

Nutrition throughout the life cycle

Course description

- This course will focus on nutrition throughout the lifecycle – from infancy through childhood to adolescence and the reproductive years.
- It also introduces maternal and child nutrition – the intricate relationship, prevalence, determinants, and consequences of low birth weight, importance of maternal nutrition, fetal, and child growth, and direct interventions to address nutritional problems of mothers and children.

Nutrition throughout the life cycle

Contents

- Introduction
- Maternal nutrition and intergenerational effect
- Low birth weight
- Prevalence
- Determinants
- Consequences
- Child growth
- Adolescent growth
- Interventions in the life cycle

Learning objectives

- At the end of this session, you should be able to:
 - Know the link between maternal and child Vs nutrition
 - Visualize the intergenerational link of undernutrition
 - Describe the consequences of low birth Weight

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- Describe causes and consequences of poor child growth
- Explain the effects of early childhood nutritional status on adolescent growth
- Describe possible nutrition interventions during adolescence
- Describe critical actions at different stages in the life cycle

Introduction

Major international commitments in the past

- Health for All by the year 2000 at Almata Conference in 1978
- Formulation of Nutritional Goals – at World summit for children in New York in 1990 (UNICEF)
- International Conference on Nutrition (FAO/WHO,1992)
- Millennium development goals (UN)
- Sustainable development goals

World Summit for Children 1990: Nutrition Goals

- Reduce severe & moderate malnutrition < 5 yrs by
- half of 1990 levels;
- Reduce rate of low birth weight (<2.5 kg) to < 10 %;
- Reduce iron deficiency anemia in women by 1/3 of
- 1990 levels;
- Virtually eliminate iodine deficiency disorders;
- Virtually eliminate vitamin A deficiency and
- consequences, including blindness

World Summit for Children 1990...

- Empower women to exclusively breast-feed for
- four to six months (**now 6 months**) and to
- continue breastfeeding, with complementary
- food, well into the second year;
- Institutionalize Growth Promotion and Monitoring
- in all countries by the end of the 1990s;
- Disseminate knowledge and support services to
- increase food production to ensure household
- food security

Millennium development goals (UN,2001)

- Eradicate extreme poverty and hunger.
- Achieve universal primary education.
- Promote gender equality and empower women.
- Reduce child mortality.
- Improve maternal health.
- Combat HIV/AIDS, malaria, and other diseases.
- Ensure environmental sustainability.
- Develop a global partnership for development

Sustainable development goals

- End poverty in all its forms everywhere
- **End hunger, achieve food security and improved nutrition and promote sustainable agriculture**
- **Ensure healthy lives and promote well-being for all**
- **Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all**
- **Achieve gender equality and empower all women and girls**
- Clean water and sanitation
- **Ensure access to affordable, reliable, sustainable and modern energy for all**
- **Promote inclusive and sustainable economic growth, employment and decent work for all**

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- **Build resilient infrastructure, promote sustainable industrialization and foster innovation**
- **Reduce inequality within and among countries**
- **Make cities inclusive, safe, resilient and sustainable**
- **Ensure sustainable consumption and production patterns**
- **Take urgent action to combat climate change and its impacts**
- **Conserve and sustainably use the oceans, seas and marine resources**
- Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss
- Promote just, peaceful and inclusive societies
- **Revitalize the global partnership for sustainable development**

Nutrition Issues Continue to be Challenges to the World

- Despite reduction in infant and child mortality surviving children are not healthy
- There has been relative decrease in rate of malnutrition however the absolute numbers of
- children are increasing every year in millions
- The prevalence of LBW is increasing and no improvement has been made since 1970's (most affected region is South East Asia where the prevalence ranges from 12 % to more than 50%)

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- 10 years after **Safe Motherhood Initiative**

was launched, the death of 600,000 women per year from pregnancy related complication continue became a reality in 1996 (99% of which took place in the developing countries)

Why is women's nutrition important?

