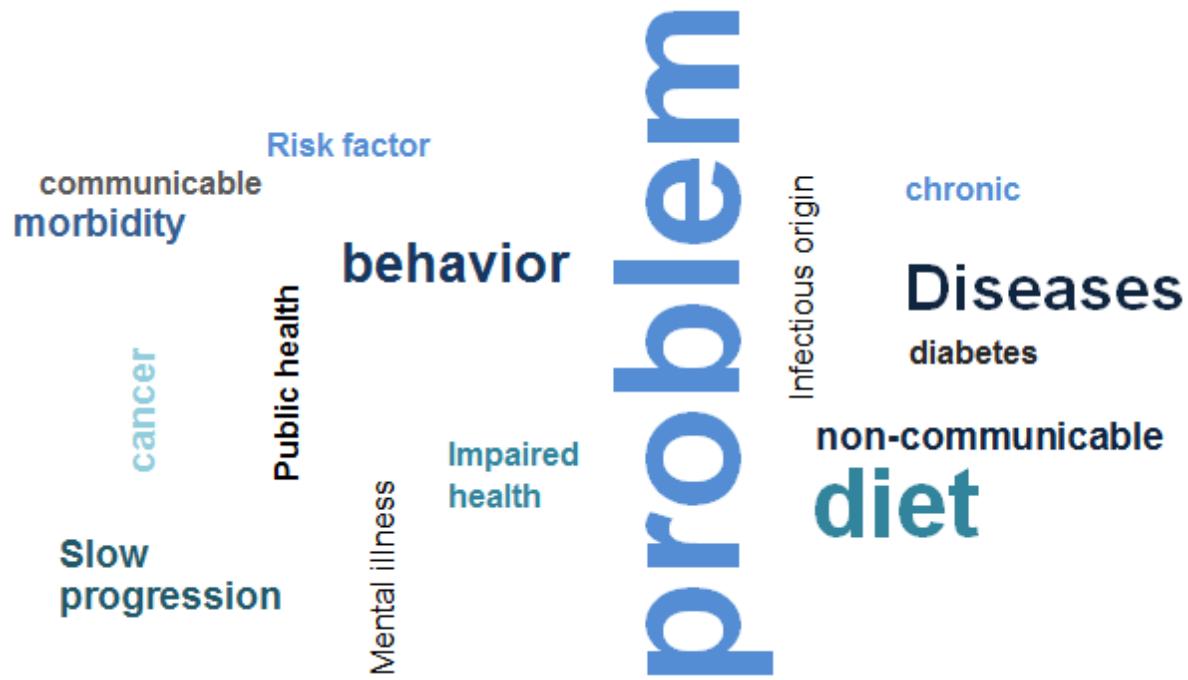


FACILITATOR GUIDE



NCD Burden of Disease

Created: 2013



Introduction to NCD Epidemiology. Atlanta, GA: Centers for Disease Control and Prevention (CDC), 2013.

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NCD Burden of Disease

LEARNING OBJECTIVES

At the end of the training, you will be able to:

- Calculate prevalence, incidence, and mortality
- Apply definitions of DALYs and QALYs

ESTIMATED COMPLETION TIME

- 120 minutes (*100 minutes interactive presentation; 20 minutes Skill Assessment*)

TRAINING TECHNIQUES

- Content and examples will be presented using *lectures* and *group discussion*. Participants will complete the practice exercise in pairs and the skill assessment individually

PREREQUISITES

- *Introduction to NCD Epidemiology*

MATERIALS AND EQUIPMENT

Facilitator:

- PowerPoint file for presentation
- Marker for slides
- Flipchart and markers

Participant:

- Participant Guide
- Calculators – one for each participant
- (Sample) data on burden of disease (see Preparation section)

REFERENCES AND RESOURCES

- CP Wen, SP Tsai, TY Cheng, CJ Chen, DT Levy, HJ Yang, MP Eriksen, *Uncovering the Relation Between Betel Quid Chewing and Cigarette Smoking in Taiwan*, Tobacco Control 2005, 12:i16-i22 doi:10.1136/tc.2004.008003
- GA Mensah, *Epidemiology of Stroke and High Blood Pressure in Africa*, Heart 2008;94:697-705 doi:10.1136/heart.2007.127753
- World Health Organization (WHO), Global mesothelioma deaths reported to the World Health Organization between 1994 and 2008, Retrieved on August 15th, 2013, from <http://www.who.int/bulletin/volumes/89/10/11-086678/en/>

- World Health Organization (WHO), New study presents state of the world's health, Retrieved on August 15th, 2013, from <http://www.who.int/mediacentre/news/notes/2008/np11/en/>
- World Health Organization (WHO), Overview Non Communicable Disease Prevention & Control (NPC), Retrieved on August 15th, 2013, from <http://www.afro.who.int/en/clusters-a-programmes/dpc/non-communicable-diseases-managementndm/overview.html>
- Graph of infant and child mortality in Myanmar, Retrieved on August 15th, 2013, from http://www.lightofmyanmar.com/wpblog/wp-content/uploads/2010/08/Myanmar_Burma_infant_child_mortality_birth_death_rate_population_trend_statistics_data.jpg
- World Health Organization (WHO), World Health Statistic 2008 Report, Retrieved on August 15th, 2013, from http://www.who.int/whosis/whostat/EN_WHS08_Full.pdf
- Cancer Research UK, Breast cancer incidence statistics, Retrieved on August 15th, 2013, from <http://info.cancerresearchuk.org/cancerstats/types/breast/incidence/#Lifetime>
- World Health Organization (WHO), The global burden of disease: 2004 update, Retrieved on August 155th, 2013, from http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_part4.pdf
- World Health Statistics 2008

PREPARATION CHECKLIST

The following are action items to be completed by the facilitator prior to training:

- ___ Review slides
- ___ Change slide 13 so that it is country-specific. Refer to <http://www.nationmaster.com/country/>, locate your country and then select “Age-distribution.” Copy at least three graphs onto the slide (with custom animation) and show one graph at a time to compare the demographic transition.
- ___ Compile country data on incidence, prevalence and mortality and make copies for participants. If there are insufficient country data, make copies of the sample data found at the end of this Facilitator Guide.

FONT GLOSSARY

The following fonts are used in this guide:

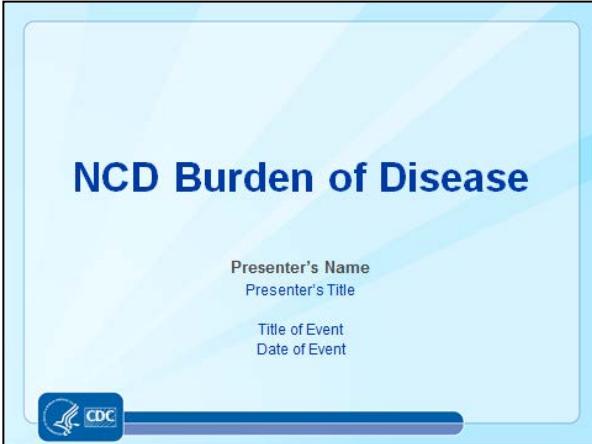
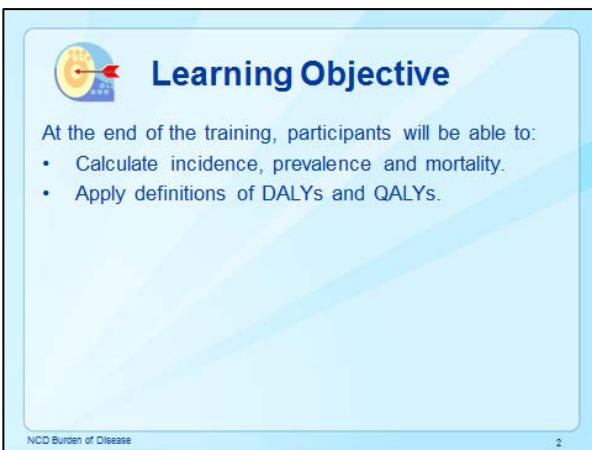
Font Type	Font Meaning
Plain	Script
Bold	Instructions
<i>Italics</i>	<i>Answers</i>

ICON GLOSSARY

The following icons are used in this guide:

Image Type	Image Meaning
	<i>Small group exercise.</i>
Activity Icon	
	Write responses during facilitator-led discussions or debriefs.
Flip Chart Icon	
	Question for facilitator to ask participants.
Question Icon	
	Supplemental information discussion.
Tip Icon	
	Do not start the assignment until your facilitator tells you to begin.
Stop Icon	

MODULE CONTENT

Duration/ Slide Number	What To Do/What To Say
1 minute Slide 1	 A presentation slide titled "NCD Burden of Disease". It includes fields for "Presenter's Name" and "Presenter's Title", and "Title of Event" and "Date of Event". The CDC logo is at the bottom.
1 minute Slide 2	 A presentation slide titled "Learning Objective". It features a target icon and the text: "At the end of the training, participants will be able to:" followed by a bulleted list: "Calculate incidence, prevalence and mortality." and "Apply definitions of DALYs and QALYs." The slide also includes the text "NCD Burden of Disease" and the number "2".

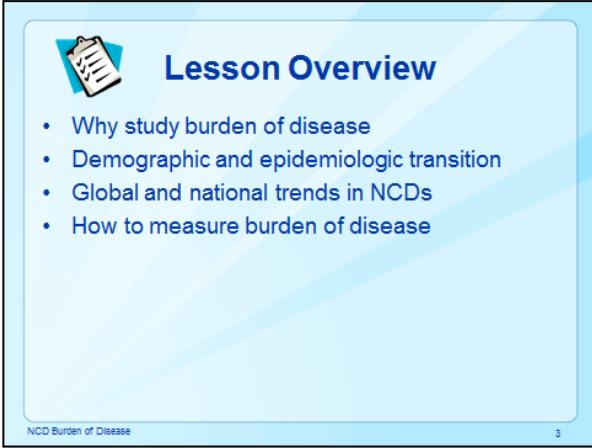
• Tell participants that this lesson will take approximately two hours to complete.

