Child Health, Part 1: Overview of Problems, Trends, and Strategies for Improvement

Donna M. Denno, M.D., M.P.H.
University of Washington
Seattle, WA

Chris Stewart, M.D.
University of California
San Francisco, CA
2008, updated 2013
Learning Objectives

• Define most commonly used measures of child mortality
• List 5 leading causes of childhood death worldwide
• List 5 underlying causes of childhood mortality
• Define strategies for delivering interventions to combat childhood mortality
• Describe major “actors” in global child health
• State percent of childhood deaths that can be prevented with interventions that are currently available
Why focus on child health?

- Children
  - represent the most vulnerable segment of society
  - suffer disproportionately in terms of mortality risk

- Improvements in child health
  - Good measure of a societal progress

- Childhood illness
  - Contribute substantially to the global burden of disease

- Majority of childhood deaths
  - Preventable or treatable with currently available interventions
Scope of the Problem

6.9 million children under 5 years of age died in 2011

Of course being healthy* means more than merely surviving but as a starting point for discussion it is hard to avoid the fact that 13 children under the age of five years die every minute.

* WHO Definition of health "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." [2]
Indicators of childhood mortality

• **Under five mortality rate (U5MR) (also called child mortality rate)** = probability of dying between birth and exactly 5 years as expressed per 1000 live births

• **Infant mortality rate (IMR)** = probability of dying between birth and exactly 1 year as expressed per 1000 live births

• **Neonatal mortality rate (NMR)** = probability of dying between birth and exactly 28 days as expressed per 1000 live births

See Note B
U5MR, IMR, NMR: Some differences in the problem and approaches to tackling the problem

- Societal vulnerability
  - ↑ Dependence on adults for care with ↓ age
- Biologic vulnerability
  - ↑ Immune & developmental immaturity with ↓ age
- Causes of death
  - Differ by age group
- Types of interventions and methods for delivery
  - Common problems that occur beyond the neonatal period tend to be more easily addressed by public health strategies while neonatal problems may require more clinical based interventions
Neonatal care is receiving more attention as greater progress is made in reducing the burden of disease among older children and as more information is available on the burden of neonatal disease and interventions that can effectively reduce this burden.

Most interventions aimed at decreasing neonatal mortality are linked to prenatal and maternal care interventions. The interventions that are aimed at reducing childhood mortality beyond the neonatal period are typically delivered via public health programs that we generally think of as more classic public health delivery methods (e.g. immunization clinics).
Reminder -- Morbidity

• Some common diseases do not have high case fatality rates but do cause significant disability.
• Not evident if we only look at U5MR, IMR, NMR
• Examples
  – Vitamin A deficiency → leading cause of preventable blindness worldwide
  – Iodine deficiency → leading cause of mental retardation with 43 million affected.
  – Iron deficiency → affects >50% of children → decreased IQ and poor school performance, anemia
  – Helminthic infections → poor growth, anemia, decreased learning

See Note C
Millennium Development Goal #4 (MDG4): Reduce Child Mortality

**TARGET**
Reduce by two thirds, between 1990 and 2015, the under-five mortality rate

The Millennium Development Goals (MDG) are a set of time-bound targets to guide countries around the world in a framework for improving health, increasing development, and reducing poverty. Many of the 8 goals relate to improving the health of children—e.g. improving educational opportunities, providing health environments, decreasing poverty and hunger. Recognizing the important role that child health plays in the overall health of societies, the MDGs include a goal explicitly aimed at reducing child mortality by two-thirds, between 1990 and 2015. This is MDG #4.
The world is not on track to meet MDG4


