Economic Impact of Non-Communicable Disease

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INTERNATIONAL CONFERENCE OF PUBLIC HEALTH
“Current Issue of Non-Communicable Disease”
Epidemiological Transition

• Indonesia is undergoing an epidemiological transition, with the disease burden shifting from communicable diseases to non-communicable diseases (NCDs)

• For example, according to estimates from the World Health Organization (WHO), the proportional mortality due to NCDs has increased from 50.7% in 2004 to 71% in 2014.
Four Major Non-Communicable Diseases (NCDs) Worldwide

1. Cardiovascular diseases (e.g. heart disease, stroke)
2. Cancer
3. Chronic respiratory diseases
4. Diabetes

• NCDs are the leading cause of mortality in the world.
• In 2008 more than 36 million people died from NCDs in 2008, mainly cardiovascular diseases (48%), cancers (21%), chronic respiratory diseases (12%) and diabetes (3%).

Source: WHO, 2011
NCD Share of Mortality Worldwide
NCD Share of Mortality in Indonesia

Total population: 247,000,000
Income Group: Lower middle
Percentage of population living in urban areas: 50.7%
Population proportion between ages 30 and 70 years: 42.6%

NCDs are estimated to account for 71% of total deaths.

Source: WHO, 2014
The proportional mortality due to NCDs has increased from 50.7% in 2004 to 71% in 2014 in Indonesia.

Cause of Death In Indonesia, 2012 (% of Total)

Total population: 247 000 000
Income Group: Lower middle
Percentage of population living in urban areas: 50.7%
Population proportion between ages 30 and 70 years: 42.6%

Source: WHO, 2016
Figure 1: Proportion of NCD mortality under 60 years by income group of countries.

- More than 9 million of NCD mortality occurred before the age of 60 and could have largely been prevented.
- Premature deaths from NCDs range from 22% among men and 35% among women in low-income countries to 8% among men and 10% among women in high-income countries.

Source: WHO, 2011
DALY as a Measure of Disease Burden

One of the most common measures of disease burden is DALYs. One DALY can be thought of as one lost year of "healthy" life.

The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability.
• DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD):

\[
\text{DALY} = \text{YLL} + \text{YLD}
\]

YLL = N \times L

where:
N = number of deaths
L = standard life expectancy at age of death in years

YLD = I \times DW \times L

where:
I = number of incident cases
DW = disability weight
L = average duration of the case until remission or death (years)

Alternatively,

\[
\text{YLD} = P \times DW
\]

where:
P = number of prevalent cases
DW = disability weight
Burden of Disease (DALYs) Worldwide, 2001

Burden of diseases worldwide: Disability adjusted life years (DALYs), 2001

- Neuropsychiatric disorders 13%
- Injuries 12%
- HIV/AIDS 6%
- Diarrhoeal diseases 4%
- Childhood diseases 3%
- Respiratory infections 6%
- Malaria 3%
- Maternal conditions 2%
- Perinatal conditions 7%
- Nutritional deficiencies 2%
- Other NCDs 1%
- Malignant neoplasms 5%
- Diabetes 1%
- Cardiovascular diseases 10%
- Respiratory diseases 4%
- Digestive diseases 3%
- Diseases of the genitourinary system 1%
- Congenital abnormalities 2%
- Musculoskeletal diseases 2%

Source: WHR, 2002
DALYs by WHO Region, 2004

The contribution of premature death varied dramatically across regions, with YLL rates seven times higher in Africa than in high-income countries. In contrast, the YLD rates were less varied, with Africa having 30% higher rates than high-income countries. South-East Asia and Africa together bore 54% of the total global burden of disease in 2004, although they account for only about 40% of the world’s population. The Western Pacific Region has the “healthiest” low- and middle-income countries, with countries such as China now having life expectancies similar to those of many Latin American countries, and higher than those in some European countries.

## Ten leading causes of burden of disease, world, 2004 and 2030

<table>
<thead>
<tr>
<th>Disease or injury</th>
<th>2004</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>As % of total DALYs</td>
<td>Rank</td>
</tr>
<tr>
<td></td>
<td>Rank</td>
<td></td>
</tr>
<tr>
<td>Lower respiratory infections</td>
<td>6.2</td>
<td>1</td>
</tr>
<tr>
<td>Diarrhoeal diseases</td>
<td>4.8</td>
<td>2</td>
</tr>
<tr>
<td>Unipolar depressive disorders</td>
<td>4.3</td>
<td>3</td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>4.1</td>
<td>4</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>3.8</td>
<td>5</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>3.1</td>
<td>6</td>
</tr>
<tr>
<td>Prematurity and low birth weight</td>
<td>2.9</td>
<td>7</td>
</tr>
<tr>
<td>Birth asphyxia and birth trauma</td>
<td>2.7</td>
<td>8</td>
</tr>
<tr>
<td>Road traffic accidents</td>
<td>2.7</td>
<td>9</td>
</tr>
<tr>
<td>Neonatal infections and other</td>
<td>2.7</td>
<td>10</td>
</tr>
<tr>
<td>COPD</td>
<td>2.0</td>
<td>13</td>
</tr>
<tr>
<td>Refractive errors</td>
<td>1.8</td>
<td>14</td>
</tr>
<tr>
<td>Hearing loss, adult onset</td>
<td>1.8</td>
<td>15</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.3</td>
<td>19</td>
</tr>
</tbody>
</table>

- Unipolar depressive disorders
- Ischaemic heart disease
- Road traffic accidents
- Cerebrovascular disease
- COPD
- Lower respiratory infections
- Hearing loss, adult onset
- Refractive errors
- HIV/AIDS
- Diabetes mellitus

