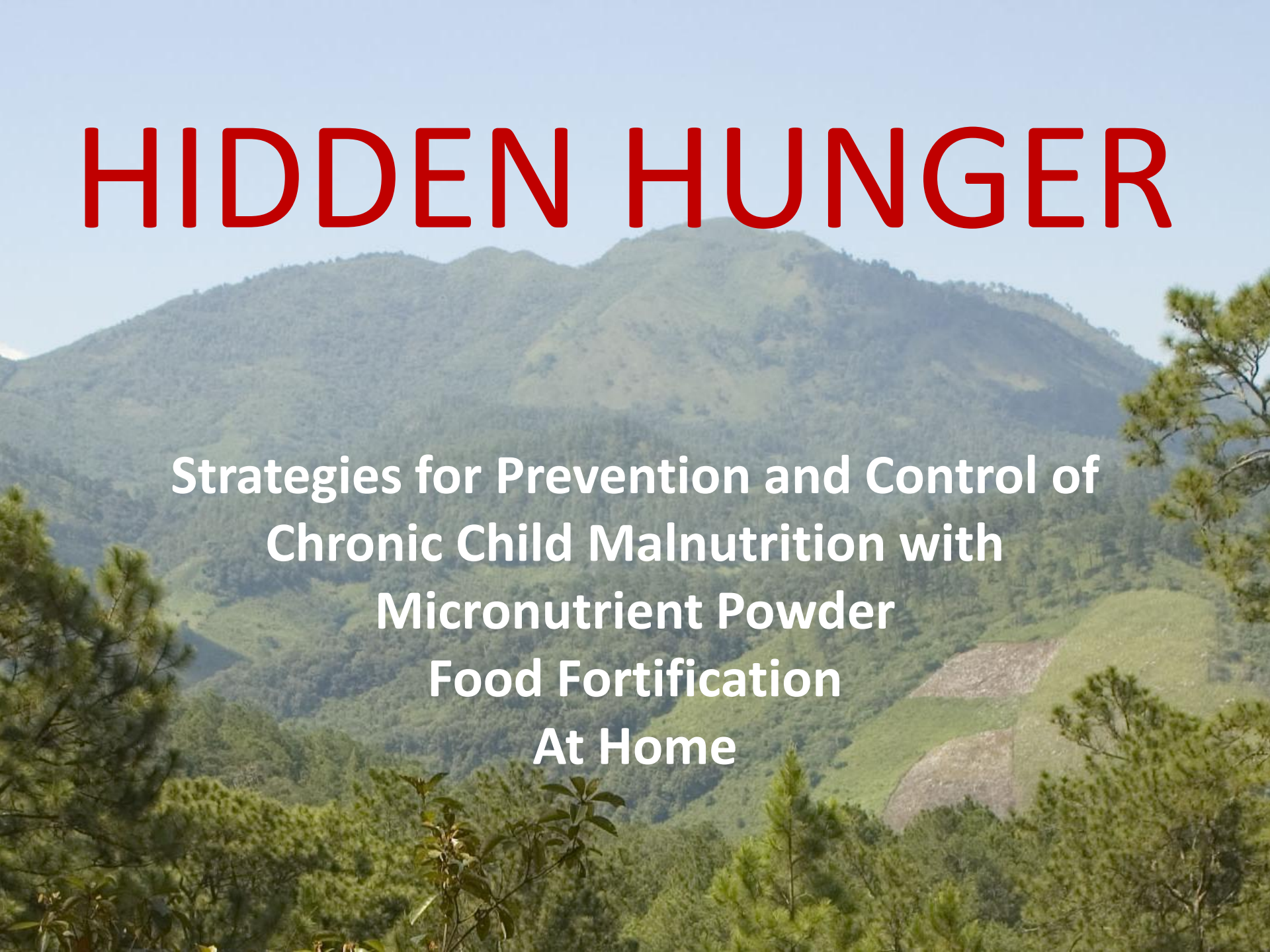
HIDDEN HUNGER



Strategies for Prevention and Control of Chronic Child Malnutrition with Micronutrient Powder Food Fortification At Home


THERE IS TROUBLE IN PARADISE
EVEN IN SUCH BEAUTIFUL PLACES


HUNGER IS HIDING


THE PROBLEM of HIDDEN HUNGER:
Children living with chronic malnutrition may be in serious danger, even when they appear normal


THE PROBLEM of
HIDDEN HUNGER:
Not just
QUANTITY,
but
QUALITY
or
NUTRITIONAL
VALUE
of food


In many developing countries, the majority of children SUFFER HIDDEN HUNGER

HIDDEN HUNGER:

- Causes most deaths in children under age 5
- Causes many illnesses and most mental retardation
- 100% curable
- 100%preventable

WHAT IS HIDDEN HUNGER?