### Table 1

Levels and trends in the under-five mortality rate, by Millennium Development Goal region, 1990–2011 (deaths per 1,000 live births)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed regions</td>
<td>15</td>
<td>11</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>55</td>
<td>3.8, 4.2, 3.5</td>
<td>On track</td>
</tr>
<tr>
<td>Developing regions</td>
<td>97</td>
<td>91</td>
<td>80</td>
<td>69</td>
<td>59</td>
<td>57</td>
<td>32</td>
<td>41</td>
<td>2.5, 1.9, 3.1</td>
<td>Insufficient progress</td>
</tr>
<tr>
<td>Northern Africa</td>
<td>77</td>
<td>59</td>
<td>45</td>
<td>34</td>
<td>26</td>
<td>25</td>
<td>26</td>
<td>68</td>
<td>5.5, 5.4, 5.5</td>
<td>On track</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>178</td>
<td>170</td>
<td>154</td>
<td>133</td>
<td>112</td>
<td>109</td>
<td>59</td>
<td>39</td>
<td>2.3, 1.5, 3.1</td>
<td>Insufficient progress</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>53</td>
<td>43</td>
<td>34</td>
<td>26</td>
<td>22</td>
<td>19</td>
<td>18</td>
<td>64</td>
<td>4.8, 4.4, 5.2</td>
<td>On track</td>
</tr>
<tr>
<td>Caucasian and Central Asia</td>
<td>76</td>
<td>70</td>
<td>61</td>
<td>52</td>
<td>44</td>
<td>42</td>
<td>42</td>
<td>44</td>
<td>2.8, 2.2, 3.3</td>
<td>Insufficient progress</td>
</tr>
<tr>
<td>Eastern Asia</td>
<td>48</td>
<td>45</td>
<td>35</td>
<td>24</td>
<td>16</td>
<td>15</td>
<td>16</td>
<td>70</td>
<td>5.7, 3.3, 7.8</td>
<td>On track</td>
</tr>
<tr>
<td>Excluding China</td>
<td>28</td>
<td>38</td>
<td>30</td>
<td>19</td>
<td>17</td>
<td>17</td>
<td>9</td>
<td>38</td>
<td>2.3, −0.7, 5.0</td>
<td>On track</td>
</tr>
<tr>
<td>Southern Asia</td>
<td>116</td>
<td>102</td>
<td>88</td>
<td>74</td>
<td>63</td>
<td>61</td>
<td>39</td>
<td>47</td>
<td>3.1, 2.8, 3.3</td>
<td>Insufficient progress</td>
</tr>
<tr>
<td>Excluding India</td>
<td>119</td>
<td>103</td>
<td>87</td>
<td>72</td>
<td>62</td>
<td>60</td>
<td>40</td>
<td>50</td>
<td>3.3, 3.2, 3.4</td>
<td>Insufficient progress</td>
</tr>
<tr>
<td>South-eastern Asia</td>
<td>69</td>
<td>57</td>
<td>47</td>
<td>37</td>
<td>30</td>
<td>29</td>
<td>23</td>
<td>58</td>
<td>4.1, 3.9, 4.4</td>
<td>On track</td>
</tr>
<tr>
<td>Western Asia</td>
<td>63</td>
<td>52</td>
<td>42</td>
<td>37</td>
<td>31</td>
<td>30</td>
<td>21</td>
<td>52</td>
<td>3.5, 4.1, 3.0</td>
<td>On track</td>
</tr>
<tr>
<td>Oceania</td>
<td>74</td>
<td>67</td>
<td>61</td>
<td>56</td>
<td>51</td>
<td>50</td>
<td>25</td>
<td>33</td>
<td>1.9, 1.8, 1.9</td>
<td>Insufficient progress</td>
</tr>
<tr>
<td>World</td>
<td>87</td>
<td>82</td>
<td>73</td>
<td>63</td>
<td>53</td>
<td>51</td>
<td>29</td>
<td>41</td>
<td>2.5, 1.8, 3.2</td>
<td>Insufficient progress</td>
</tr>
</tbody>
</table>

See Note D
Slowing trends in improvements in child mortality

Figure 1.1 Slowing progress in child mortality: how Africa is faring worst

Source: WHO Report 2005: Make Every Mother and Child Count
99% of childhood deaths occur in Low and Middle Income Countries

- 93% of all childhood deaths occur in Asia (42%) and Africa (51%). The highest burden of deaths in Asia and Africa are in South Asia and West and Central Africa, respectively.

- The under-5 mortality rate in Sub-Saharan Africa is >10 fold that of the rate in industrialized countries.


See also: http://www.alertnet.org/thenews/newsdesk/LA609360.htm
Inequitable distribution of child mortality: Under-5 mortality rates in 6 countries

U5MR: Inequities within countries

In 21 developing countries where U5MRs decreased overall during the past decade, the gaps in mortality rates between the rich and the poor increased.

Source: WHO Report 2005: Make Every Mother and Child Count
Causes of Child Mortality
POP QUIZ: What are the leading causes of childhood mortality in the U.S.?

Source: WHO 2000-2003 data
POP QUIZ: What are the leading causes of childhood mortality in the U.S.?

- Neonatal Causes: 58%
- Injuries: 10%
- Acute Respiratory Infections (including pneumonia): 2%
- Other (e.g. cancer): 30%

Source: WHO 2000-2003 data
Global causes of child mortality

Source: http://www.childinfo.org/mortality.html
Leading causes of child mortality, globally

1. Neonatal causes 40%

Deaths after the neonatal period:

2. Pneumonia 14%
3. Diarrhea 10%
4. Malaria 7%
5. Injuries 5%
6. HIV/AIDS 2%
7. Measles 1%
Undernutrition is an Important Underlying Cause of Death

Source: USAID Nutrition module
Regional variations in proportional mortality rates, cont.

*Causes* of death also vary from region to region, country to country (and even among subnational units). For example, malaria is responsible for 7% of childhood deaths globally; however, it can be *the* leading cause of childhood deaths in some endemic African countries.

Proportional mortality data can be misleading if caution is not used in interpretation. We often use pie charts to visually display causes of death as percentages—i.e. proportional mortality. Remember, proportional mortality only tells you what percent of deaths are due to a certain cause—it does not tell you about disease incidence or prevalence and it is not the same as cause specific mortality rates. For example, more than 50% of childhood deaths in the United States are due neonatal causes compared to Africa where <1/3 of all childhood deaths are due to neonatal causes. However, the number of children who die from neonatal causes per every 1,000 children (i.e. the cause specific mortality rate) is ~3fold in Africa compared to the US. A disease can kill as many people, but may result in a lower proportional mortality rate because there are so many deaths due to other causes.
Regional variations in cause-specific mortality rates

Underlying Causes or Determinants of Disease and Malnutrition

- Poverty
- Inequality/Relative Poverty
- Lack of access to care
- Lack of maternal education
- Conflict/War/Disaster
Absolute Poverty

• 1.3 billion, or one in 5, are living in extreme poverty worldwide (defined as <$1.25/day—the “international poverty line”)

• Additional 1.2 billion live on between $1.25-$2/day—closer to a practical poverty, especially in middle income countries

• More than 40% of people living in developing countries live on less than $2/day
Relative Poverty

Poverty is defined as either **absolute** or **relative** poverty. Both are important determinants of health.