• Explain that this module will teach them the importance of burden of disease and how to measure it.

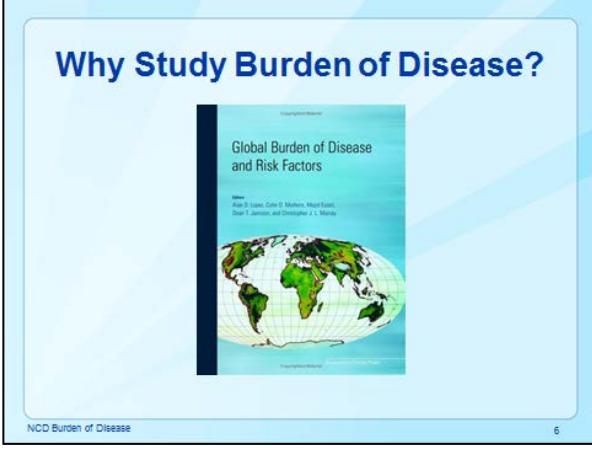
• Explain that after learning the lesson content, they will complete a skill assessment individually.

• Direct participants to Slide 1 in their participant guides.

• Read the learning objectives from the slide.

Duration/ Slide Number	What To Do/What To Say
1 minute	<p>Slide 3</p>  <p>Lesson Overview</p> <ul style="list-style-type: none"> • Why study burden of disease • Demographic and epidemiologic transition • Global and national trends in NCDs • How to measure burden of disease <p>NCD Burden of Disease 3</p>
1 minute	<p>Slide 4</p>  <p>WHY STUDY BURDEN OF DISEASE</p> <p>NCD Burden of Disease 4</p>

- Explain that the presentation begins by discussing the definition and purpose of studying burden of disease.

Duration/ Slide Number	What To Do/What To Say
2 minutes Slide 5	 <p>What is Burden Of Disease?</p> <p>Considers health, social, political, environmental and economic factors to determine the cost that disease and disability exert upon the individual and society</p> <p>NCD Burden of Disease 5</p>
Question 2 minutes Slide 6	 <p>Why Study Burden of Disease?</p> <p>Global Burden of Disease and Risk Factors</p> <p>Authors: Michael H. Lopez, Christopher J. Murray, Magdalena Ezzati, Scott J. Johnson, and Christopher J. Murray</p> <p>NCD Burden of Disease 6</p>

Question

- Ask: Can anyone define *burden of disease*?
- Reveal and then read answer by clicking on slide.

Question

- Ask: Why study burden of disease?
- Answers should include: *To assess the magnitude and impact of the problem, which is necessary for appropriate policy development, allocation of resources, awareness, prioritization of health problems, and implementation of interventions.*

Duration/ Slide Number	What To Do/What To Say
------------------------	------------------------

2 minutes

Slide 7

WHO Global Burden of Disease Study

- WHO assessment of the global burden of disease
- Features comparisons between deaths, diseases and injuries by region, age, sex and country income
- Provides projections of deaths and burden of disease by cause and region to the year 2030

NCD Burden of Disease 7



- Read the slide.**
- Ask:** What is the Global Burden of Disease Study (GBD Study)?
- Say:** The original GBD Study was published in 1991 to provide a comprehensive assessment of disease burden for 107 diseases and injuries, and 10 selected risk factors for the world as a whole and 8 major regions. This assessment included both NCDs and communicable diseases. Since then, WHO has regularly published updates of the GBD in its World Health reports.

2 minutes

Slide 8

WHO Global Burden of Disease Study (cont.)

The study contains information on

- Causes of death in different parts of the world
- Leading causes of death by age sex and disease
- Numbers of people with various diseases and disabilities
- Number of people who become ill each year
- Causes of loss of health and the actual loss of years of good health

NCD Burden of Disease 8



- Read the slide.**
- Ask:** How would the WHO GBD Study help your country in preventing and controlling NCDs?
- Possible answer:** can provide you with important input for health decision making, planning and priority setting.

Duration/ Slide Number	What To Do/What To Say																																	
2 minutes Slide 9	 <p>10 Leading Causes of Death in the World</p> <table border="1"> <thead> <tr> <th>Cause of Death</th> <th>Deaths in millions</th> <th>% of deaths</th> </tr> </thead> <tbody> <tr> <td>Ischaemic heart disease</td> <td>7.25</td> <td>12.8%</td> </tr> <tr> <td>Stroke and other cerebrovascular disease</td> <td>6.15</td> <td>10.8%</td> </tr> <tr> <td>Lower respiratory infections</td> <td>3.46</td> <td>6.1%</td> </tr> <tr> <td>Chronic obstructive pulmonary disease</td> <td>3.28</td> <td>5.8%</td> </tr> <tr> <td>Diarrhoeal diseases</td> <td>2.46</td> <td>4.3%</td> </tr> <tr> <td>HIV/AIDS</td> <td>1.78</td> <td>3.1%</td> </tr> <tr> <td>Trachea, bronchus, lung cancers</td> <td>1.39</td> <td>2.4%</td> </tr> <tr> <td>Tuberculosis</td> <td>1.34</td> <td>2.4%</td> </tr> <tr> <td>Diabetes mellitus</td> <td>1.26</td> <td>2.2%</td> </tr> <tr> <td>Road traffic accidents</td> <td>1.21</td> <td>2.1%</td> </tr> </tbody> </table> <p>http://www.who.int/mediacentre/factsheets/fs310/en/index.html</p> <p>NCD Burden of Disease</p> <p style="text-align: right;">9</p>	Cause of Death	Deaths in millions	% of deaths	Ischaemic heart disease	7.25	12.8%	Stroke and other cerebrovascular disease	6.15	10.8%	Lower respiratory infections	3.46	6.1%	Chronic obstructive pulmonary disease	3.28	5.8%	Diarrhoeal diseases	2.46	4.3%	HIV/AIDS	1.78	3.1%	Trachea, bronchus, lung cancers	1.39	2.4%	Tuberculosis	1.34	2.4%	Diabetes mellitus	1.26	2.2%	Road traffic accidents	1.21	2.1%
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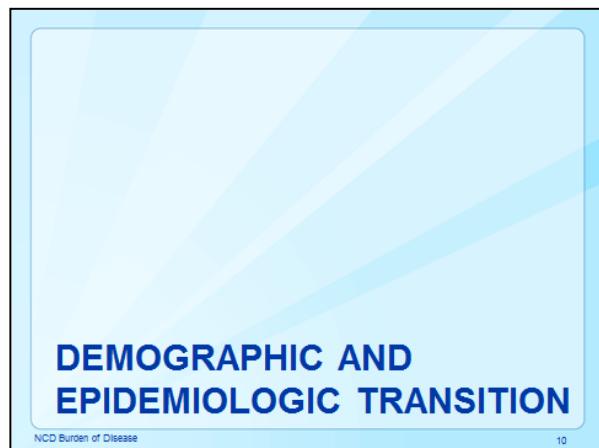


- **Ask:** What do you think are the leading causes of death worldwide?
- **Reveal and then read answer by clicking on slide.**
- **Explain that the WHO GBD Study contains a lot of information that a country can find useful, e.g., the 10 leading causes of death in 2008 for the world.**
- **Point out that this chart shows that more than twice as many deaths in 2008 were due to NCDs and injuries than communicable diseases. Also point out the high number of deaths due to coronary heart disease.**
- **Ask:** What does this say about NCDs compared with communicable diseases?
- **Explain that this information can help you prioritize where to direct your money.**



1 minute

Slide 10

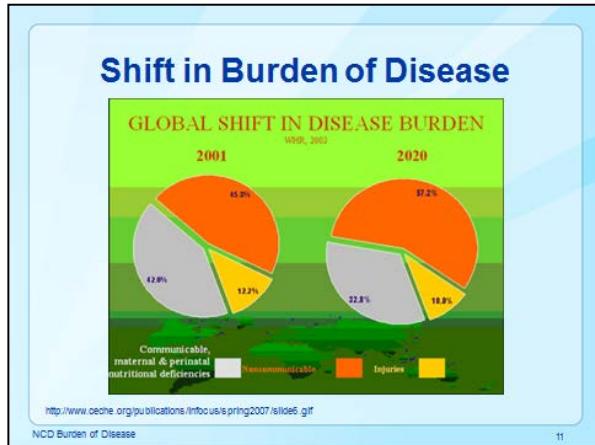


- **Explain that you will now discuss demographic and**

Duration/ Slide Number	What To Do/What To Say
------------------------	------------------------