WHO HAS HIDDEN HUNGER?

WHY IS IT HIDING?

HOW DO WE FIND IT?

WHAT CAN WE DO ABOUT IT?

Q: WHAT IS HIDDEN HUNGER?

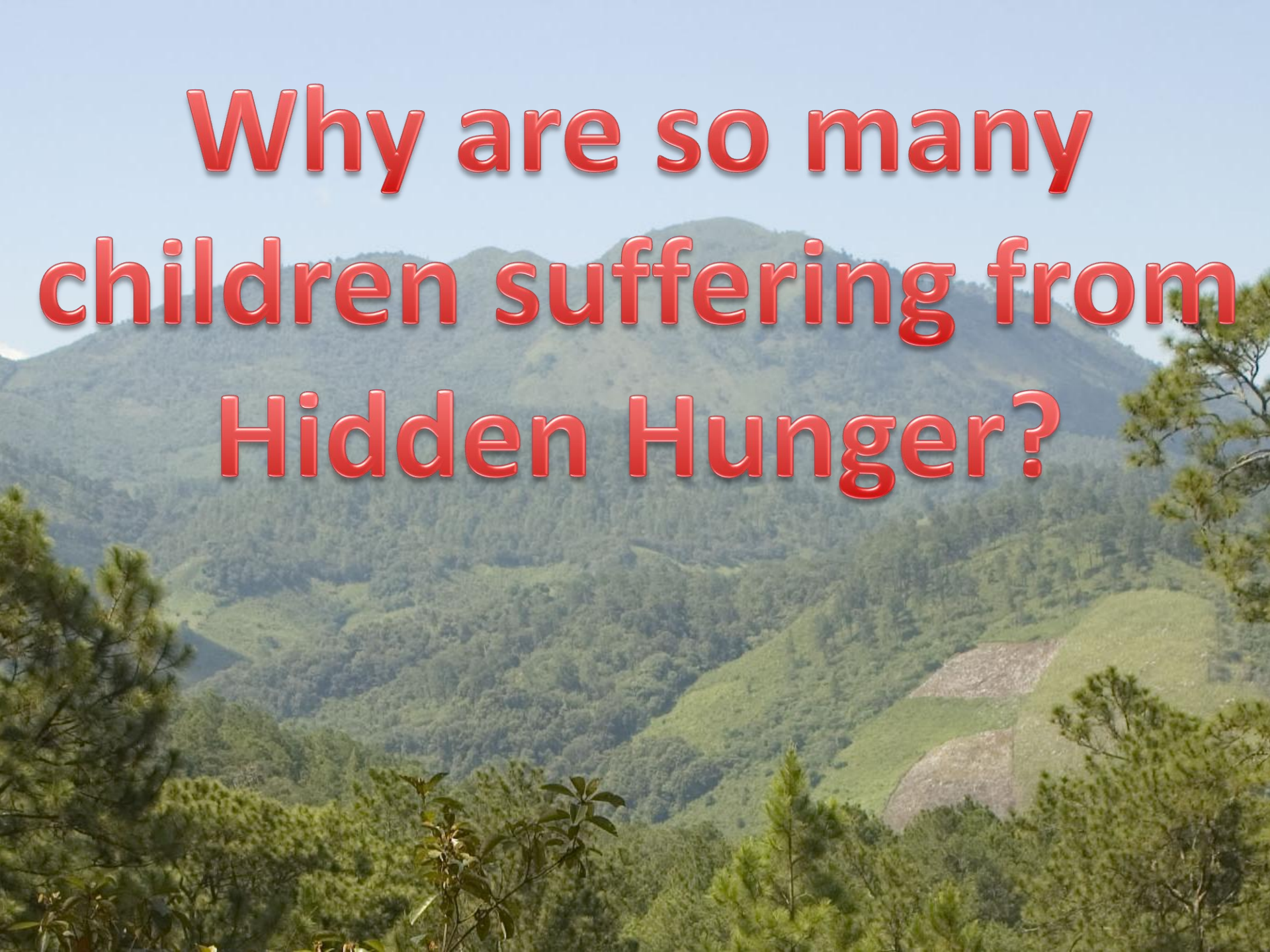
A: Vitamin and mineral deficiency

Q: WHO HAS HIDDEN HUNGER?