- 450 million women in developing countries are stunted (CED)
- Worldwide, 59% of pregnant women and 47% of all women are anaemic
- Over 2 million women are blind due to vitamin A deficiency (VAD)
- 250 million women are at risk of Iodine Deficiency Disorder (IDD)
- Social, economic, health and development impact of maternal under-nutrition
- Impact on maternal health & mortality
- Impact on child survival & development
- In developing countries, women have an energy intake of 1500-1700 (70% of requirement) and Protein intake is of about 42 g per day(85% of the requirement)
- Poor maternal nutritional health contributes to at least four of the five major causes of **Maternal Mortality**

Causes of maternal mortality and nutritional implications

Causes	% of maternal mortality	Nutritional precedent
Hemorrhage	30-35	Anemia: 500 Million women
Induced abortion/Teenage pregnancy	20-45	??
Hypertension /Eclampsia	15-25	Low calcium intake?
Infection/Sepsis	5-15	Impaired immunity: iron and vitamin A deficiency Exhausted: CED
Obstructed Labor	5-15	Stunted: height <150cm 500 million women
Prolonged labor	---	CED: 500 million women Wt <45kg ;BMI<18.5



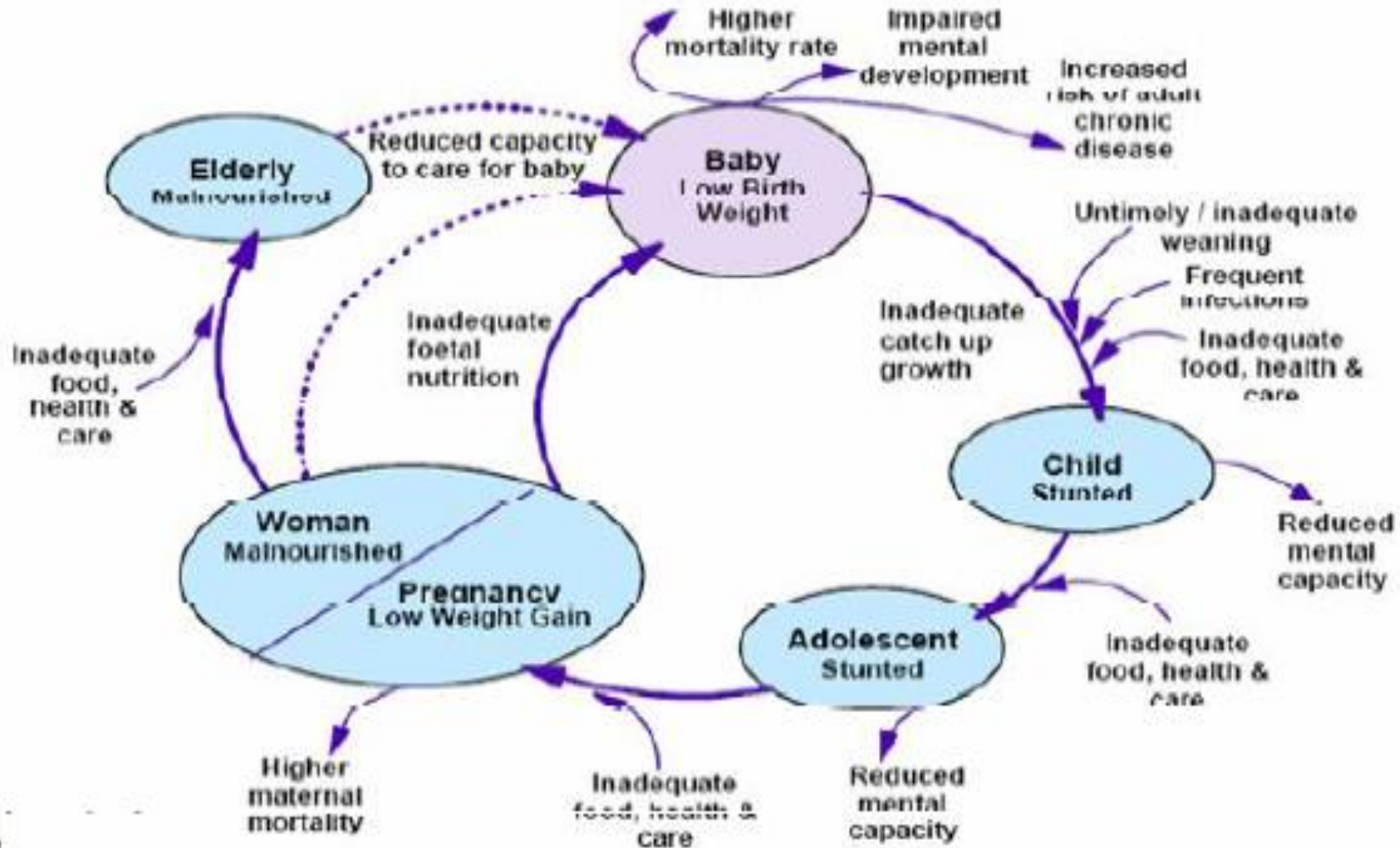
- Ill health among women and the heavy burden of reproductive activities requiring physical labor are associated also with malnutrition
- The sequential burden of reproduction on the women's health and nutritional status is known as the *maternal depletion syndrome*.