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**Leading Causes of Burden of Disease Worldwide, 2004 and 2030**
Global DALYs by Cause of Disease

Source: Epianalysis, 2012
NCD Share of DALYs Worldwide

DALYs (%) in 2004

- Cardiovascular
- Respiratory
- Injuries
- Diarrhoeal diseases
- Other noninfectious conditions
- Malignant neoplasms
- Other infectious, maternal, perinatal and nutritional

Specific Causes:
- Tuberculosis
- HIV/AIDS
- Malaria
- Trypanosomiasis
- Schistosomiasis
- Leishmaniasis
- Lymphatic filariasis
- Hepatitis B/C
- Meningitis
- Childhood-cluster diseases

(excluding HIV)
Vicious NCDs-Economic Cycle

- Reduce labor force size (mortality, absenteeism, disability, early retirement)
- Higher dependency ratio on others
- Diminished labor productivity
- Reduced access to factors of production
- Increased consumption of health services
- Reduced savings
- Reduced investment in physical capital

Lower GDP per Capita

Stunted Economic Growth, More Poverty and Inequality

Source: Adapted from Abegunde and Stanciolu, "An Estimation of the Economic Impact of Chronic Noncommunicable Diseases in Selected Countries," WHO, 2006
Causal Pathway of the Socio-Economic Impact of Non-Communicable Diseases

Source: Thakur et al., 2011
Analysis of Economic Impact of NCDs at Household Level
• The economic value of DALYs lost due to a NCD can be calculated by multiplying the estimated DALYs loss due to a NCD in a specified year by the GDP per capita in the same year for the respective countries, using human capital approach.

Economic Loss = Disability Adjusted Life Years (DALYs) x GDP Per Capita

• Individuals are productive members of the economy.
• Individual’s yearly economic contribution is the GDP per capita.
• Years lost due to disability or death are years that are not productive and therefore not contributing in the GDP.

Source: Dalal and Svanström, 2015
Estimating Economic Losses Due To Ill Health: The WHO EPIC Method

- The EPIC model predicts losses caused by different health conditions in terms of their effect on the value of economic output.
- **EPIC** links the value of economic output to quantities of labor and capital inputs, as well as to technology.
- Labor is diminished by disability and death caused by NCDs.
- Capital is also reduced because costs of screening, treatment and care claim resources that would otherwise be available for public and private investment.

Over the period 2011-2025, the cumulative lost output in LMICs associated with the four NCD conditions that are the focus of the UN High-Level Meeting is projected to be more than US$ 7 trillion.

The annual loss of approximately US$ 500 billion amounts to roughly 4% of GDP for low- and middle-income countries in 2010.

In every income group, losses from NCDs are greater than public spending on health.

Figure 2: Cumulative NCD loss, beginning in 2011

Causes of NCDs

• The four major causes/ risk factors of NCDs:
  1. Tobacco use
  2. Physical inactivity
  3. Harmful use of alcohol
  4. Unhealthy diets

• The prevalence of these risk factors remains high worldwide, and is increasing in the majority of low- and middle-income countries.
NCD Risk Factors in Indonesia

Total population: 247 000 000
Income Group: Lower middle
Percentage of population living in urban areas: 50.7%
Population proportion between ages 30 and 70 years: 42.6%

Source: WHO, 2014
Barker’s Hypothesis
(Thrifty Phenotype Hypothesis)

1. Intra-uterine retardation growth (IURG)
2. Low birth weight
3. Premature birth

Have causal association with ill health conditions in adulthood:

1. Hypertension
2. Coronary heart diseases
3. Type II Diabetes Mellitus (Non-Insulin-Dependent Diabetes)

This hypothesis:
• Proposed by an English epidemiologist David Barker in 1990
• Empirical evidences were shown in Barker’s book “Fetal and Infant Origins of Adult Disease” (1992).
FATAL FOETAL: The graph points out that measures taken before a child is born have an enormous effect in preventing non-communicable diseases.

Source: Matias Helgheim, 2016
Evidence-Based Effective “Best Buy” Intervention Strategies to Tackle Leading Causes of NCDs


<table>
<thead>
<tr>
<th>Risk factor / disease</th>
<th>Interventions</th>
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| Tobacco use                               | • Tax increases  
• Smoke-free indoor workplaces and public places  
• Health information and warnings  
• Bans on tobacco advertising, promotion and sponsorship |
| Harmful alcohol use                       | • Tax increases  
• Restricted access to retailed alcohol  
• Bans on alcohol advertising |
| Unhealthy diet & physical inactivity      | • Reduced salt intake in food  
• Replacement of trans fat with polyunsaturated fat  
• Public awareness via mass media about diet and physical activity |
| Cardiovascular disease (CVD) and diabetes | • Counseling and multi-drug therapy for people with a high risk of developing heart attacks and strokes (including those with established CVD)  
• Treatment of heart attacks with aspirin |
| Cancer                                    | • Hepatitis B immunization to prevent liver cancer (already scaled-up)  
• Screening and treatment of pre-cancerous lesions to prevent cervical cancer |
Summary

1. NCDs are the major cause of mortality and disability, in high, middle, as well as low income countries.

2. NCDs has tremendous impact on economic as they impede productivity, escalate medical cost, hinder economic growth, and increase poverty.

3. The NCD threat can be overcome using existing knowledge on its causes. The 4 major causes of NCDs are: (1) Tobacco use; (2) Physical inactivity; (3) Harmful use of alcohol; (4) Unhealthy diets.

4. There are cost-effective “best buy” interventions that can be used to solve or mitigate the problems of NCDs and their economic burden.

5. Comprehensive, integrated, life-course, multi-sectoral action at country level and local level, led by governments, is the means to achieve success in the control of NCDs and their economic burden.