A: TWO BILLION PEOPLE!

But every child suffering is an individual person, with a family and a community

And every child has a face….


Why are so many children suffering from Hidden Hunger?


Infertile soil

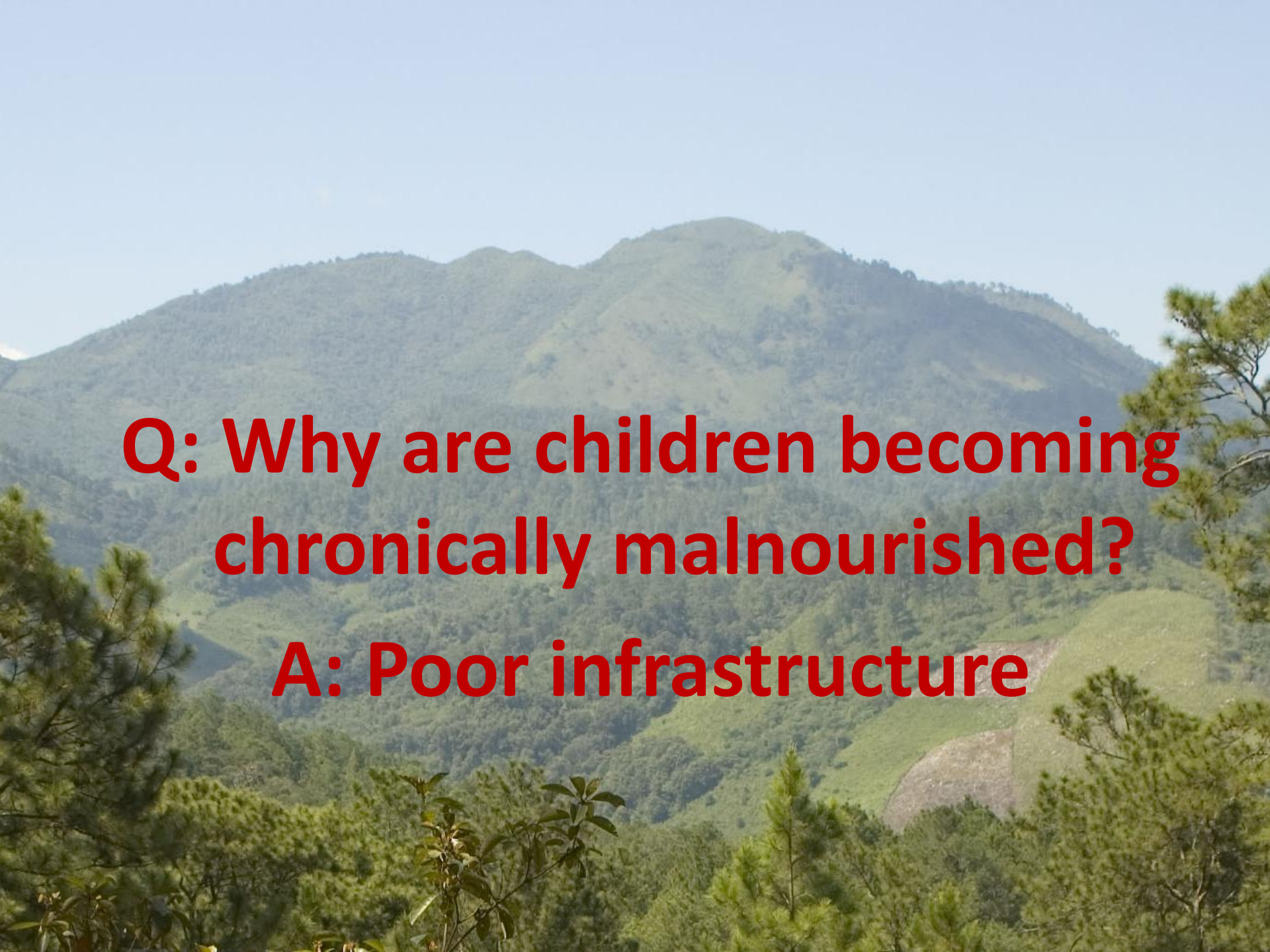

Why are children becoming chronically malnourished?

What has gone wrong?