Maternal Depletion :% spent on child bearing and nurturing

Variables	Developing countries	Industrial Countries
Menarche,age	14	11
Menopause,age	42	53
Fertile periods ,years	28	42
Number of children	6	2
Months pregnant	6x9=54	2x9=18
Months lactating	6x24=144	2x24=48
Months reproducing		
*Total	198mo.	66 mo.
*As percent of fertile period	59%	13%



Nutrition throughout the life cycle (SCN, UN,



Undernutrition throughout the Life Cycle

- Undernutrition often starts *in utero* and may extend throughout the life cycle
- It also spans generations
- A foetus which has experienced IUGR is *unlikely to catch up* at the later life, has increased chance of dying during infancy.
- Strong epidemiological evidence suggests a link between maternal and early childhood undernutrition and increased adult risk of various *chronic diseases*

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- Most growth failure occurs from before birth until two to three years of age
- A child who is stunted at three years of age is likely to remain stunted throughout life
- Apart from the indirect effects on the mother, micronutrient deficiencies during pregnancy have serious implications for the developing foetus
- The main micronutrient with significant effect on the baby include Iodine, vitamin A, and Iron

Low birth weight (LBW)

- **LBW** is defined as weighing less than 2,500 g at birth
- It is one of the most common statistics because it requires a single measurement, weight at birth, and no information about gestational age
- There are two main causes of LBW:
 - Being born small for gestational age, or
 - Being born prematurely

