- Neoplasms: 46%
- Cardiovascular & circulatory diseases: 42%
- Multiple disease areas: 9%
- Diabetes: 3%

Costs:
- Ratios: Cost-saving & cost-effective
- ≤ US$100/DALY-averted: 60%
- Cost-saving: 40%
- Cost-effective: 40%

Intervention Type:
- Immunization: 40%
- Legislation: 28%
- Pharmaceutical: 18%
- Health education or behavior: 10%
- Diagnostic/screening: 2%
- Medical procedure: 1%
- Other: 1%

Threshold: 
- ≤ US$100/DALY-averted
## Results: Best-buys

### Programmatic Interventions

<table>
<thead>
<tr>
<th>Cost-saving Interventions</th>
<th>≤ $100/DALY averted</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Legal limit on dietary trans-fat</td>
<td>• Increase in tobacco tax</td>
</tr>
<tr>
<td>• Voluntary agreements on dietary trans-fat limits</td>
<td>• Legislation to reduce salt intake</td>
</tr>
<tr>
<td>• Graphic warning labels on cigarette packs</td>
<td>• Mass media campaign to reduce salt intake</td>
</tr>
<tr>
<td>• Smoking ban</td>
<td>• Policy interventions to reduce sodium consumption by 10%</td>
</tr>
<tr>
<td></td>
<td>• Package labeling of tobacco products</td>
</tr>
<tr>
<td></td>
<td>• Advertisement ban on tobacco products</td>
</tr>
<tr>
<td></td>
<td>• Salt reduction through voluntary agreements with industry</td>
</tr>
<tr>
<td></td>
<td>• Bupropion or Varenicline for smoking cessation</td>
</tr>
<tr>
<td></td>
<td>• Nicotine replacement therapy (gum or patch) for smoking cessation</td>
</tr>
</tbody>
</table>
# Results: Best-buys

## Cardiovascular Disease

<table>
<thead>
<tr>
<th>Cost-saving Interventions</th>
<th>≤ $100/DALY averted</th>
</tr>
</thead>
</table>
| • Acute rheumatic fever and rheumatic heart disease control program | • Daily aspirin  
• Individual-based hypertension treatment of high blood pressure with beta-blocker & diuretic  
• Treatment of chronic heart failure with diuretics  
• Primary prevention of ischemic heart disease & stroke using individual-based drug regimens |

## Cancer

<table>
<thead>
<tr>
<th>Cost-saving Interventions</th>
<th>≤ $100/DALY averted</th>
</tr>
</thead>
</table>
| • HPV (16/18) Vaccination | • Chemotherapy for non-Hodgkin’s lymphoma  
• Breast cancer screening with mammography |
|                           | • Cervical screening |

## Diabetes

| Cost-saving Interventions | Benefit-based tailored treatment (prescribing statins based on cardiovascular risk factors rather than LDL) |
Conclusions
• Cost-saving interventions were preventative and programmatic (e.g. smoking warnings or bans, breast cancer screening)

• Cost-effective interventions were largely treatment-focused (e.g. nicotine replacement)

• Diabetes (few reported cost-saving or cost-effective interventions) and chronic respiratory diseases (no studies) represent opportunities for additional research
Thank you!

ghcearegistry.org

dollendorf@tuftsmedicalcenter.org

@dollendorf