**Absolute poverty** is also called abject poverty or destitution and means that basic needs (e.g. adequate food, shelter, health care) cannot be met.

**Relative poverty** refers to the inequitable distribution of wealth *within* a society. Gaps between rich and poor have increased in many countries over the past two decades. Data from rich and poor countries where there are large gaps between rich and poor consistently shows that people living at the bottom economic strata are more likely to die than those at the top. Living in a setting where some people are materially deprived compared to others around them is linked to poor health outcomes. For example, young adult males in Harlem have been shown to have similar mortality rates compared to their like aged males in Africa. [8] For more information see WHO Commission on Social Determinants of Health Final Report[9]


(Discussion of relative vs. absolute poverty is in Part 1 Chapter 2.)
Relative Poverty: Impacts the poor in rich countries too—the Glasgow example

**Life expectancy at birth (men)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glasgow, Scotland (deprived suburb)</td>
<td>54</td>
</tr>
<tr>
<td>India</td>
<td>61</td>
</tr>
<tr>
<td>Philippines</td>
<td>65</td>
</tr>
<tr>
<td>Korea</td>
<td>65</td>
</tr>
<tr>
<td>Lithuania</td>
<td>66</td>
</tr>
<tr>
<td>Poland</td>
<td>71</td>
</tr>
<tr>
<td>Mexico</td>
<td>72</td>
</tr>
<tr>
<td>Cuba</td>
<td>75</td>
</tr>
<tr>
<td>US</td>
<td>75</td>
</tr>
<tr>
<td>UK</td>
<td>76</td>
</tr>
<tr>
<td>Glasgow, Scotland (affluent suburb)</td>
<td>82</td>
</tr>
</tbody>
</table>

Relative Poverty: Increasing gaps between the rich and poor

Access to Care

• Can be limited for a variety of reasons:
  – Lack of services (ex. in rural areas with lacking health services and transportation infrastructure)
  – Inability to pay for services
    • Poverty
    • World Bank and International Monetary Fund Structural Adjustment policies included imposition of “user fees” for health services which in many countries had been largely free of charge
  – Quality of care--Existing services may be substandard (or viewed as such by the population)

Maternal Education


Armed conflicts have direct and indirect impacts on child health.

90% of conflict-related deaths since 1990 have been civilians. 80% of these have been women and children.

Source: UNICEF *State of the Worlds’ Children* 2005, p. 100
Armed Conflict, cont.

Children are always among the most heavily affected by armed conflict—either directly or indirectly. Even if they survive the bullets, they are often subject to violence or being orphaned. The destruction wrought by war disrupts social services such as education and health care. In a typical five-year war, the U5MR increases by 13% (and adult mortality by even more). The aftermath is still evident after the conflict ends; during the first five years of peace, the average U5MR remains 11% higher than it corresponding level before the conflict.

For further information see Chapter 3 “Children Caught up in Conflict” in the UNICEF State of the World’s Children 2005 http://www.unicef.org/sowc05/english/fullreport.html
Intervention Delivery

• What is an intervention?
  – Definition—“biologic agent or action intended to reduce morbidity or mortality”*
  – Targeted
    • Usually at direct causes of mortality and malnutrition
    • Not often targeted at underlying determinants of health but increasingly this need is being recognized
  – Examples—insecticide treated bednets to prevent malaria, vitamin A supplementation, measles vaccination, access to clean water and sanitation, treatment with oral rehydration therapy for diarrhea

Examples of Intervention Delivery Methods

• Primary Health Care — comprehensive range of basic preventive and curative health services available to all and delivered at the community level
  – As articulated in 1978 Alma Ata Declaration “Health Care for All by the Year 2000”—signed by 138 ministers of health
  – Addresses underlying social, economic and political causes of poor health as well as medical causes
Examples of Intervention Delivery Methods

• Vertical Programs
  – Focus on control of one disease or narrow set of diseases with targeted interventions
  – Implementation often separate from existing health system
Integrated Management of Childhood Illnesses (IMCI)

- Integrated approach
- Aims to reduce death, illness and disability, and to promote improved growth and development
- Includes both preventive and curative elements
- Implemented by families, communities and health facilities

See Note I
IMCI Addresses Most Causes of Death

- Pneumonia
- Diarrhea
- Malaria
- Severe Malnutrition
- Sepsis
- Meningitis
- Measles
- Dehydration
- Anemia
- Ear infection
- HIV/AIDS
- Wheezing

If a child presents with fever, cough and tachypnea IMCI algorithms address treatment of malaria, pneumonia as well as nutritional and growth concerns. IMCI protocols take into account comorbidities and underlying conditions leading to disease.
Health Worker Skills
Care in the Community and
Health Systems

If caretakers do not or
cannot access care and health systems
are not strengthened then just training
health workers results in a incomplete
delivery mechanism for the IMCI package

Clinical
Assessment
and treatment by
health workers

Knowledge,
Beliefs
and skills
caretakers

Capacity, structure
and functions of
health system
IMCI Case Examples: 18-month old with fever and lethargy

| Community Provider | • Caretaker at home recognizes that health care is needed  
|                    | • Health care provider is available in community and family can afford to pay for services if there are fees  
|                    | • Health care provider recognizes symptoms/signs of complicated malaria, initiates treatment and refers to hospital for further care. Inquires about use of insecticide treated bednet in household and advises caretaker regarding its use to prevent malaria  
| Health System      | • Family able to access hospital care (transportation, costs, etc)  
|                    | • Hospital facility quickly admits child and starts on appropriate treatment for complicated malaria  
| Community          | • Caretaker learns about insecticide treated materials and implements use for the children in the household.  

