FUNDAMENTALS OF GLOBAL HEALTH:

Determinants of Health
The Ecology of Health
Environment & Malnutrition
Information & Data Sites

7 September 2015
Last Week in Review

- Concepts & Contexts
- Key Indicators
- Global Burden of Disease
- The Global Health Agenda
TODAY’S LECTURE

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DETERMINANTS OF HEALTH:

GLOBAL RISK:
- Dietary Risks
- High Blood Pressure
- Smoking
- Indoor Air Pollution
- Alcohol Use
- High BMI
- High Blood Sugar
- Childhood Underweight
- Outdoor Air Pollution
- Physical Inactivity

GLOBAL NORTH:
- Dietary Risks
- High Blood Pressure
- Smoking
- High BMI
- Alcohol Use
- Physical Inactivity
- High Blood Sugar
- Outdoor Air Pollution
- Drug Use

GLOBAL SOUTH:
- Dietary Risks
- High Blood Pressure
- Smoking
- Indoor Air Pollution
- Childhood Underweight
- High Blood Sugar
- Outdoor Air Pollution
- Alcohol Use
- Occupational Injuries
- High BMI

Risk Factors & Protective Factors impacting health. ---may be proximal or distal

Source: GBD, accessed 2015
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• The Health-Wealth Gradient:

• The Status Syndrome:
**Biopsychosocial Model Of Health Status:**
Health as an “Ecological” Complex of Determinants*

<table>
<thead>
<tr>
<th>BIO</th>
<th>PSYCHO</th>
<th>SOCIAL</th>
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<tbody>
<tr>
<td>Genetics</td>
<td>Mental Health</td>
<td>Place: geography, residence, environment</td>
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<tr>
<td>Sex</td>
<td>Experience</td>
<td>Race/ethnicity</td>
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<tr>
<td>Age</td>
<td>Child Rearing</td>
<td>Occupation</td>
</tr>
<tr>
<td></td>
<td>Stress</td>
<td>Gender, gender identity, sexual orientation</td>
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<td></td>
<td>Coping Skills</td>
<td>Religious Status</td>
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<td></td>
<td>Self Efficacy</td>
<td>Education</td>
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<td></td>
<td>Resiliency</td>
<td>Socio-economic status</td>
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<td></td>
<td>Ego depletion</td>
<td>Social Capital</td>
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*The model also explains the health impact of [epigenetics](https://example.com), [metabolomics](https://example.com), the [microbiome](https://example.com), and [stress](https://example.com). Multiple external & internal factors influence gene expression, metabolism & impact of metabolic by-products, gut bacteria, and cortisol levels.*
Four Additional Overlapping Paradigms Expand The Model Into A “Web of Causation”:

1. Networks
   - Societal
   - Community
   - Interpersonal
   - Individual

2. Barriers
   - Sociocultural
   - Financial
   - Structural
3. Structural Violence

Social, Political, Economic, and Cultural Systems Perpetuating

- Inequity (of all types)
- Vulnerability (higher risk of risks)
- Constrained Agency
- Barriers to Access & Care
- Discrimination & “Othering”
- Poverty
  > 2 billion people in poverty (≤$2/day)
  >1 billion in extreme poverty (≤ $1.25/day)
Note: relative poverty impacts health

4. Global Transitions

- DEMOGRAPHIC shift from high birth/mortality to low birth/mortality
- URBAN shift from rural to urban regions in a world of 9.6 billion people by 2050
- NUTRITIONAL shift from cereals, fiber, vegetables to animal foods, high fat, sugar
- EPIDEMIOLOGIC shift from infectious to chronic diseases (hence LMIC dual yoke of disease burden)
### MDGs (2000-2015)

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Global partnership for development

### SDGs (2016-2030)

**Goal 1** End poverty
**Goal 2** End hunger
**Goal 3** Well-being
**Goal 4** Quality education
**Goal 5** Gender equality
**Goal 6** Water and sanitation for all
**Goal 7** Affordable and sustainable energy
**Goal 8** Decent work for all
**Goal 9** Technology to benefit all
**Goal 10** Reduce inequality
**Goal 11** Safe cities and communities
**Goal 12** Responsible consumption by all
**Goal 13** Stop climate change
**Goal 14** Protect the ocean
**Goal 15** Take care of the earth
**Goal 16** Live in peace
**Goal 17** Mechanisms and partnerships to reach the goals

**GLOBAL HEALTH: ENMESHED WITH ALL MDGs & SDGs**
A GH SUPERFECTA: Health + Gender Equity + Education + Development

The Gender Inequality Index (GII) is a composite measure of women’s reproductive health, labor market participation, and empowerment.
*Most Equal: Netherlands
*Least Equal: Mauritania

The Human Development Index (HDI) is a composite indicator combining LE, education, quality of life
#1: Norway
#187: Niger
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Let's examine two determinants within the ecological model.
ENVIRONMENT AS DETERMINANT

Did you know?