2 minutes

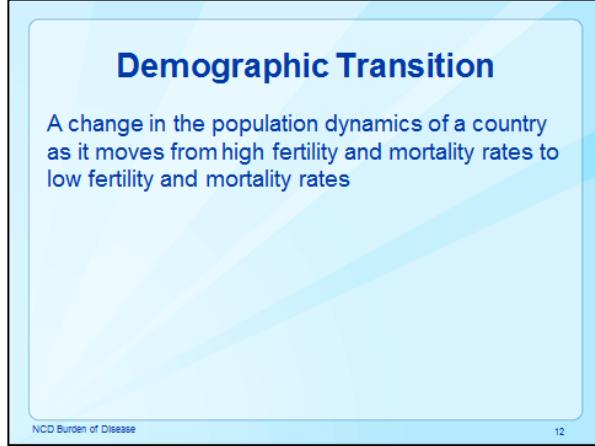
Slide 11



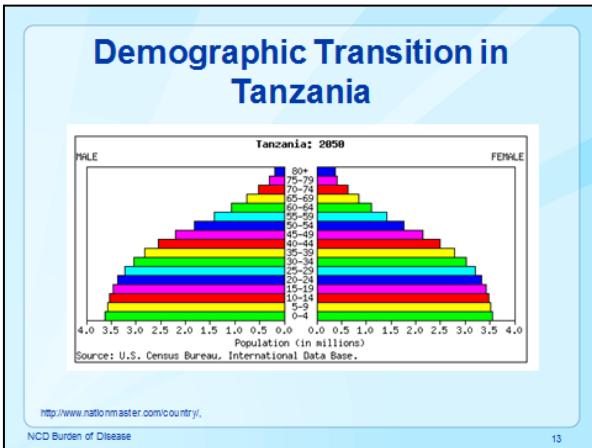
- Ask: What kind of transition or shift in burden of disease do you see on this slide?
- Ask: Do you think this shift is occurring in every country? If so, why?
- Explain that the 2002 World Health Report showed communicable diseases, maternal and perinatal, and nutritional deficiencies at 42% and NCDs and injuries at approximately 57%. By 2020, communicable diseases are predicted to decrease to approximately 32% and NCDs and injuries will increase to 67%.
- Emphasize that the abovementioned estimates/projections are for the entire global population and will vary by country.

2 minutes

Slide 12



- Ask: What is demographic transition?

Duration/ Slide Number	What To Do/What To Say
Question 2 minutes	<ul style="list-style-type: none"> • Read the slide. • Tell participants you will now show them an example of demographic transition.
Slide 13	 <p>Demographic Transition in Tanzania</p> <p>Tanzania: 2050</p> <p>Source: U.S. Census Bureau, International Data Base.</p> <p>http://www.nationmaster.com/country/ NCD Burden of Disease 13</p>



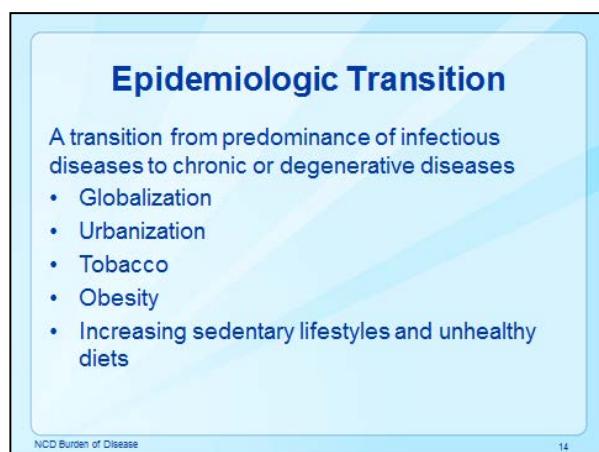
Tip

- Note: For this slide, you should use your country's age distribution. Refer to <http://www.nationmaster.com/country/>, locate your country and then select "Age-distribution".
- Explain that this is a population pyramid that displays the distribution of a population by age group and sex, with the youngest 5-year age group at the bottom and the oldest at the top, males pointing to the left and women to the right.
- Click on each graph and discuss the example of the projected demographic transition in your country.
- Point out how the shape of the graph changes over time.



Question

- Ask: Why is the shape relevant?
- Possible answer: Because age is a key determinant of NCDs. Any population that is aging will experience higher rates of NCDs. The change in demographic transition is a determinant to the change in NCDs.
- Explain that in order to determine burden of disease, they need to look at demographic transition in their country.
- Tell participants that you will now discuss epidemiologic transition.

Duration/ Slide Number	What To Do/What To Say
2 minutes Slide 14	 <p>Epidemiologic Transition</p> <p>A transition from predominance of infectious diseases to chronic or degenerative diseases</p> <ul style="list-style-type: none"> • Globalization • Urbanization • Tobacco • Obesity • Increasing sedentary lifestyles and unhealthy diets <p>NCD Burden of Disease 14</p>



- **Ask:** What is epidemiologic transition?
- **Click and read definition.**
- **Click again so that the definition disappears.**



- **Ask:** What causes epidemiologic transition or the rise in NCDs?
- **Click and read each bullet as they appear. Include these points and questions:**



- As mortality rates drop, people live longer, so are more likely to live long enough to develop a chronic disease.
- Globalization is a process in which regions are becoming increasingly interconnected through the movement of people, goods, capital and ideas—a process that has both beneficial and harmful implications for health.
- **Ask:** Why does globalization cause NCDs to rise?
- With rapidly increasing globalization and accompanying urbanization, and in developing countries, trends towards tobacco use, obesity, sedentary lifestyles and unhealthy diets are resulting in an increased worldwide burden of chronic NCDs (e.g., diabetes, cardiovascular and lung diseases, cancer, psychiatric disorders), and their associated risk factors (e.g., smoking, alcohol, hypertension, obesity).

Duration/ Slide Number	What To Do/What To Say
<p>1 minute</p> <p>Slide 15</p>	 <p>GLOBAL AND NATIONAL TRENDS OF NCDs</p> <p>NCD Burden of Disease 15</p>
<ul style="list-style-type: none"> Explain that you will now discuss global and national trends of NCDs, including future impact. <p>2 minutes</p> <p>Slide 16</p>	<p>Global Trends in Cardiovascular Disease and Cancer</p> <ul style="list-style-type: none"> Deaths from cardiovascular disease are predicted to rise from 17.1 million in 2004 to 23.4 million from 2030. Deaths from cancer are predicted to increase from 7.4 million in 2004 to 11.8 million in 2030. <p>NCD Burden of Disease 16</p>
<p>? Question</p>	<ul style="list-style-type: none"> Explain that as populations age in middle- and low-income countries over the next 25 years, the proportion of deaths due to NCDs is predicted to rise significantly. Ask: Who knows some global trends in NCDs? Which diseases or risk factors will increase, for example, in the next 10 or more years? Read the slide.

Duration/ Slide Number	What To Do/What To Say
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2 minutes

Slide 17

Global Trends in Obesity

- In 2005, about 1.6 billion adults (age 15+) throughout the world were overweight ($BMI > 25$); including 400 million who were obese ($BMI > 30$).
- By 2015, WHO projects that approximately 2.3 billion adults will be overweight and 700 million obese.

NCD Burden of Disease 17



- **Read the slide.**
- **Ask:** What is BMI?
- **Possible answer:** *an indicator of how much body fat a person has, calculated from height and weight.*
- **Ask:** How will the rise in obesity and overweight adults affect the burden of NCDs?
- **Possible answer:** *It will lead to an increase in obesity-related diseases such as diabetes and heart disease.*

2 minutes

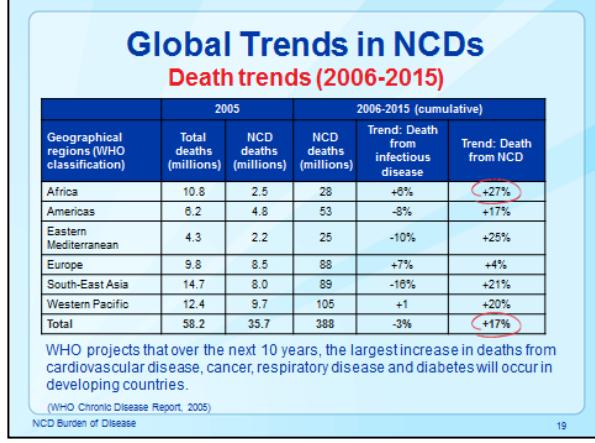
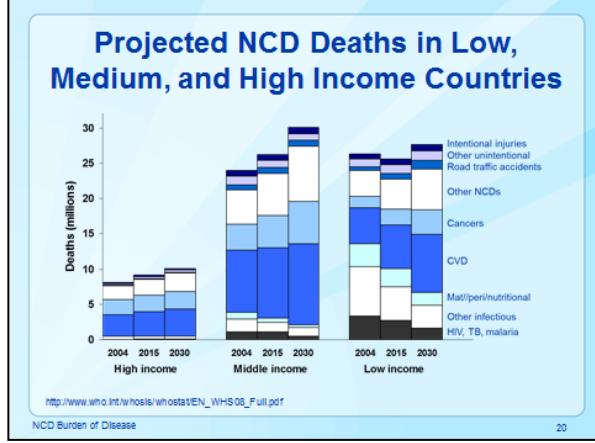
Slide 18

Global Trends in Traffic Accidents

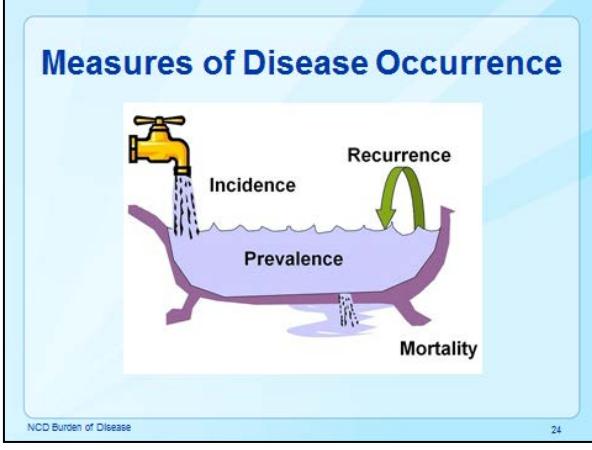
- Deaths due to road traffic crashes are predicted to increase from 1.3 million in 2004 globally (ninth leading cause of death) to 2.4 million in 2030 (fifth leading cause of death).

