PARENTAL HEIGHT AND STUNTING

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Core Message

• Stunting is an outcome of environmental factors
  ✓ 90% of stunting can be attributed to negative environmental factors
  ✓ 10% of stunting can be attributed to genetic factors

• Stunting can be prevented with right interventions
  ✓ Nutrient dense food
  ✓ WASH, poverty alleviation, education

• Stunting interventions at right time of life cycle
  ✓ 1,000 days Window of Opportunity
  ✓ Adolescent girl’s health/nutrition
  ✓ Optimal nutrition throughout childhood and adolescence

• Stunting creates long lasting damage
  ✓ Children do not reach full development
  ✓ Economic loss, productivity reduced, higher burden on health system
WHAT IS STUNTING
What is stunting?

- **STUNTING** is defined as less than -2SDs height-for-age (HAZ) by NCHS standards, usually in children aged 6-59 months.
- **SEVERE STUNTING** is defined as less than -3SDs (HAZ) by NCHS standards, usually in children aged 6-59 months.
How is it different than other forms of malnutrition?

- **Wasted**: Low weight-for-height, indicates short term malnutrition

- **Underweight**: Low weight-for-age, can indicate short or long term malnutrition, or both
HOW IS IT CAUSED?
WHO/UNICEF’s Framework of Causes of Undernutrition

- **Malnutrition disability, morbidity & death**
  - Inadequate Diet
    - Inadequate household food security
  - Disease
    - Inadequate maternal/child care
    - Inadequate services/unhealthy environment

- **Immediate Causes**
  - Underlying Causes
    - Basic Causes
  - Lack of resources: financial, human, physical, social & natural
  - Socio, political & economic context

Basic Causes

Underlying Causes

Immediate Causes

Socio, political & economic context

Lack of resources: financial, human, physical, social & natural

Inadequate household food security

Inadequate maternal/child care

Inadequate services/unhealthy environment

Inadequate Diet

Disease

Malnutrition disability, morbidity & death
4 Phases of human growth

- **Infant growth**
- **Child growth**
- **Puberty**
- **Adulthood**

- **Height variation = only 10% genetics, 90% is environmental factors:**
  - Maternal nutrition
  - Feeding practices and access to nutrient dense food
  - Hygiene & sanitation
  - Infection frequency
  - Access to healthcare
  - Socio-economic factors
Prenatal causes

- Babies born **pre-term** are 1.9 times more likely (compared to normal term babies) to become stunted at 12-60 months
- Babies born **small for gestational age (SGA)** are 2.4 times more likely (compared to adequate for gestational aged (AGA) babies) to become stunted at 12-60 months
- Babies born **both pre-term and SGA** are 4.5 times more likely (compared to normal term and AGA babies) to become stunted at 12-60 months
- Other **maternal factors** associated with low birth weight and therefore stunting are:
  - Short maternal stature
  - Low body mass index
  - Early pregnancy
  - Closely spaced births
  - Poor weight gain during pregnancy
  - Exposure to arsenic during pregnancy (Bangladesh study)
The Cycle of Malnutrition

- **Pregnant / lactating woman**
  - Poor diet
  - Inadequate health care

- **Stunted adolescent**
  - Poor diet
  - Adolescent pregnancy

- **Stunted child under 5 years**
  - Poor feeding practices
  - Inadequate health care
  - Poor WASH > diarrhea & EED
  - Recurrent Infections
  - Ongoing poor diet & WASH
Causes of stunting during this period

- **Poor** quality, insufficient quantity of nutrient dense foods in **diet**

- **Diarrhea** – 1 meta-analysis study found that 25% of stunting could be attributed to $\geq 5$ episodes of diarrhea

- **Environmental enteric dysfunction (EED)** – malabsorption of nutrients due to chronic inflammation and permeability of the intestines

- **Mycotoxins** or fungi that infect staple foods in many developing countries were related to stunting in a few studies.
1. Data from Young Lives, longitudinal study from Vietnam, Ethiopia, Peru & India found Substantial recovery from early stunting was possible. (Lundeen, EA, et al. 2013)

2. Adolescence is the time beyond infancy when growth velocity is maximal and represents the last opportunity for catch-up growth. (Prendergast & Humphrey, 2014) But there is very little research on this.

3. 30% of the absolute height for age difference (HAD) accumulate between the ages of 3 and 5 (Leroy, JL. et al. 2014)
Average height as an indicator of development over time

Average height of 9 year old Norwegian boys and girls, 1920 - 1985

Mean height changes among immigrant populations

Mean height of Mayan boys and girls in Guatemala (Maya-Guat) and the United States (Maya-USA) compared with the US average (NHANES)

Increase in stature in the US:
- access to treated drinking water
- reliable supply of food (school breakfast and lunch programs for children from low-income families + public assistance programs (WIC program and food stamps)

Maya in the USA though taller, have a higher prevalence of overweight and obesity.

retained less of their traditional diet, physical activity and leisure time pursuits (consume a diet closer to that typical for US & consume more total kcals/day than the Maya of rural Guatemala)

Source: Bogin, 2010
The Dutch men used to be the shortest in Europe in 1850…

- Now Dutch men are the tallest in the world - averaging at 1.83m

**Why?**

- Infusion of “tall” genes?

- **Life got better**
  - Drinking water was purified
  - Sewer systems were installed
  - Safety regulation of food
  - Providing better health care and diets to children

- Δ in environment

Children responded to this change and grew taller

Source: Bogin, 2010
The Dutch decided to provide public health benefits to all of the public, including the poor.

While in the US, improved health was a privilege for those who could afford it.

The poor often lack adequate housing, sanitation and health care.

In 1990

Only 4% of Dutch babies were born at LBW

7% of American babies were born at LBW

White Americans: LBW rate of 5.7%
Black Americans: LBW rate of 13.3%

Disparities between the rich and poor in the US carry through to adulthood: high income Black and White Americans are taller than low income Blacks and Whites by about 1.5cm but do not differ within same socioeconomic status.

Source: Bogin, 2010
Jasienska, 2009
Komlos and Baur, 2004
STUNTING PREVALENCE BY COUNTRY
Changes in Stunting Prevalence


The “Stunting Syndrome”

“Multiple pathological changes marked by linear growth retardation increase morbidity and mortality and reduce physical, neuro-developmental and economic capacity.” Prendergast & Humphrey, 2014

- Sub-optimal physical development
- Sub-optimal mental development
- Lack of school readiness
- Poor school performance
- Risk of obesity later in life and related chronic diseases
- Reduced productivity and human capital in adulthood
- Increased risk of DEATH!
Economic losses due to stunting

Estimated % of GNP lost due to poor nutrition, 1990-2010, and projections to 2050

Take Home Message

• Stunting is 90% environmental and 10% genetics; therefore stunting can be prevented

• Right interventions at the right time can reduce and prevent stunting

• Women need access to nutritious nutrient dense food throughout the life cycle

• Parents, care takers and adolescents need to be empowered to be able to make the right decisions on food intake

• All sectors of society need to collaborate on finding solutions to reduce stunting – the human, social and economic losses are too big!
THANK YOU
Recovery from stunting from age 1 to 8 years in 4 countries (Young Lives study)