See Note J
• Training health workers → improved performance but.....
  – District and national health systems lack sufficient management structure, funding, coordination, supervision, and manpower
  – Low utilization rates of health services → IMCI cannot impact child mortality
  – Difficult to maintain & expand existing IMCI sites
  – IMCI has not reached those most in need — poorer and more rural communities

A multicountry evaluation of IMCI programs found that the 11 day IMCI training course did positively impact health workers performance. However, the health systems and parent/caretaker care components were not strongly implemented and were impediments to overall IMCI effectiveness.

For more information on the multicountry evaluation see [http://www.who.int/imci-mce/](http://www.who.int/imci-mce/)
• UN agencies: UNICEF, WHO
• National Development Agencies: USAID, UK Department for International Development (DFID)
• Philanthropic Foundations: e.g., Gates, Rockefeller
• International Banks: World Bank, IMF
• Nongovernmental Organizations: Oxfam, CARE, MSF
• Individual Country Governments

For an excellent overview of the history and activities of the major players in international child health see Chapter 2 “International health agencies, activities and other actors” in Anne-Emmanuelle Birn’s *Textbook of International Health*, 3rd edition, 2009. Chapters 17 of *Global Health: Diseases, Programs, Systems, and Policies* 3rd ed, by Michael Merson, Robert Black and Anne Mills, Aspen, 2011, also provides an overview to the world of multilateral international assistance.
Conclusion: Is there hope? YES!

- 7 in 10 of the 10 million annual deaths in children younger than 5 years are attributable to six causes
- Effective interventions exist
- Effective interventions need to be available to the poorest populations

Pneumonia, diarrhea, malaria and 3 neonatal disorders (pre-term delivery, sepsis and lack of oxygen at birth.) Interventions need the vehicle of strong communities and health systems to deliver reductions in childhood morbidity and mortality.

WHO World Health Report 2005: Making Every Mother and Child Count
“Two-thirds of child deaths could be prevented by interventions that are available today and are feasible for implementation in low-income countries at high levels of population coverage.”

7 in 10 of the 10 million annual deaths in children younger than 5 years are attributable to six causes: Pneumonia, diarrhea, malaria and 3 neonatal disorders (pre-term delivery, sepsis and asphyxia.)

2/3 of childhood deaths are preventable with interventions that we already know to be effective and are feasible for implementation. Things like insecticide treated bednets, appropriate antibiotics for respiratory infections and antimalarials, access to clean water and sanitation, oral rehydration therapy for treatment of diarrhea, intermittent presumptive treatment of malaria during pregnancy, attended births with appropriate care of the neonate. These prevention and treatment interventions are reviewed in detail in the 2nd GHEC Child Health Module.

Quiz

• Now we invite you to take the module quiz and test your recent learning.
• This module quiz includes 16 questions reviewing some of the key points of this module.
• Note your answers on paper and then review the answers that follow the last question. After completing your quiz you can review the conclusion and suggested references for this module presentation.
1. Approximately how many children die every year around the world?

A. 60-70 million
B. 6-7 million
C. 650,000
D. 65,000

2. What percent of childhood deaths occur in low and middle income countries?

A. 50%
B. 67%
C. 75%
D. 99%
3. T or F  Neonatal mortality rate (NMR) is the probability of dying between birth and one year as expressed per 1000 live births.

4. T or F  U5MR and child mortality rate (CMR) are synonyms.

5. T or F  Neonatal deaths are included in child (i.e. under-five) mortality figures/rates.

6. T or F  Undernutrition and obesity are both forms of malnutrition.
7. Which of the following is NOT considered to be a key component of IMCI?

A. Training health workers at the community level to be able to treat all sick children at the community level.

B. Teaching caretakers to recognize signs of illness so they will know when to seek care

C. Continued monitoring and training of health workers

D. Health infrastructures having systems in place to assure availability necessary medications
8. Approximately what percent of global childhood deaths are preventable and/or treatable with interventions that are currently available and feasible for implementation?

A. 10%
B. 25%
C. 50%
D. 67%
E. 90%

9. T or F Interventions aimed at reducing neonatal deaths are closely linked to maternal health interventions
10. IMCI health provider protocol for assessment of a febrile child might include (more than one response acceptable):

A. Checking immunization/growth card to see if vaccinations are up to date

B. Checking immunization/growth card to see if there is any growth faltering

C. Assessment for signs of complicated malaria

D. Checking to see if child is sleeping under an insecticide treated bed nets

E. All of the above
11. Millennium Development Goal #4 seeks to reduce the childhood mortality rate between 1990 and 2015 by:

A. One-fourth  
B. One-third  
C. One-half  
D. Two-thirds

12. T or F Given current trends in child mortality rate reduction, we are on target to meet Millennium Development Goal #4.
13. T or F   S Asia and sub Saharan Africa have the greatest proportions of child deaths compared to other regions in the world.