NCD Burden of Disease 18

- **Read slide.**

Duration/ Slide Number	What To Do/What To Say																																																					
2 minutes	<p>Slide 19</p>  <table border="1" data-bbox="497 380 1003 623"> <thead> <tr> <th rowspan="2">Geographical regions (WHO classification)</th> <th colspan="2">2005</th> <th colspan="3">2006-2015 (cumulative)</th> </tr> <tr> <th>Total deaths (millions)</th> <th>NCD deaths (millions)</th> <th>NCD deaths (millions)</th> <th>Trend: Death from infectious disease</th> <th>Trend: Death from NCD</th> </tr> </thead> <tbody> <tr> <td>Africa</td> <td>10.8</td> <td>2.5</td> <td>28</td> <td>+8%</td> <td>+27% (circled)</td> </tr> <tr> <td>Americas</td> <td>6.2</td> <td>4.8</td> <td>53</td> <td>-8%</td> <td>+17% (circled)</td> </tr> <tr> <td>Eastern Mediterranean</td> <td>4.3</td> <td>2.2</td> <td>25</td> <td>-10%</td> <td>+25%</td> </tr> <tr> <td>Europe</td> <td>9.8</td> <td>8.5</td> <td>88</td> <td>+7%</td> <td>+4%</td> </tr> <tr> <td>South-East Asia</td> <td>14.7</td> <td>8.0</td> <td>89</td> <td>-16%</td> <td>+21% (circled)</td> </tr> <tr> <td>Western Pacific</td> <td>12.4</td> <td>9.7</td> <td>105</td> <td>+1</td> <td>+20%</td> </tr> <tr> <td>Total</td> <td>58.2</td> <td>35.7</td> <td>388</td> <td>-3%</td> <td>+17% (circled)</td> </tr> </tbody> </table> <p>WHO projects that over the next 10 years, the largest increase in deaths from cardiovascular disease, cancer, respiratory disease and diabetes will occur in developing countries.</p> <p>(WHO Chronic Disease Report, 2005) NCD Burden of Disease</p>	Geographical regions (WHO classification)	2005		2006-2015 (cumulative)			Total deaths (millions)	NCD deaths (millions)	NCD deaths (millions)	Trend: Death from infectious disease	Trend: Death from NCD	Africa	10.8	2.5	28	+8%	+27% (circled)	Americas	6.2	4.8	53	-8%	+17% (circled)	Eastern Mediterranean	4.3	2.2	25	-10%	+25%	Europe	9.8	8.5	88	+7%	+4%	South-East Asia	14.7	8.0	89	-16%	+21% (circled)	Western Pacific	12.4	9.7	105	+1	+20%	Total	58.2	35.7	388	-3%	+17% (circled)
Geographical regions (WHO classification)	2005		2006-2015 (cumulative)																																																			
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Western Pacific	12.4	9.7	105	+1	+20%																																																	
Total	58.2	35.7	388	-3%	+17% (circled)																																																	
2 minutes	<ul style="list-style-type: none"> Tell participants that in 2005, there were 35.7 million deaths due to NCDs and that this number is expected to increase by 17% by 2015. Point out that the largest increase in NCD deaths are predicted to occur in Africa, with an increase of 27%. 																																																					
2 minutes	<p>Slide 20</p>  <p>The chart shows projected NCD deaths in millions for three income groups: High income, Middle income, and Low income, comparing projections for 2004, 2015, and 2030. The causes of death are categorized as follows:</p> <ul style="list-style-type: none"> High income: Deaths (millions) - 2004: ~8, 2015: ~10, 2030: ~11. Middle income: Deaths (millions) - 2004: ~22, 2015: ~25, 2030: ~28. Low income: Deaths (millions) - 2004: ~25, 2015: ~27, 2030: ~29. <p>Causes of death (from top to bottom of stack): Intentional injuries, Other unintentional, Road traffic accidents, Other NCDs, Cancers, CVD, Maternal/perinatal/nutritional, Other infectious, HIV, TB, malaria.</p> <p>http://www.who.int/whosis/whosstat/EN_WHS08_Full.pdf NCD Burden of Disease</p>																																																					
 Question	<ul style="list-style-type: none"> Discuss the projected deaths from 2015 and 2030 and point out the differences in high-income, middle-income and low-income countries. Ask: Which NCD is projected to cause the most deaths by 2030? Why? Answer: CVD (cardiovascular disease). Some factors related to the projected rise in CVD deaths are unhealthy diet and obesity. 																																																					

Duration/ Slide Number	What To Do/What To Say
2 minutes	<p>Slide 21</p>  <p>NATIONAL TRENDS IN NCDs</p> <p>NCD Burden of Disease 21</p>
 Tip	<ul style="list-style-type: none"> Prior to this lesson, you should have modified this slide to include the national trends in NCDs. Lead a discussion on national trends in NCDs.
<p>3 minutes</p> <p>Slide 22</p>  Question	<p>Future Impact of NCD Burden</p> <p>The results of projections indicate that the already constrained health systems will face a double burden of disease, in which HIV/AIDS and other common infectious diseases will co-exist with the new NCDs.</p> <ul style="list-style-type: none"> What is the social and economic impact of this double burden? <p>NCD Burden of Disease 22</p>
	<ul style="list-style-type: none"> Discuss the future impact of the NCD burden by reading the points on the slide. Explain that NCDs are not new everywhere, but they ARE expanding. Ask the question on the slide. Answers should include: social and economic impact on the individual, family, employers, health system and national economy.

Duration/ Slide Number	What To Do/What To Say
<p>1 minute</p> <p>Slide 23</p>	 <p>MEASURES USED TO DESCRIBE BURDEN OF DISEASE</p> <p>NCD Burden of Disease 23</p>
<p>2 minutes</p> <p>Slide 24</p>	 <p>Measures of Disease Occurrence</p> <p>Incidence Recurrence</p> <p>Prevalence</p> <p>Mortality</p> <p>NCD Burden of Disease 24</p>

- Explain that in this final section of the lesson, they will discuss the different ways to measure burden of disease.

- Say: Several measures are used to quantify the magnitude of disease occurrence, each one valid for a slightly different purpose. The number or actual count of persons affected by a chronic disease, condition, or risk factor is often used as the most fundamental measure of burden in a population. This measure is useful when assessing the need for health care or public health services as a direct measure of the burden on these systems.
- Read the slide and tell participants that you will next define each of these measures, but they will learn *where* and *how* to collect this information in subsequent lessons.

Duration/ Slide Number	What To Do/What To Say
------------------------	------------------------

2 minutes

Slide 25

Incidence

The development of new cases of a disease that occur during a specified period of time in previously disease-free or condition-free ("at risk") individuals.

NCD Burden of Disease 25



- **Ask:** Referring to the graphic of the bathtub and water, can anyone define "incidence"?
- **Click and then read the slide. Emphasize "new" cases as in "new bath water".**

2 minutes

Slide 26

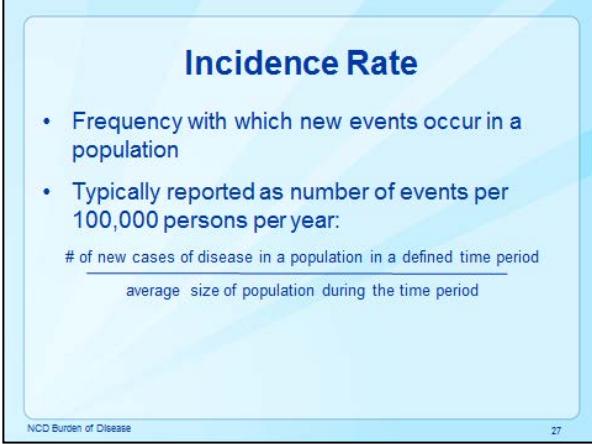
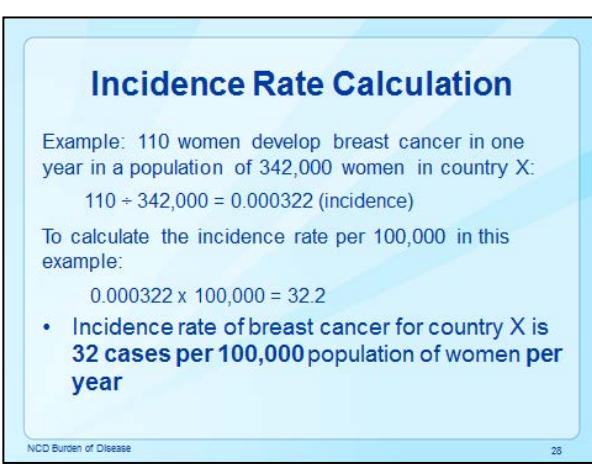
Approaches to Considering Incidence