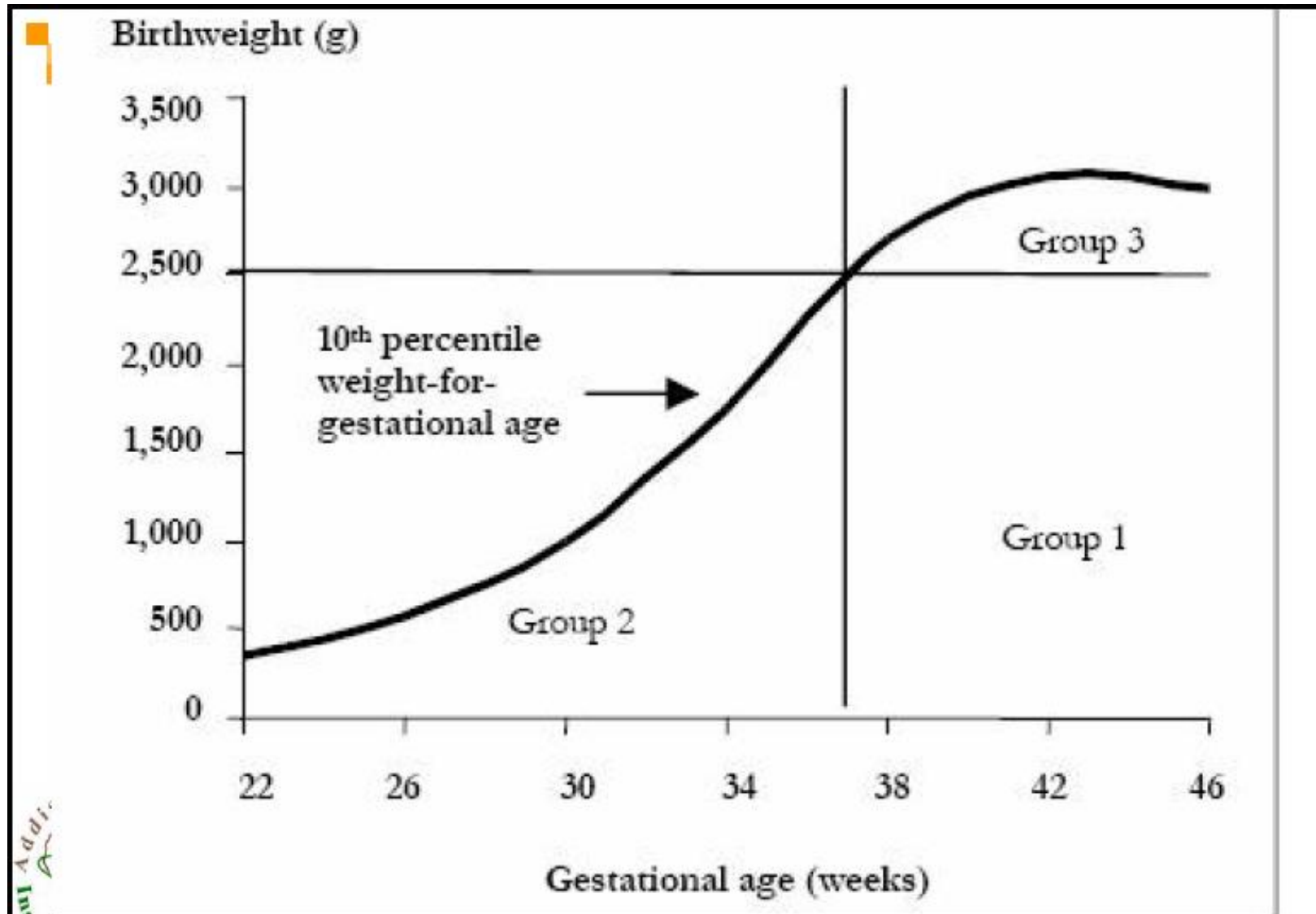
Causes of premature delivery

- High maternal blood pressure
- Acute infections
- Hard physical work
- Multiple pregnancy
- In many cases the cause is unknown

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- To deal with the influence of prematurity, a World Health Organization (WHO) Expert Committee proposed the term "IUGR-LBW" "IUGR-LBW" : refers to infants born at term (>37 weeks of gestation) with LBW (<2,500 g)
- IUGR is a condition whereby birth weight is below the 10th percentile of the international 'birth weight for gestational age' curve,
- In developing countries, the majority of LBW infants are small but are not born prematurely.

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- Because of undernutrition of the mother before pregnancy, and during pregnancy ,the prevalence of LBW is higher in Asia than elsewhere
- About 60% of women in South Asia and 40% in South-East Asia are underweight (<45 kg), 40% of them are thin, with BMI <18.5, and more than 15% are stunted (<145 cm)
- Stunting which starts *in utero* becomes worse if the diet or health status is inadequate during postnatal development

Wasting or Stunting in utero

- The foetus undergoes its maximum increase in length at 20-30 weeks of gestation, and in weight during the third trimester.
- Therefore, the timing of undernutrition in utero has different effects on weight and length
- Stunted (also called symmetrically or proportionately growth-retarded) infants have a normal ponderal index (PI) (defined as weight/length^3) but their weight, length, head and abdominal circumferences are below the 10th percentile of reference values.

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- Wasted (asymmetrically or disproportionately growth retarded) infants have a relatively normal length and head circumference, but their body weights and PIs are low due to lack of fat, and sometimes of lean tissue
- Wasting is thought to result from undernutrition that occurs late in pregnancy, when fat deposition is most rapid
- Only 1% of foetal body weight is fat at 26 weeks compared to 12% at 38 weeks.