14. Which are the 3 most important underlying determinants of child mortality?

A. Lack of paternal education  
B. Lack of maternal education  
C. High fertility rates  
D. High levels of poverty  
E. Inadequate access to healthcare
15. T or F  Despite improvements in child mortality rates, many countries have experienced increasing gaps in mortality rates between the rich and the poor.
16. A multi-country evaluation of IMCI found the following (multiple responses acceptable):

A. Training of health providers improved assessment and treatment practices
B. Some sites experienced poor utilization of health services by caretakers of children
C. Health system infrastructure deficits led to poor supervision of health providers in the community
D. Implementation of the community component of IMCI does not impact child health
And now the answers to the questions
1. Approximately how many children die every year around the world?

A. 60-70 million  
**B. 6-7 million -- Approximately 6.9 million children died in 2011**  
C. 650,000  
D. 65,000

2. What percent of childhood deaths occur in low and middle income countries?

A. 50%  
B. 67%  
C. 75%  
**D. 99%**
3. **False** Neonatal mortality rate (NMR) is the probability of dying between birth and one year as expressed per 1000 live births (NMR is the probability of dying between birth and 28 days as expressed per 1000 live births)

4. **True** U5MR and child mortality rate (CMR) are synonyms.

5. **True** Neonatal deaths are included in child (i.e. under-five) mortality figures/rates, including those in the IMR and NNR.

6. **True** Undernutrition and obesity are both forms of malnutrition.
7. Which of the following is NOT considered to be a key component of IMCI?

A. Training health workers at the community level to be able to treat all sick children at the community level. -- Key components of IMCI include the 1) caretakers in the community, 2) strong health systems to supervise health workers and provide referral care, and 3) training of community based health workers to recognize signs of illness, treat appropriately and refer children who are severely ill to referral facilities.

B. Teaching caretakers to recognize signs of illness so they will know when to seek care

C. Continued monitoring and training of health workers

D. Health infrastructures having systems in place to assure availability necessary medications
8. Approximately what percent of global childhood deaths are preventable and/or treatable with interventions that are currently available and feasible for implementation?

A. 10%
B. 25%
C. 50%
D. 67%
E. 90%

9. True  Interventions aimed at reducing neonatal deaths are closely linked to maternal health interventions
10. IMCI health provider protocol for assessment of a febrile child might include (more than one response acceptable):

A. Checking immunization/growth card to see if vaccinations are up to date

B. Checking immunization/growth card to see if there is any growth faltering

C. Assessment for signs of complicated malaria

D. Checking to see if child is sleeping under an insecticide treated bed nets

E. All of the above -- IMCI health provider protocol for assessment of a febrile child includes: checking immunization history and growth chart, evaluating for signs of complicated malaria (and referring for further care if needed), asking the caretakers if the child is sleeping under an insecticide treated bednet in order to prevent further episodes of malaria.
11. Millennium Development Goal #4 seeks to reduce the childhood mortality rate between 1990 and 2015 by:

A. One-fourth
B. One-third
C. One-half
D. Two-thirds

12. False -- Given current trends in child mortality rate reduction, we are on target to meet Millennium Development Goal #4. (Few countries are on track to meet MDG4.)
13. **True** S Asia and sub Saharan Africa have the greatest proportions of child deaths compared to other regions in the world. – About 80% of child deaths occur in these regions.

14. Which are the 3 most important underlying determinants of child mortality?

A. Lack of paternal education  
B. Lack of maternal education  
C. High fertility rates  
D. High levels of poverty  
E. Inadequate access to healthcare
15. True  Despite improvements in child mortality rates, many countries have experienced increasing gaps in mortality rates between the rich and the poor.
16. A multi-country evaluation of IMCI found the following (multiple responses acceptable):

A. Training of health providers improved assessment and treatment practices
B. Some sites experienced poor utilization of health services by caretakers of children
C. Health system infrastructure deficits led to poor supervision of health providers in the community
D. Implementation of the community component of IMCI does not impact child health
Congratulations! You have completed the module. Check out the useful references that follow and review a 2\textsuperscript{nd} module on child health in resource limited settings.
References


References


Recommended resources:


• UNICEF’s annual State of the World’s Children Report includes latest statistics on child health and development. Each report also covers a special theme. The 2009 report, for example, focused on maternal and newborn health.

• UNICEF ChildInfo website [http://www.childinfo.org/index.html](http://www.childinfo.org/index.html)

Credits

Donna M. Denno, M.D., M.P.H.
University of Washington
Seattle, WA

Chris Stewart, M.D.
University of California
San Francisco, CA

2013
The Global Health Education Consortium gratefully acknowledges the support provided for developing these teaching modules from:

**Margaret Kendrick Blodgett Foundation**

**The Josiah Macy, Jr. Foundation**

**Arnold P. Gold Foundation**

This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 3.0 United States License](http://creativecommons.org/licenses/by-nc-nd/3.0/us/).
Supplementary Notes
NOTE A -- Why focus on child health?