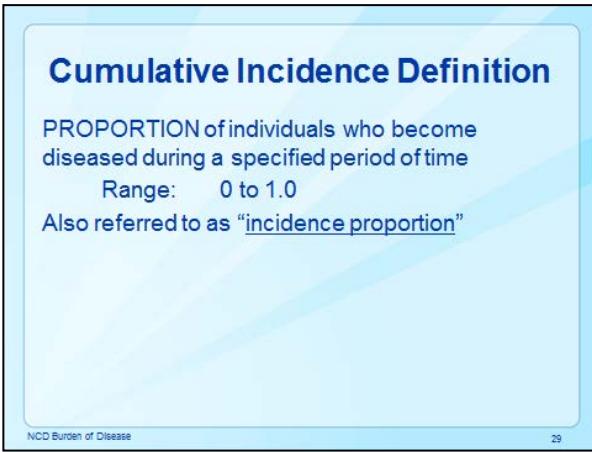
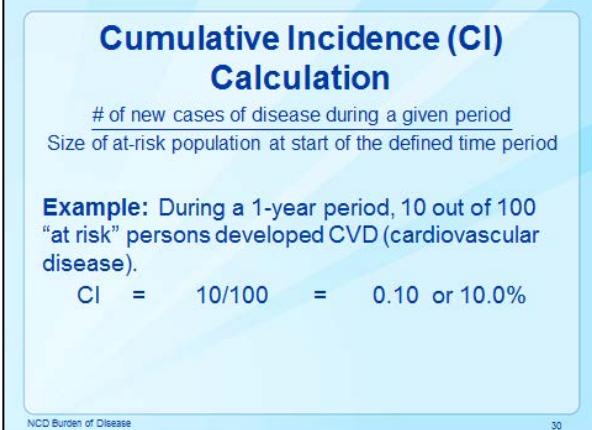
Two fundamental approaches to considering the incidence of disease or health condition:

1. Incidence Rate
2. Cumulative Incidence

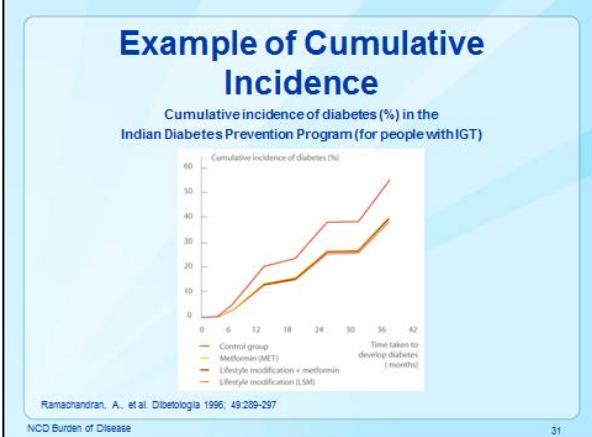
NCD Burden of Disease 26

- **Read the slide.**
- **Tell participants that you will next explain each approach.**

Duration/ Slide Number	What To Do/What To Say
2 minutes	<p>Slide 27</p>  <p>Incidence Rate</p> <ul style="list-style-type: none"> Frequency with which new events occur in a population Typically reported as number of events per 100,000 persons per year: $\frac{\text{# of new cases of disease in a population in a defined time period}}{\text{average size of population during the time period}}$ <p>NCD Burden of Disease 27</p>
	<ul style="list-style-type: none"> Read the definition of incidence rate and explain how to calculate it.
3 minutes	<p>Slide 28</p>  <p>Incidence Rate Calculation</p> <p>Example: 110 women develop breast cancer in one year in a population of 342,000 women in country X:</p> $110 \div 342,000 = 0.000322 \text{ (incidence)}$ <p>To calculate the incidence rate per 100,000 in this example:</p> $0.000322 \times 100,000 = 32.2$ <ul style="list-style-type: none"> Incidence rate of breast cancer for country X is 32 cases per 100,000 population of women per year <p>NCD Burden of Disease 28</p>
	<ul style="list-style-type: none"> Work through this example of calculating incidence rates with participants. Use the flipchart if needed.

Duration/ Slide Number	What To Do/What To Say
2 minutes	<p>Cumulative Incidence Definition</p> <p>PROPORTION of individuals who become diseased during a specified period of time Range: 0 to 1.0 Also referred to as “<u>incidence proportion</u>”</p> 
Slide 29	
2 minutes	<ul style="list-style-type: none"> • Read the definition of cumulative incidence. • Explain that it provides an estimate of the probability (risk) that an individual will develop a disease <u>during a specified period of time</u>. <p>Cumulative Incidence (CI) Calculation</p> $\frac{\text{\# of new cases of disease during a given period}}{\text{Size of at-risk population at start of the defined time period}}$ <p>Example: During a 1-year period, 10 out of 100 “at risk” persons developed CVD (cardiovascular disease).</p> $\text{CI} = 10/100 = 0.10 \text{ or } 10.0\%$ 
Slide 30	

- Read the slide and explain that to accurately calculate cumulative incidence, we need to follow the entire population at risk for the specified time interval.

Duration/ Slide Number	What To Do/What To Say																																								
2 minutes Slide 31	<p>Example of Cumulative Incidence</p> <p>Cumulative incidence of diabetes (%) in the Indian Diabetes Prevention Program (for people with IGT)</p>  <table border="1"> <caption>Data from Figure: Cumulative incidence of diabetes (%) in the Indian Diabetes Prevention Program</caption> <thead> <tr> <th>Time (months)</th> <th>Control group (%)</th> <th>Metformin (MET) (%)</th> <th>Lifestyle modification + metformin (%)</th> <th>Lifestyle modification (LSM) (%)</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>6</td><td>5</td><td>5</td><td>5</td><td>5</td></tr> <tr><td>12</td><td>10</td><td>10</td><td>10</td><td>10</td></tr> <tr><td>18</td><td>15</td><td>12</td><td>12</td><td>12</td></tr> <tr><td>24</td><td>20</td><td>18</td><td>18</td><td>18</td></tr> <tr><td>30</td><td>25</td><td>22</td><td>22</td><td>22</td></tr> <tr><td>36</td><td>30</td><td>28</td><td>28</td><td>28</td></tr> </tbody> </table> <p>Ramachandran, A., et al. Diabetologia 1996; 39:289-297</p> <p>NCD Burden of Disease 31</p>	Time (months)	Control group (%)	Metformin (MET) (%)	Lifestyle modification + metformin (%)	Lifestyle modification (LSM) (%)	0	0	0	0	0	6	5	5	5	5	12	10	10	10	10	18	15	12	12	12	24	20	18	18	18	30	25	22	22	22	36	30	28	28	28
Time (months)	Control group (%)	Metformin (MET) (%)	Lifestyle modification + metformin (%)	Lifestyle modification (LSM) (%)																																					
0	0	0	0	0																																					
6	5	5	5	5																																					
12	10	10	10	10																																					
18	15	12	12	12																																					
24	20	18	18	18																																					
30	25	22	22	22																																					
36	30	28	28	28																																					
2 minutes Slide 32	<ul style="list-style-type: none"> Explain that this graph is from a study of 531 adults with impaired glucose tolerance (a predictor of diabetes) who were randomized into 1 of 4 groups: <ol style="list-style-type: none"> Treated with a drug, methformin, only Treated with lifestyle modification only Treated with both methformin and lifestyle modification Control group – no treatment / neither methformin nor lifestyle modification Explain that the graph shows the percentage of each group that developed overt diabetes during 36 months of follow-up Explain that the cumulative incidence of type 2 diabetes was higher in the control group – the group that did not receive any lifestyle modification or medicine. Say: Another way of saying this is that the groups that had lifestyle modification and medication delayed the development of diabetes. 																																								

Duration/ Slide Number	What To Do/What To Say
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3 minutes

Slide 33



- Ask: Can someone summarize the difference between cumulative incidence and incidence rate?
- Read the slide.



Practice 1

Calculate the incidence rate for Type 2 Diabetes in adults using the following information:

- Population of adults in country Y: 1,750,000
- # of new cases of Type 2 diabetes over the last 5 years: 525

NCD Burden of Disease 33



2 minutes

Slide 34

- Read the practice activity to participants.
- Distribute calculators to participants or ask them to use their phone or computer calculator.
- Ask participants to spend 2 to 3 minutes individually completing this practice.
- Review the answer using the next slide.



Practice 1 - Answer

- $525 / 1,750,000 = .0003$
- $.0003 / 5 \text{ years} = .00006$
- $.0006 \times 100,000 = 6$
- The incidence rate would be 6 cases of Type 2 Diabetes per 100,000 adults per year.

NCD Burden of Disease 34



- Ask for a volunteer to show calculation on flip chart.
- Then show and explain answer on slide.

Duration/ Slide Number	What To Do/What To Say
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2 minutes**Slide 35**

Prevalence

- The number of existing cases divided by the population count
- Measured at a point in time rather than over some interval
- Typically shown as a percentage
- Influenced by incidence and survival.
- Like incidence, can be used to describe disease in a population
- Unlike incidence, can be used to describe an attribute such as genetic marker, behavior or risk factor in a population (e.g., smoking, wearing a seatbelt)

NCD Burden of Disease 35

- **Say:** Now we are going to turn our attention from incidence to prevalence.
- **Ask:** Can anyone define “prevalence”?
- **Click and then read the slide.**
- **Ask:** What is the relationship between prevalence and incidence?
- **Say:** Prevalence is influenced by incidence (more new cases yield more existent cases) and survival (reduces the number of affected individuals at any point in time). For example, for breast cancer, the prevalence greatly exceeds the annual incidence because most women diagnosed with breast cancer survive for at least 5 years.
- **Ask:** How might a prevalence estimate of the number of breast cancer survivors in a given area be useful?
- **Possible answer:** *It may be useful in targeting limited public health resources.*

2 minutes**Slide 36**

Example: Calculating Prevalence

In a large city, there are 275,000 women and 85,250 of these women are obese.