Prevalence of IUGR

- In developing countries, it affects more than 11% of all births
- Rates of IUGR-LBW can be categorized
- as percentages of all births, as follows:
 - Low (<5%),
 - Moderate (5-10%),
 - High (10-15%) and
 - Very high (>15%)
- The highest incidences of LBW and IUGR are found in South and Central Asia ;28% and 33% respectively

Causes of LBW

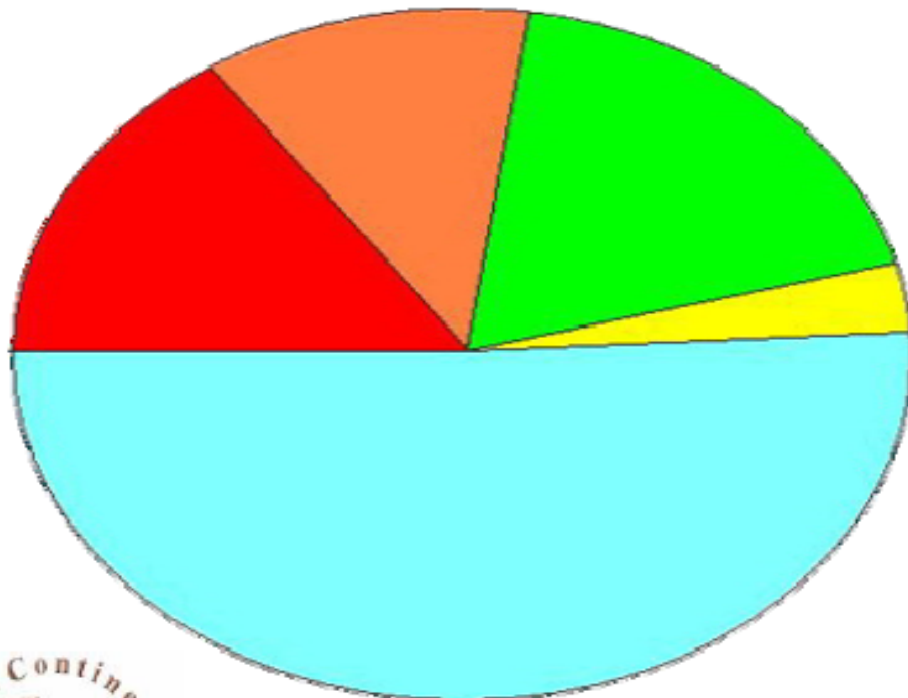
Developing Countries

- Maternal Under nutrition
- " 50% of all IUGR in rural areas of developing countries is attributable to small maternal size at conception (low weight and short stature), and low gestational weight gain
- Malaria in endemic areas
- Other types of maternal infections that can cause loss of appetite, higher nutrient losses or requirements, abnormal placental blood flow or structure, or foetal infections

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Determinants of intra-uterine growth retardation (IUGR)



- Low pre-pregnancy weight
- Short stature
- Low caloric intake
- Maternal low birth weight
- Non nutritional factors

Developed countries

- The majority of LBW is caused by premature delivery, Cigarette smoking during pregnancy followed by low gestational weight gain and low BMI at conception
- Deficiencies of some micronutrients, such as folic acid, increase the risk of preterm delivery

Consequences of Low Birth Weight

Increased Mortality and Morbidity

- Stunted infants have a higher neonatal mortality and morbidity than wasted.
- Wasted infants demonstrate more postpartum weight catch-up, whereas stunted infants tend not to catch up to the reference growth norms
- Infants who weigh 2,000-2,499 g at birth have a ten-fold higher risk than those weighing 3,000 - 3,499 g
- The more severe the growth restriction within the LBW category, the higher the risk of death

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- However, being born small because of preterm delivery is a stronger risk factor for peri-natal mortality.
- Being born preterm, as well as having LBW carries the strongest risk of mortality
- IUGR and LBW infants are more susceptible to hypoglycemia and to birth asphyxia

Greater Risk of Stunting

- Most studies illustrate that the size and nutritional status of pregnant women are more important than postnatal factors for growth of a child
- A review of 12 studies that provided data on the subsequent growth of IUGR infants (preterm infants excluded) revealed that they underwent partial catch-up growth during their first two years of life.