1) Children represent the most vulnerable societal group for a number of reasons: a) biologic immaturity—for example, immunologic immaturity put them at increased risk of infectious diseases, b) they are at risk of insults which can arrest or retard their physical and mental development, c) they are dependant on adults for their optimal development and in fact survival. As a result of their vulnerability and dependence on society and adults for their care, the UN Convention on the Rights of the Child (UNCRC) was drafted and presented in 1989 with all countries signing the Convention and all but 2 countries’ governments (US and Somalia) ratifying the Convention. At the time of this writing, the new US Presidential Administration has indicated that they will review the document for ratification reconsideration. However, ratification requires Congressional approval in the US as well. For more information see [http://www.unicef.org/ceecis/overview_1583.html](http://www.unicef.org/ceecis/overview_1583.html) for an overview and [http://www.crin.org/docs/resources/treaties/uncrc.asp](http://www.crin.org/docs/resources/treaties/uncrc.asp) for the full text.

2) Improvements in child health are a good measure of societal progress—hence the Millennium Development goals (described later in Note F) contains a specific goal explicitly stating the need to reduce childhood mortality as well as other goals relating to children as well (i.e. improving education rates, reducing poverty rates). Infant and child mortality rates (discussed in later slide and note C) have traditionally been (and still are) used as sensitive markers for the overall health of nations as a whole.

3) GHEC Module 21 reviews the Global Burden of Disease* and common ways to measure that burden including life expectancy and disability-adjusted life years (DALYs)¹. Childhood illness, disability, and death are important components of the global burden of disease; death during childhood substantially contributes to reduced life expectancy in developing countries. Furthermore, childhood illness is an important contributor to the global burden of disease. For example, the key causes of childhood morbidity are estimated to account for 14% of DALYs [1].

4) 2/3 of childhood deaths are preventable and/or treatable with interventions that are currently available! Read on for more information!

*For more information about the Global Burden of Disease Project see:

---

¹ DALY is a weighted index that takes into account loss of life, morbidity and disability.
NOTE B -- Indicators of childhood mortality

DEFINITIONS, DEFINITIONS—LET’S GET A HANDLE ON THE LINGO USED TO MEASURE CHILD HEALTH OR LACK THEREOF

An indicator is a commonly used term in public health that refers to a measure of health or disease. Incidence and prevalence rates and different types of mortality rates are commonly used indicators. For example:

- **Proportional mortality** = number of deaths due to a specific cause in a defined population over a year / total number of deaths occurring in that population during the same year
- **Mortality rate** = number of deaths due to a specific cause in a defined population over a year / total number in the defined population at the midpoint of the same year = probability of dying due to a specific cause in a given population
- Note that proportion dying and probability of dying from a given cause are very different! For example, 3% of childhood deaths in developing countries are due to injuries vs. 10% in developed countries. So, are injuries an important problem in developing countries? Doesn’t seem like it if you just look at proportional mortality of 3%. However, the risk or probability of a child dying from injuries is greater in developing countries than it is in developed countries!! In other words, more children / population are at risk of fatal injuries in developing countries than in developed countries. It’s just that they are also dying from other causes at higher rates, so the importance of injuries as a contributor to mortality is masked if you just look at proportional mortality.

In child health the 3 most used common mortality indicators are:

- **Under five mortality rate (U5MR) is also referred to as child mortality rate (CHR)** = number of deaths under five years of age in a defined population over a year / number of live births occurring in that population during the same year
- **Infant mortality rate (IMR)** = number of deaths under one year of age in a defined population over a year / number of live births occurring in that population during the same year
- **Neonatal mortality rate (NMR)** = number of deaths under 28 days of age in a defined population over a year / number of live births occurring in that population during the same year

Note the differences in the definitions of the denominators between the child mortality rates and general mortality rate. Note also that NMR is encompassed within IMR and U5MR, and NMR and IMR are encompassed within U5MR.
For more information about these and other indicators see:
Specific indicators by country can be found on the UNICEF
http://www.unicef.org/infobycountry/index.html or WHO
http://www.who.int/whosis/en/ websites

Return to Slide 5
NOTE C -- Reminder -- Morbidity

IODINE Deficiency is the single most important cause of preventable brain damage and mental retardation. It significantly raises the risk of stillbirth and miscarriage in pregnant women. 43 million people worldwide suffer from varying degrees of brain damage and physical impairment due to iodine deficiency—there is a spectrum of associated disability. The primary intervention for the control of IDD is through salt iodization. For more information on IDD see http://www.childinfo.org/idd.html

VITAMIN A Deficiency is a contributing factor in 2.2 million deaths each year from diarrhea and 1 million deaths from measles among preschool children under five. Severe deficiency can also cause irreversible corneal damage, leading to partial or total blindness. Vitamin A deficient children face a 23% greater risk of dying from ailments such as measles, diarrhea or malaria. Vitamin A supplementation of children with can reduce deaths from diarrhea and measles by 35-50% and 50%, respectively. Treatment with high dose vitamin A is an important component of measles case management. For more information on vitamin A deficiency see http://www.childinfo.org/vitamina.html

IRON Deficiency is the most common nutritional disorder in the world. It lowers resistance to disease and weakens a child's learning ability and physical stamina. It is a significant cause of maternal mortality, increasing the risk of hemorrhage and infection during childbirth. Nearly 2 billion people are estimated to be anemic and millions more are iron deficient, the vast majority are women and children. For more information see http://www.unicef.org/nutrition/23964_iron.html

HELMINTHIC infections are an important cause of poor growth and anemia worldwide. Hookworm infection, for example, is an important cause of anemia in many settings with clinical manifestations similar to that of iron deficiency anemia. Periodic presumptive treatment among schoolchildren can lead to control in endemic settings. For more information on helminthiasis see http://www.who.int/topics/helminthiasis/en/

Furthermore, many common causes of child mortality can leave survivors with long term disabilities: for example, reduced cognitive function post cerebral malaria, intestinal malabsorption as a result of prolonged or recurrent diarrheal infections leading to poor nutrient absorption, disabilities secondary to injuries.
NOTE D -- The world is not on track to meet MDG4

Progress is being made in reducing childhood mortality. Between 1980 and 2008 annual child deaths worldwide decreased from 13.5 million to 8.8 million. Latin America, the Caribbean, Eastern Europe, the Pacific and East Asia are on track for meeting MDG4.