Environment:

- Adverse farming conditions, poor rainfall
- Soil is depleted of micronutrients, and people are eating nutrient-poor food grown in the vicinity of their homes

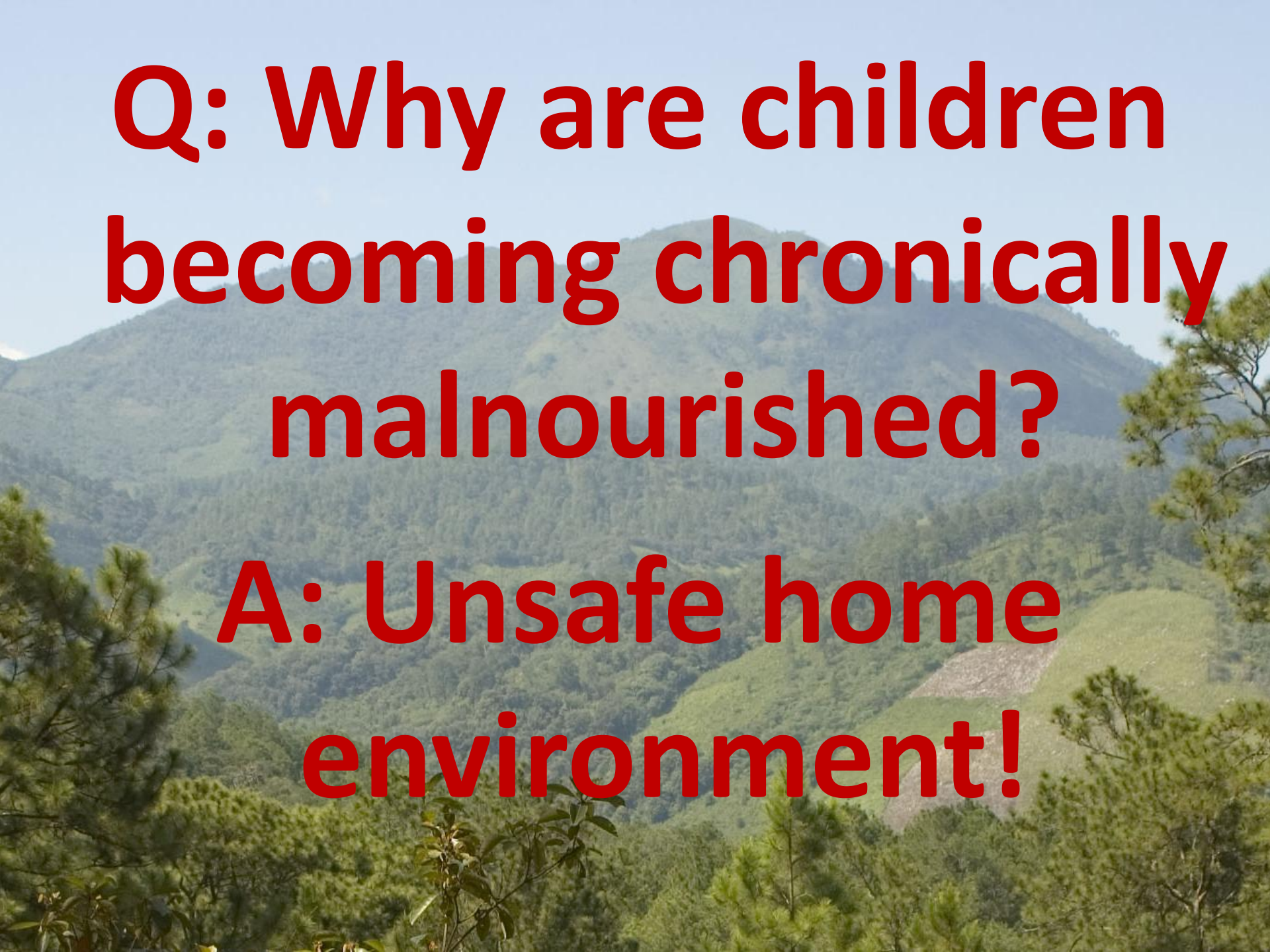

Lack of Infrastructure


Q: Why are children becoming chronically malnourished?
A: Poor infrastructure

Poor infrastructure:

Lack of clean water and sanitation leads to:

- Recurrent illnesses with viruses, bacteria, intestinal parasites, malaria when immune system is weakened by malnutrition
- Frequent diarrhea causes direct loss of nutrients, and small bowel bacterial overgrowth causes Malabsorption of nutrients


Q: Why are children becoming chronically malnourished?
A: Unsafe home environment!