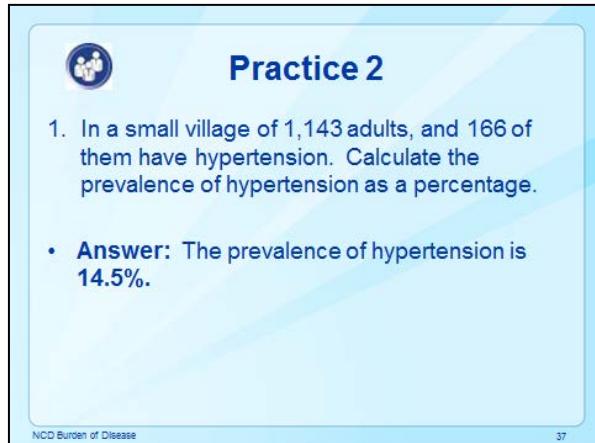
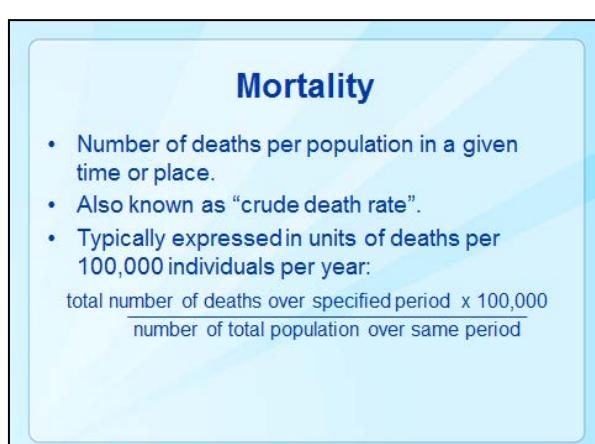
$$85,250 \div 275,000 = .31$$

Prevalence: $.31 \times 100 = 31\%$

Approximately 31% of women in this large city are obese.

Group	Obese (%)	Overweight (%)	Total (%)
Rural Men	~2	~1	~3
Urban Men	~15	~10	~25
Rural Women	~10	~5	~15
Urban Women	~31	~10	~41

NCD Burden of Disease 36

Duration/ Slide Number	What To Do/What To Say
	<ul style="list-style-type: none"> • Review this example of calculating prevalence.
5 minutes	
Slide 37 & 38	<p> Activity</p>
	 <p>Practice 2</p> <ol style="list-style-type: none"> 1. In a small village of 1,143 adults, and 166 of them have hypertension. Calculate the prevalence of hypertension as a percentage. <ul style="list-style-type: none"> • Answer: The prevalence of hypertension is 14.5%. <p>NCD Burden of Disease 37</p>
	<p> Question</p>
	<ul style="list-style-type: none"> • Ask participants to spend 3 to 4 minutes completing the practice activity on their own.
	<ul style="list-style-type: none"> • Ask a volunteer to write the calculation on a flip chart:
	$166/1143 = .145 \times 100 = 0.145 \text{ or } 14.5\%$
	<ul style="list-style-type: none"> • Click so that answer appears on slide.
2 minutes	
Slide 39	<p> Question</p>
	 <p>Mortality</p> <ul style="list-style-type: none"> • Number of deaths per population in a given time or place. • Also known as “crude death rate”. • Typically expressed in units of deaths per 100,000 individuals per year: $\frac{\text{total number of deaths over specified period}}{\text{number of total population over same period}} \times 100,000$ <p>NCD Burden of Disease 39</p>
	<ul style="list-style-type: none"> • Say: Now let's discuss mortality measures.
	<ul style="list-style-type: none"> • Ask participants to define <i>mortality</i>.
	<ul style="list-style-type: none"> • Click and then read slide.

Duration/ Slide Number	What To Do/What To Say
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2 minutes

Slide 40

Mortality Rate Calculation

Example: 850 deaths per year in a population of 170,000

Mortality rate

- $(850/170,000) \times 100,000 = 500$ per 100,000 population

NCD Burden of Disease 40

- Walk through the example with participants.

2 minutes

Slide 41

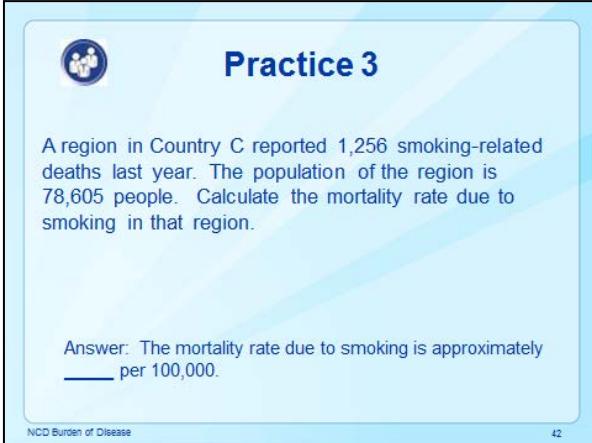
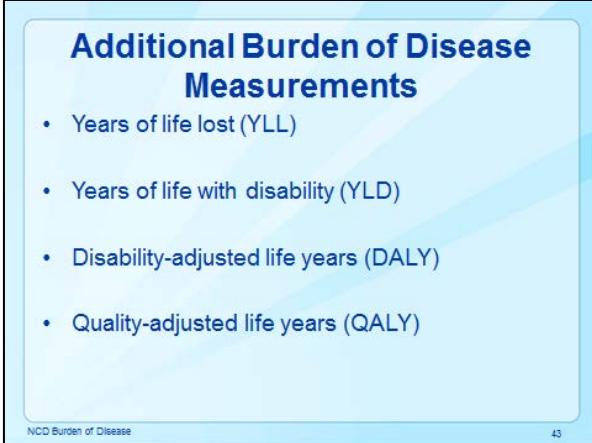
Types of Mortality Rates

- **Crude mortality rate:** The total number of deaths per 100,000 people per year.
- **Maternal mortality rate:** The total number of maternal deaths per total number of live births per 100,000 per year.
- **Infant mortality rate:** The total number of infant (children below 1 year) deaths per 1000 live births
- **Child mortality rate:** The total number of child (more than 1 and less than 5 years) deaths per 1000 live births

NCD Burden of Disease 41



- Ask: What are some types of mortality rates?
- Read the slide.
- Ask for additional types of mortality rates.
- Possible answers: **Perinatal mortality rate:** The total number of fetal and neonatal deaths per 1000 births. **Age-specific mortality rate:** total number of deaths per 100,000 people of a given age band per year. **Age-adjusted mortality rate:** total number of deaths per 100,000 people statistically modified to eliminate the effect of different age distributions in the different populations. **Cause-specific mortality rate:** total number of deaths per 100,000 people as a result of a specific cause. **Sex-specific mortality rate:** total number of deaths per 100,000 people specified by gender.

Duration/ Slide Number	What To Do/What To Say
5 minutes Slide 42	 <p>Practice 3</p> <p>A region in Country C reported 1,256 smoking-related deaths last year. The population of the region is 78,605 people. Calculate the mortality rate due to smoking in that region.</p> <p>Answer: The mortality rate due to smoking is approximately _____ per 100,000.</p> <p>NCD Burden of Disease 42</p>
Question  Flip Chart 	<ul style="list-style-type: none"> Ask participants to spend 3 to 4 minutes completing the practice activity on their own. Ask a volunteer to write the calculation on a flip chart: $\frac{1,256}{78,605} \times 100,000 = 1,598 \text{ per 100,000}$ <p>78,605</p> <ul style="list-style-type: none"> Click so that answer appears on slide.
2 minutes Slide 43	 <p>Additional Burden of Disease Measurements</p> <ul style="list-style-type: none"> Years of life lost (YLL) Years of life with disability (YLD) Disability-adjusted life years (DALY) Quality-adjusted life years (QALY) <p>NCD Burden of Disease 43</p>
	<ul style="list-style-type: none"> Say: Now let's move on to some other measures used to describe burden of disease. Say: The idea of having one number to summarize the impact of a health condition on a population, or even on the entire world has been around for a long time. Measures have been developed to summarize the impact of a health condition. Because no measure captures every aspect of the impact, and because different aspects of a health burden may be more or less important for different purposes, there are many different

Duration/ Slide Number	What To Do/What To Say
	measures.
 Question	<ul style="list-style-type: none"> Click on each measure and then tell participants that for this lesson, you will only discuss definitions of each, not how to calculate. Ask: What is the limitation of just looking at mortality? Possible answer: We won't know how long the population has lived with the disability or what was their quality of life. Ask: What is the difference between a 62 year woman dying of a heart attack versus a 76-year old man dying of a heart attack? Is the burden the same? Possible answer: We don't know the difference if we just look at mortality. We don't know if the burden is the same. Explain that these measures you will now discuss will help them to answer these questions.
2 minutes	
Slide 44	<div style="border: 1px solid #ccc; padding: 10px;"> <h3 style="color: #4F81BD; margin: 0;">Years of Life Lost (YLL)</h3> <ul style="list-style-type: none"> Measures the years of life lost due to premature mortality Based on the number of deaths and the standard life expectancy at age of death Example: Imagine that the life expectancy for an individual is 75 years, but that person dies at age 70. That death represents 5 Years of Life Lost (YLL). </div>
 Question	<ul style="list-style-type: none"> Say: Years of life lost (YLL) measures the years of life lost due to premature mortality. Say: This measure corresponds to the number of deaths multiplied by the standard life expectancy at the age at which a given cause of death occurs. Standard life expectancy is based on life tables associated with the population that is being studied. Explain that there are life tables that define life expectancy for age groups and that if you want to compare YLL with other countries, you need to have life expectancy tables. Ask: To be sure that you are all clear on the concept of the YLL, answer this question: Under the concept of the YLL, which is valued more heavily, the life of an infant, or the life of an elderly

Duration/ Slide Number	What To Do/What To Say
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person?

- **Answer:** Based on a standard life expectancy of 75 years, the life of an infant would be weighted more heavily under the assumption that an infant stands to lose a greater number of years of life (e.g., 74+ years lost) should it pass away in infancy than a person passing away at 70 years old (e.g., 5 years lost).