Worldwide, there has been a 41% reduction in U5MR from 1990-2011. In some countries progress had stalled or even reversed in the 1990’s (e.g. Kenya, South Africa, Zimbabwe, Rwanda, Swaziland)—often due to conflict, political instability leading to reduced focus on public health infrastructure, and/or the HIV/AIDS epidemic.

However, of 66 countries with child mortality rates of at least 40 per 1,000 live births, 20 have reduced their under-five mortality rates by at least half between 1990 and 2011, and 4 of them have achieved at least a two-thirds decline (in Lao People’s Democratic Republic, Timor-Leste, Liberia and Bangladesh) [4]. For more information see http://www.childinfo.org/mortality_underfive.php .
NOTE E -- Slowing trends in improvements in child mortality

Reductions in mortality rates during the 1960s-1970s and into 1980s provided optimism that MDG #4 could be realistically met by 2015. However, progress slowed in the 1980s and 1990s [5, 6], picking up at a somewhat better pace during the first decade of this century—but not at a pace fast enough to meet MDG4 by 2015 at current rates. Globally, rates of reduction in under-five mortality decreased by an average of 1.8 percent per year between 1990–2000. Progress improved over the next decade with an average 3.2 percent decrease per annum from 2000–2011. However, in order to meet MDG4 an annual rate of reduction in child mortality of 14.2% would be needed.

Of 66 countries with the highest mortality rates, only 15 are on track to meet MDG4.

Meeting the target will require serious commitments to implementing life-saving interventions and tackling the social determinants of health. But it can be done, even in the poorest of environments. The following are examples of high mortality countries have made great strides forward in reducing under-5 mortality: Nepal, Timor Leste, Bangladesh, Eritrea, Lao People’s Democratic Republic, Mongolia, Bolivia, and Malawi.

For further information on the progress being made toward meeting MDGs see:
- [www.countdown2015mnch.org](http://www.countdown2015mnch.org)
Undernutrition typically is not directly responsible as a cause of death, more often it is a very important underlying cause of death. Altogether undernutrition contributes to 35% of childhood deaths [7]. Undernutrition puts children at increased risk of illness (e.g. increased risk of contracting pneumonia, diarrhea, malaria) and once they are sick puts them at even greater risk of dying.

Undernutrition can take many forms. While poor caloric and macronutrient (protein, fat, carbohydrate) intake is an obvious cause of undernutrition (defined as low weight for age), micronutrients also play an important role in promoting growth and micronutrient deficiencies can also lead to low weight for age. In addition, micronutrient deficiencies can be present in children who are not underweight. Micronutrient deficiencies are associated with increased risk of morbidity and mortality—for example increased risk of getting ill with diarrhea and increased risk of dying from measles, respiratory infections, and diarrhea. The most common micronutrient deficiencies are vitamin A, zinc, iron and iodine.

Breastfeeding also plays an important role in health promotion and disease prevention. Infants less than six months who have not been breastfed have a 7-fold and a 5-fold risk of dying from diarrhea and pneumonia, respectively, compared to children who have been exclusively breastfed. Those who have been breastfed but not exclusively, face a 2-fold increased risk compared to those who have been exclusively breastfed. For more information on breastfeeding see http://www.childinfo.org/breastfeeding.html

Undernutrition also inhibits physical and mental development. It is also a major cause of neonatal morbidity and mortality as malnourished girls and women with stunted growth have increased risk of obstructed labor as well as low birth weight babies.

*The term malnutrition encompasses overweight, obesity and undernutrition. The term undernutrition refers to calorie/macronutrient deficiency, micronutrient deficiency and lack of exclusive breastfeeding. Infants 6 months and older also benefit from breastmilk in their diet in terms of protection from mortality.


Return to Slide 20
Primary Health Care (PHC) refers to a specific movement originating in the late 1970’s which defined a goal of “Health for All by the year 2000” via the Alma Ata Declaration which was signed by 134 health ministers from around the world and endorsed by WHO, UNICEF and major funding organizations. The goal was to be realized via the provision of essential health care (e.g. access to care for treatment of common conditions) and basic public health services (e.g. immunizations, clean water, sanitation facilities) as well as tackling underlying causes of death such as poverty and illiteracy. PHC involves an integrated approach to the delivery of services at the community level but as a part of a comprehensive national health system.