Poor Neurodevelopmental Outcomes

- LBW infants are more likely to experience developmental deficits.
- Under nutrition that affects head circumference before 26 weeks of pregnancy has a greater impact on neurological function than does under nutrition later in pregnancy
- A study of the association between IUGR and cognitive development and behavior in the first six years of life concluded that deficits in performance of the IUGR group began to appear between 1 and 2 years of age

Reduced Strength and Work Capacity

- In the Guatemala longitudinal study, males and females at an average of 15 years of age, who were born IUGR, performed significantly more poorly on tests of strength, compared to those born weighing at least 2,500 g.
- IUGR has a serious adverse impact on later work productivity and income generating potential

Increased Risk of Chronic Diseases

- The consequences of LBW probably continue throughout life
- The risk of diseases such as hypertension, coronary heart disease, stroke and type-2 diabetes (together called "syndrome X"), are associated with size, wasting and
- stunting at birth Theories to explain the link:
 - “Barker’s theory
 - Malnutrition at the *critical periods* of intra uterine life
 - “Thrifty genotype” hypothesis
 - The concept of *'foetal programming'*

Child Growth

- *“The child is the father of the man”*
- [William Wordsworth (1770–1850)]
- ***“The child is the mother of the woman”***
- Growth is a very good indicator of child well being
- Anthropometry is the most useful tool for assessing the nutrition status/growth
- Nutritional status is then compared with a reference/standard

What are the optimum conditions for child growth?

- Sound nutritional practices (young child feeding)
- Full implementation of global/ national IYCF strategies
- Vaccinations and good health care
- Pregnant mothers should refrain from using tobacco

WHO Global Infant Feeding Recommendations, 2002

- Start BF early (<1hr after birth)
- Exclusive breast feeding for 6 months
- Start complementary feeding at 6 months with continued breast feeding to =»2 yrs
- Provide appropriate complementary feeding
- Timely
- Adequate
- Safe
- Properly fed