2 minutes

Slide 45

Years of Life with Disability (YLD)

Measures years of healthy life lost due to living in states of less than full health

NCD Burden of Disease 45



- **Read the slide.**
- **Ask:** What is a disease with a high YLD?
- **Possible answer:** *arthritis*

2 minutes

Slide 46

Overview of DALYs and QALYs

Summary measures of population health

Estimated by combining morbidity and mortality

- Combined measures of quantity and quality of life

Answers two important questions:

1. What is the total impact of disease and injury in the population?
2. How do we compare the impacts of different diseases, risk factors, and interventions that affect different populations?

Helps inform decisions regarding resource allocation

NCD Burden of Disease 46

- **Explain that you will now give an overview of the last two measures of population health: DALYs and QALYs.**
- **Read the slide.**

Duration/ Slide Number	What To Do/What To Say																
2 minutes Slide 47	<p>Disability-Adjusted Life Year (DALY)</p> <ul style="list-style-type: none"> Represents the total number of years lost to illness, disability (health utility), or premature death within a given population Allows for comparison of impact of a program and/or diseases across population 																
<ul style="list-style-type: none"> Read the slide. Explain that DALYs take into account mortality and morbidity (disability). Explain that a DALY can be used to calculate the overall disease burden. For example, to calculate the overall burden of disease from “Disease X”, you would add the years of life lost due to premature mortality and the years spent living with a disability. 																	
<ul style="list-style-type: none"> Discuss this example of DALYs in the WHO regions. Point out the YLL and YLD and how they comprise the DALY. Ask: What does mean when you have a higher proportion of YLL than YLD? Answer: Premature mortality is a large problem, like in Africa. Ask: According to this example of DALYs, which region is 	<p>Example of DALYs</p> <table border="1"> <caption>Estimated DALYs per 1000 population by WHO region</caption> <thead> <tr> <th>Region</th> <th>DALYs (approx.)</th> </tr> </thead> <tbody> <tr> <td>High income</td> <td>150</td> </tr> <tr> <td>Africa</td> <td>450</td> </tr> <tr> <td>Americas</td> <td>150</td> </tr> <tr> <td>Eastern Mediterranean</td> <td>250</td> </tr> <tr> <td>Europe</td> <td>150</td> </tr> <tr> <td>South-East Asia</td> <td>250</td> </tr> <tr> <td>Western Pacific</td> <td>150</td> </tr> </tbody> </table> <p>The chart also notes that while YLL rates are high in Africa, YLD rates are lower, contributing to a higher overall DALY rate.</p>	Region	DALYs (approx.)	High income	150	Africa	450	Americas	150	Eastern Mediterranean	250	Europe	150	South-East Asia	250	Western Pacific	150
Region	DALYs (approx.)																
High income	150																
Africa	450																
Americas	150																
Eastern Mediterranean	250																
Europe	150																
South-East Asia	250																
Western Pacific	150																



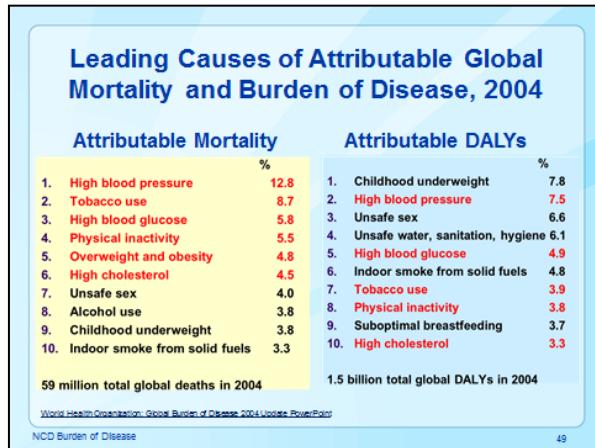
Duration/ Slide Number	What To Do/What To Say
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suffering the most?

- **Answer:** Africa.

2 minutes

Slide 49



- **Say:** Most lists of causes of death show the diseases that led to death. This slide takes causes one step back and looks at the causes of the diseases, in particular the preventable risk factors for the diseases that result in death. On the left you see the contribution of each risk factor to overall mortality. On the right, you see the contribution of each risk factor to disability-adjusted life years lost.
- **Ask:** What differences in burden of disease are we likely to see between mortality data and DALYs?
- **Explain the graphic and point out that the mortality column shows the top 6 causes of death attributable to NCDs and the DALYs show NCDs spread out across the top 10 leading causes of death.**
- **Ask:** What is the reason for this difference? What do DALYs look at?
- **Answer:** mortality AND morbidity – also, more weight is given to mortality and morbidity at younger ages.



Duration/ Slide Number	What To Do/What To Say
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2 minutes

Slide 50

Quality-Adjusted Life Year (QALY)

- Gives us an idea of how many extra months or years of life of reasonable quality a person might gain as result of treatment
- Ratings: negative values below 0 (worst possible health) to 1 (best possible health)
- Makes it possible to summarize effects of an intervention that affects both morbidity and mortality

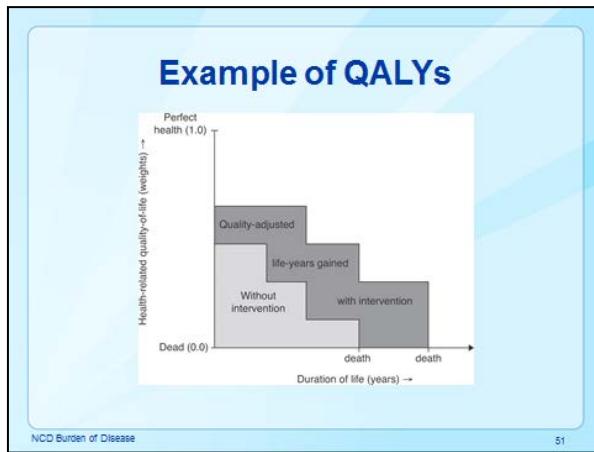
NCD Burden of Disease 50

- Read the slide.
- Explain that unlike DALYs which give you the lifetime burden, QALYs is a snapshot of the period during which an intervention is being implemented.
- Ask: How can QALYs be useful?
- Possible answer: cost-effectiveness of interventions to inform resource allocation decisions



2 minutes

Slide 51



- Explain this simple graph of QALYs that shows when you add intervention (dark grey), the QALYs increase, reflecting an increase in both survival and health-related quality of life

Duration/ Slide Number	What To Do/What To Say
10 minutes	

- Tell participants that they will now participate in the Review Game.
- Note: Adjust number of questions depending on number of tables and teams. If participants are already at small tables, you may keep them together as a team. Otherwise, divide the class into teams of four or five participants.
- After participants are in their teams, ask each team to (quickly) give you a team name. Record team names on a flip chart.
- Tell participants to discuss answers in their teams before providing them out loud. Correct answers will receive 2 points. You may give 1 point for partially correct answers.
- Begin by clicking on the following slides, one question at a time.
- To reveal the answers, click on the slide after the question appears (and participants answer the question).
- Record points on flip chart.
- (Optional) Provide a prize to winning team.

Duration/ Slide Number	What To Do/What To Say
10 minutes	
Slide 53-60	<p> Review: Answer 1-2</p> <ol style="list-style-type: none"> 1. Why is studying burden of disease useful? <i>It can provide important input for health decision making, planning and priority setting</i> 2. Name at least 4 reasons for epidemiological transition. 1) <i>globalization</i>, 2) <i>urbanization</i>, 3) <i>tobacco</i>, 4) <i>obesity</i>, 5) <i>increasing sedentary lifestyles and unhealthy diets</i>
 Question	<p>NCD Burden of Disease 54</p>
 Question	<p> Review: Answers 3-5</p> <ol style="list-style-type: none"> 3. How do you calculate incidence rate? $\# \text{ new cases} \div \text{size of population}$ 4. How do you calculate prevalence? $\text{existing cases} \div \text{population count}$ 5. How do you calculate mortality rate? $\frac{\text{number of deaths over specified period} \times 100,000}{\text{number of total population over same period}}$ <p>NCD Burden of Disease 55</p>
 Question	<p> Review: Answers 6-7</p> <ol style="list-style-type: none"> 6. What does YLL measure? <i>YLL measures years of life lost due to premature mortality.</i> 7. What does YLD measure? <i>YLD measures years of healthy life lost due to living in states of less than full health (disability).</i> <p>NCD Burden of Disease 56</p>

Duration/ Slide Number	What To Do/What To Say
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Review: Answers 8-9

8. What does DALY represent? *Disability-adjusted life years DALY represents the total number of years lost to an illness, disability or premature death within a given population.*

9. What does QALY tell us? *Quality-Adjusted Life Year; how many extra months or years of life of reasonable quality a person might gain as result of treatment.*

NCD Burden of Disease 60

1 minutes

Slide 61

Half-Truths and Misunderstandings

Half- Truth:

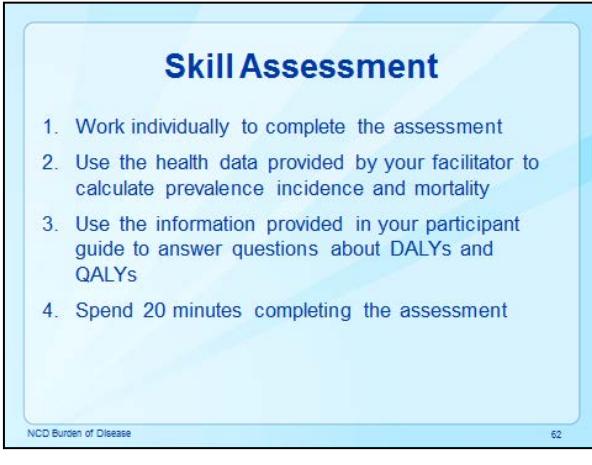
- “My grandfather smoked and was overweight – and lived to 96.”