• Accounts for +/- 25% of total DALYs? And +/- 33% of childhood DALYs?

• Is exacerbated by climate change, which is exacerbated by current methods of human development and economic growth?

• Plays a role in over 80 disorders from all three WHO disease groups?

• Environment impacts food production and can increase malnutrition?

• 750 million people lack access to improved water; over 2 billion lack access to improved sanitation. (Source: WHO Website, Accessed 2015)
Indoor Air Pollution

-Cause: use of solid fuel (wood, dung, etc.) for cooking in poorly ventilated homes

-Results: lower respiratory irritation/infection, cataracts, COPD, ischaemic heart disease, cancer, stroke

-Impact: Women and children most affected, primarily Asia & Sub-Saharan Africa

-Fast Fact: Indoor cooking also results in significant injuries for women and children.
Outdoor Air Pollution

- **Cause:** use of fossil fuels, deforestation (by burning), bovine methane production, resulting in 100’s of toxins

- **Results:** LRI, lung and eye irritation, COPD, heart disease, stroke, cancer, CNS damage, LBW babies

- **Why Chronic Disease?**: PM <2.5 microns diameter can enter bloodstream (inflammation and vessel damage)

- **Why LBW?**: impacts placental blood vessel formation

- **Impact:** Global, but Asia has greatest burden. China, the most deaths (& 5 year LE difference north/south); Delhi, the highest PM<2.5 readings!

- **Fast Fact:** outdoor air pollution contributes to 40% of heart attacks (Lim et al, Lancet 2012)
Unsafe Water, Sanitation, Hygiene

**Causes:** water and soil contaminated with biological or chemical agents (e.g., arsenic, lead, excess fluoride), lack of rudimentary latrines, poor hygiene education/opportunities, open defecation

**Results:** Diarrheal diseases (including cholera); infectious diseases such as polio, trachoma, parasitic diseases.

**Impact:** “Bottom Billion” most affected, especially SSA, parts of Asia and Central America

**Fast Fact:** women and girls may spend hours a day fetching water, harming health and education—40 billion hours/year in Sub-Saharan Africa alone spent fetching water!
Malnutrition: Two Types

**UNDERNUTRITION:** Insufficient intake of calories, one or more macronutrients (proteins, carbs, fat) and/or micronutrients (vitamins and minerals)

**OVERNUTRITION:** Excessive caloric intake, usually with an overconsumption of one or more macronutrients—especially refined carbohydrates (more with NCDs).

--May be accompanied by low phytonutrient intake (from fruits & vegetables)
--Both types can occur simultaneously (in a population or in an individual)
Today’s Focus: Undernutrition

Did you know?

- Impacts over 800 million people (poor children, women and elderly most vulnerable)?
- Contributes to 30-50% of childhood mortality?
- Reduces growth, cognitive development, and immunity?
- Is exacerbated by climate change?
- Is a risk in dozens of disorders, from tuberculosis to night blindness to work injury?
- Increases other risks?
- Almost 50 million households in the US alone are food insecure.

Asia (esp. South & South-East) bears the greatest burden of undernutrition—but there are hotspots and hot pops all over the world, including right here in Durham.
### Some Common Deficiencies

<table>
<thead>
<tr>
<th>Deficiency</th>
<th>Symptoms and Effects</th>
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<tbody>
<tr>
<td>Protein-Energy Malnutrition (PEM)</td>
<td>Lowered immunity, stunted growth, wasting, cognitive impairment, marasmus, kwashiokor</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>Night blindness, Decreased immunity, lowered growth, higher maternal DALYs, increased child mortality, increased prevalence of diarrhea</td>
</tr>
<tr>
<td>Iodine</td>
<td>Miscarriage or stillbirth, cognitive impairment, lowered growth, goiter</td>
</tr>
<tr>
<td>Iron</td>
<td>Low birth weight, fetal mortality, lowered growth, cognitive impairment, anemia, reduced productivity, maternal mortality (inc. hemorrhage from uterine atony)</td>
</tr>
<tr>
<td>Zinc</td>
<td>Decreased immunity, lowered growth, increased diarrhea prevalence/severity/duration, lowered reproductive functions, increased mortality risk</td>
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LET’S WRAP IT UP!

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NEXT UP:

• W/F Discussion Sections:
  • Review Slidesets and Notes
  • Read Case Studies Carefully:
    – Improving the Health of the Poor in Mexico
    – Reducing Child Mortality Through Vitamin A in Nepal

• Lecture Topic Monday 14 September:
  • Actors, Systems, and Interventions