To read the 1978 Alma Ata declaration on PHC and Health Care for all by 2000 see [http://www.paho.org/english/dd/pin/alma-ata_declaration.htm](http://www.paho.org/english/dd/pin/alma-ata_declaration.htm)
NOTE H -- Examples of Intervention Delivery Methods

Following the Alma Ata declaration, there was concern (for example among governments with a vested political interest in preserving inequities as well as among influential US international health experts) that PHC was too ambitious a project, and that there needed to be a focus on delivering specific selective interventions—referred to as selective cost effective interventions (SPHC). SPHC movement focused on the technological aspects of the interventions. The roles of communities, socio economic development and addressing underlying determinants of health are not by SPHC. In the 1980’s UNICEF adopted a SPHC child survival strategy termed GOBI (growth monitoring, oral rehydration therapy and immunization). This was expanded to include family planning, food supplements and female education (GOBI-FFF). SPHC programs are often delivered as vertical programs—i.e. not an integral part of the health care and public health system in developing communities but rather as isolated and independent programs.

Vertical programming often results in human resources being diverted from day-to-day management of PHC operations in order to devote time and attention to the vertical intervention being promoted at that time. Vertical programming is difficult to sustain without continued carry-through via a functioning health system.

For more information on PHC its revitalization 21st century see GHEC Module 30 PHC—Now More than Ever

Return to Slide 37
NOTE I -- Integrated Management of Childhood Illnesses (IMCI)

In the 1990’s UNICEF and WHO started promoting the Integrated Management of Childhood Illnesses (IMCI) approach which might be viewed as a pendulum partial swing back toward PHC—community involvement is emphasized although underlying social, political and economic causes of poor health are not well addressed. IMCI is “an integrated approach to child health that focuses on the well-being of the whole child. IMCI aims to reduce death, illness and disability, and to promote improved growth and development among children under 5 years of age. IMCI includes both preventive and curative elements that are implemented by families and communities as well as by health facilities.” In health facilities, the IMCI strategy promotes the accurate identification of childhood illnesses in outpatient settings, ensures appropriate combined treatment of all major illnesses, strengthens the counselling of caretakers, and speeds up the referral of severely ill children. In the home setting, it promotes appropriate care-seeking behaviours, improved nutrition and preventative care, and the correct implementation of prescribed care.

There are 3 components to IMCI:

- improving health worker skills
  - IMCI trainings are structured 11 day courses aimed at teaching health care workers in the community (i.e. primarily the non-physician providers (e.g. nurses) who provide the majority of care in many developing countries.
  - The courses cover IMCI protocols in identifying the common presentations of the sick child as well as appropriate treatment, follow-up and referral for these conditions.
  - The courses and IMCI protocols also have components on assessing “well child issues”—growth, nutrition, development, and immunizations. The protocols encourage health workers to check immunization/growth chart cards during sick visits to assess for and growth faltering, gaps in immunizations or routine vitamin A doses, delays in development (developmental milestones are included on these cards. Appropriate treatment and referral are included in guidelines.

- improving home and community based care and practices to ensure that:
  - appropriate prevention strategies such as exclusive breastfeeding for 6 months, appropriate nutrition, use of insecticide treated materials are being practiced
  - home based care is appropriate for both the sick child (e.g. appropriate antimalarials for the febrile child in a malaria endemic setting, oral rehydration therapy for the child with diarrhea and no dehydration)
  - children are taken promptly to a health worker when symptoms and signs of illness warrant health care (e.g. symptoms of complicated malaria--fever and poor feeding, fever and lethargy or diarrhea with signs of dehydration (poor ability to drink, lethargy, etc)
- Children are given full courses of prescribed treatments (e.g. full course of appropriate antibiotics prescribed by health worker for respiratory infection, full course of appropriate anti-malarials)

• Improving health systems
  - Appropriate supervision and continued training for health workers
  - Procurement systems with adequate supplies of medications, vaccines, and supplies
  - Referral facilities (i.e. hospitals) that respond to referrals from the community level. Mechanisms must be in place to efficiently respond to the sick child who is referred from the community.

Standard IMCI protocols share common features (e.g. identification of child needing antibiotics for treatment of respiratory infection and symptoms/signs requiring hospital referral), but protocols are also setting specific (e.g. includes assessment and treatment for dengue fever in endemic settings)
Note J -- IMCI Case Examples: 18-month old with fever and lethargy

Preliminary Data from 5 countries that where an evaluation of IMCI is taking place are encouraging in regards to training of health workers but the health systems component of IMCI is just not strong enough to deliver an effective total IMCI package. Access to care presents another significant impediment to IMCI effectiveness.

Case example: An 18 month old presents with fever and lethargy. In order for IMCI to be effective in helping this child, the caretaker needs to identify that the child is ill and seek care. The community health worker must be trained to recognize severe malaria based on clinical presentation and initiate immediate treatment and referral to a health care facility. The family must then be able to access the facility and the facility must recognize the condition and treat the child appropriately.

Case example: An 8 month old presents cough and fever. Again, the family must recognize that this is a condition for which care should be sought and care within the community should be accessible. The community health worker should not only be able to follow clinical algorithm leading to a clinical diagnosis of pneumonia but should also assess the growth and immunization record and give nutrition advice and update immunizations accordingly. The community health worker should also document developmental progress on the growth chart and intervene if there is developmental delay. If the child is from a malaria endemic setting treatment for potential concomitant malaria is included in the clinical care guidelines as well.

In IMCI care is more comprehensive. Community education regarding healthy practices is important and encompassed in 16 “key family practices for healthy growth and development” that fall into 4 categories: promote physical growth and mental development, promote disease prevention, promote appropriate home care, and promote health care seeking behavior. For a full list of the 16 key community IMCI family practices see http://www.paho.org/english/ad/fch/ca/GSIYCF_keyfam_practices.pdf

Return to Slide 41