Reality:

- These people are the rare exception.

NCD Burden of Disease 61

- **Say:** Another set of misunderstandings arises from kernels of truth. In these cases, the kernels of truth are distorted to become sweeping statements that are not true. Because they are based on the truth, such half-truths are among the most persistent misunderstandings.
- **Click on “reality”.**
- **Say:** Outliers inevitably exist, but they are extremely rare. The vast majority of chronic disease can be traced back to the common risk factors, and can be prevented by eliminating these risks.

Duration/ Slide Number	What To Do/What To Say
1 minute Slide 62	
20 minutes Slide 63	 <p>Skill Assessment</p> <ol style="list-style-type: none"> 1. Work individually to complete the assessment 2. Use the health data provided by your facilitator to calculate prevalence incidence and mortality 3. Use the information provided in your participant guide to answer questions about DALYs and QALYs 4. Spend 20 minutes completing the assessment

- Tell participants they will now practice what they learned.

- Read the assessment instructions out loud.
- Tell participants to turn to the appropriate slides in their Participant Guide to complete the assessment.
- You will either hand out country-specific data that you previously collected or show them data on the screen.
- If you do not have country-specific data, you may use the sample data at the back of this facilitator guide.
- Allow participants 20 minutes to complete the assessment.
- Give them a 5-minute warning.
- Walk around while participants are working and answer any

Duration/ Slide Number	What To Do/What To Say
	<p data-bbox="518 276 915 312">questions they may have.</p> <ul style="list-style-type: none"><li data-bbox="474 346 1432 424">• After 20 minutes, ask for volunteers to provide the answers (and to use the flip chart for calculations).

SKILL ASSESSMENT (FROM PARTICIPANT GUIDE)

Instructions:

1. Work individually to complete the assessment.
2. Use the health data provided by your facilitator to calculate prevalence, incidence and mortality.
3. Use information provided in your participant guide to answer questions about DALYs and QALYs.
4. Spend 20 minutes completing the assessment.

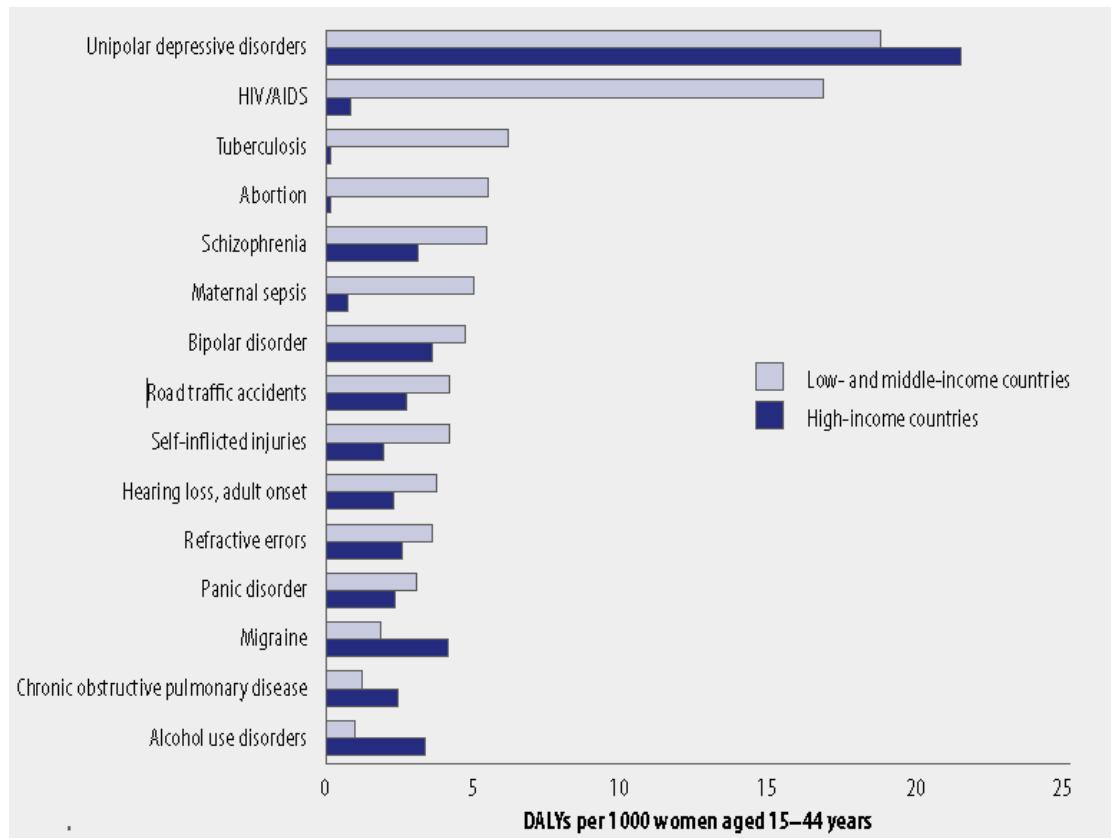
Part 1: Calculate Burden of Disease (10 minutes)

1. Using the information provided by your facilitator or the following information to calculate incidence, prevalence and mortality:
 - a. Incidence Rate:
 - b. Prevalence:
 - c. Mortality Rate:

Part 2: DALYs and QALYs (10 minutes)

- According to the WHO 2004 table below, what is the leading cause of disease burden for NCDs (including mental health) for women aged 15-44 years in low- and middle-income countries?

Figure: Leading causes of disease burden for women aged 15-44 years, high-income countries, and low- and middle-income countries, 2004



Reference: http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_part4.pdf

Unipolar depressive disorders

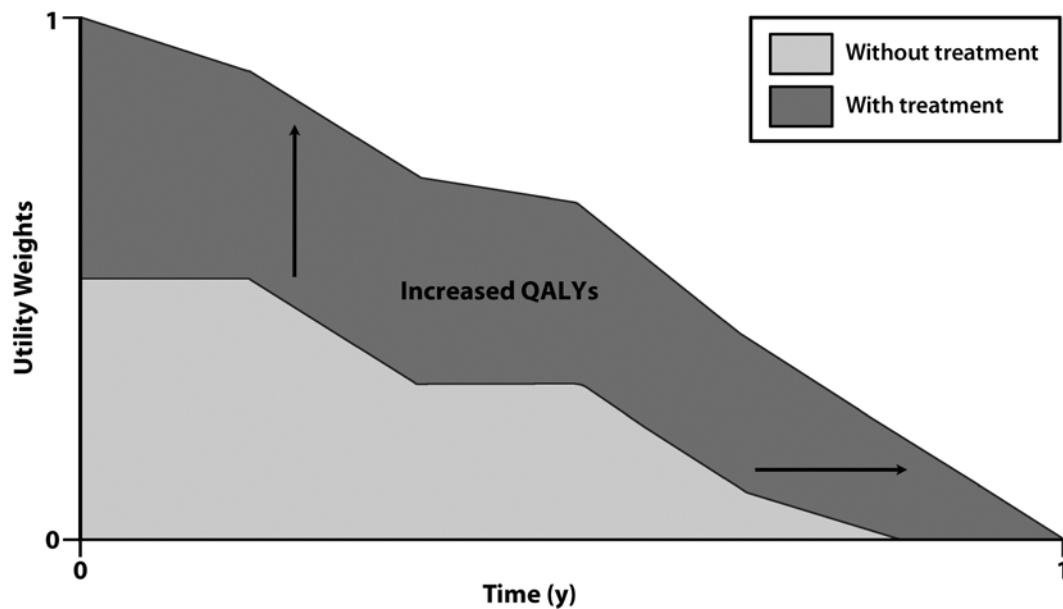
- What does it mean when a disease has a higher DALY than other diseases? How can this information be useful?

It means that the disease has a higher number of years lost due to illness, disability or premature death. This information can be helpful to a country when prioritizing which public health problem to focus prevention and control efforts.

(Continued on next Slide)

What does the graph below tell us about QALYs and how it changes depending on whether treatment is provided?

This graph shows a higher QALY when there is treatment compared to when there is no treatment.



Burden of Disease

Sample Country Data for Calculating Incidence, Prevalence and Mortality

1. In country X there were 1,812,000 new cases of diabetes in 2009. The country population was 305,529,237. Calculate the incidence rate of diabetes per 100,000 people and record your answer in the space below.
 2. In country Y, there were 20,870,804 cases of hypertension in 2008. The country population was 67,325,176. Calculate the prevalence of hypertension and record your answer in the space below.
 3. In country Z, there were 210,545 deaths due to heart disease in 2009. The country population was 9,965,817. Calculate the mortality rate for heart disease per 100,000 persons and record your answer in the space below.

Answers to Sample Country Data for Calculating Incidence, Prevalence and Mortality

1. In country X there were 1,812,000 new cases of diabetes in 2009. The country population was 305,529,237. Calculate the incidence rate of diabetes per 100,000 people and record your answer in the space below.

$\frac{1,800,000}{305,529,237} \times 100,000 = .059$ or approximately **5,930 per 100,000 people**

2. In country Y, there were 20,870,804 cases of hypertension in 2008. The country population was 67,325,176. Calculate the prevalence of hypertension and record your answer in the space below.

$\frac{20,870,804}{67,325,176} = .309$ or approximately **31%**

3. In country Z, there were 210,545 deaths due to heart disease in 2009. The country population was 9,965,817. Calculate the mortality rate for heart disease per 100,000 people and record your answer in the space below.

$\frac{210,545}{9,965,817} \times 100,000 = 2,112.6$ or **2,113 deaths per 100,000 people**