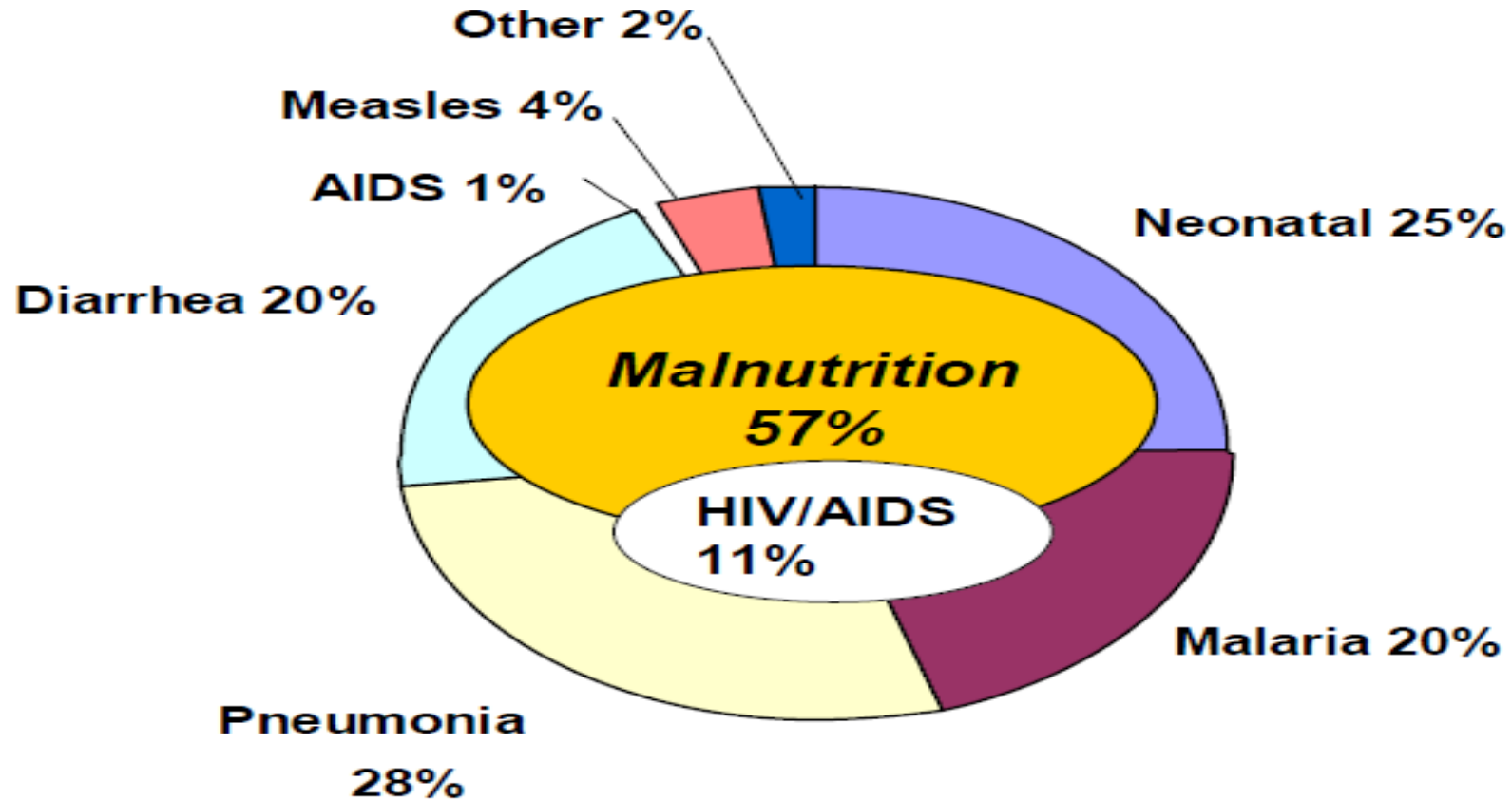
Causes of Poor Growth in a Child

- The most common immediate causes of poor growth of humans in developing countries include:
- Poor maternal nutrition status at conception and undernutrition *in utero*;
- Inadequate breastfeeding;
- Delayed complementary feeding,
- Inadequate quality or quantity of complementary feeding;
- Impaired absorption of nutrients due to intestinal infections or parasites; or
- combinations of these problems

Consequences of Poor Growth

- **Increased mortality**
- In developing countries about 45 to 65% of child deaths are due to mild to severe malnutrition 54% of deaths of children under 5 years in developing countries were accompanied by low WFA

Causes of under-5 deaths in Ethiopia



Increases morbidity in children

- 20 to 25% of the global burden of disease in children
- Stunted growth (restricted growth for a stunted child at the age of 3 years)
- The short stature of adults in developing countries is largely the result of poor growth during the first three years of life
- Supplementation in **early childhood** improved the stature, fat-free mass and work capacity of adolescents and young adults

Associated with poor cognitive and motor development

- The earlier that children became stunted, the more the severe their stunting, and the greater their impairment in later cognitive ability
- Psychosocial stimulation, in addition to supplementation, can improve the development quotient of young children, with the maximal effect obtained by a combination of both.

Adolescent growth

- Second highest rate of growth attained, second to the first year of life
- More than 20% of total growth in stature and up to 50% of adult bone mass are achieved
- Nutrient requirements are significantly increased above those in the childhood years
- Among girls, the "growth spurt" or peak growth velocity occurs normally about 12-18 months before menarche at some time between 10 to 14 years.

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- Growth in stature continues, however, for up to 7 years after menarche
- Maximal adult height in women may thus be attained as early as 16 years or, particularly for populations with high rates of undernutrition, as late as 23 years
- The development of the birth canal is not fully completed until about 2-3 years after growth on height has ceased ;whereas peak bone mass is not achieved until the age of 25 years
- The adult height finally attained may still differ as a result of pre-existing childhood stunting

Interventions in the life cycle

Why a Life-cycle Approach?

- Maximum benefits in one age group come from investments in an earlier age group (there is a cumulative effect in the next generation)
- Health and nutrition programs implemented well before women become pregnant, and within a life-cycle perspective, have long term impacts on succeeding generations.
- Nutritional status is an intergenerational continuum.

Short-term and long-term effects of early nutrition