Unsafe homes

Unsafe home environment:

- Pollution causing “Oxidative stress” (“burning”) by toxins such as agricultural chemicals, cooking smoke, and fungal toxins in food
- Not enough anti-oxidant vitamins and minerals in diet to counteract the oxidizing effect of the pollutants

Q: What is happening on a global scale that is impacting the lives of children suffering from hidden hunger?

A: International socio-economic and political forces deprive families of access to their very basic needs.

Q: What is the impact of deprivation on the lives of children?

A: Lack of education, housing, medical care and food takes a tremendous toll- and may rob them of a chance to survive


MALNUTRITION
leaves children defenseless!


MALNUTRITION CAUSES: Poor barriers or linings of skin and all internal organs so pathogens (viruses, bacteria, parasites) can enter the body easily!

MALNUTRITION CAUSES: Poor immunity to fight off infection that has penetrated the child's defenses


MALNUTRITION CAUSES: Poor healing and recovery from illnesses and damage

- **HIDDEN HUNGER CAUSES**

  <u>NUTRITIONAL</u> ACQUIRED IMMUNE DEFICIENCY SYNDROME

- **<u>NUTRITIONAL AIDS</u> HAS HUMORAL AND CELLULAR IMMUNO-DEFICIENCY**

SIMILAR TO HIV/AIDS !

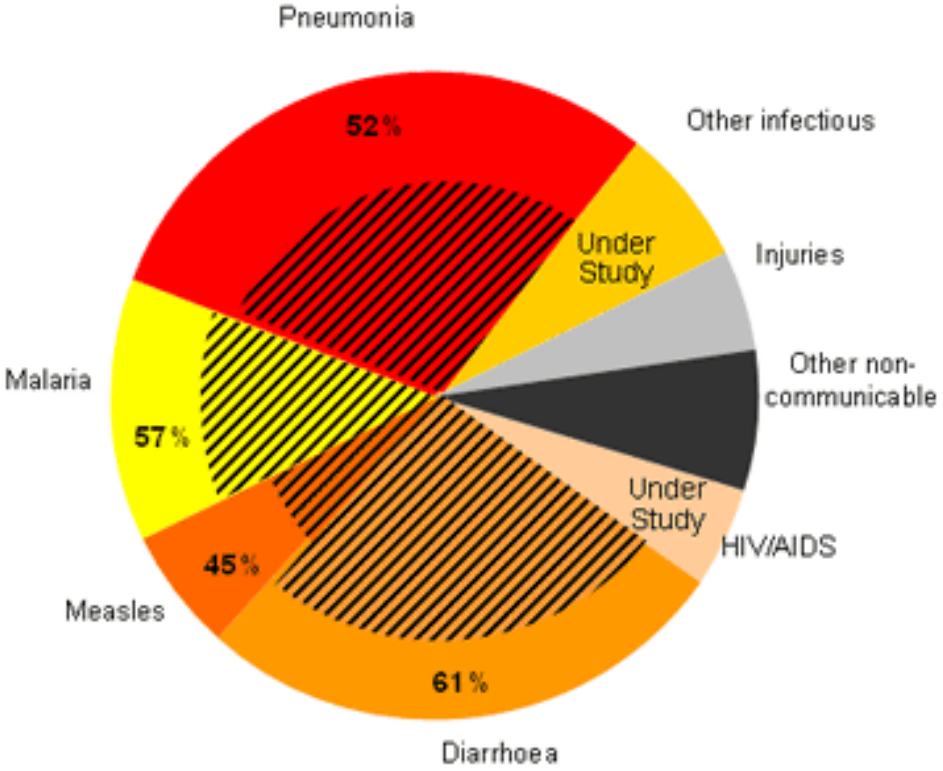
- **<u>NUTRITIONAL AIDS</u> KILLS MORE PEOPLE THAN HIV/AIDS**

Noma
is a dramatic example of a life-threatening disease that illustrates the synergy of poor barriers, poor immunity and poor healing.

Nutritional Blindness due to Vitamin A deficiency is an example of the danger of malnutrition.

Source:
Child deaths:
Causes and epidemiological dimensions (Yearly average for 2000-2003)
Robert E. Black, M.D., M.P.H.
Johns Hopkins Bloomberg School of Public Health

Deaths among children aged 28 days to five years
(≅ 6.6 million/year)

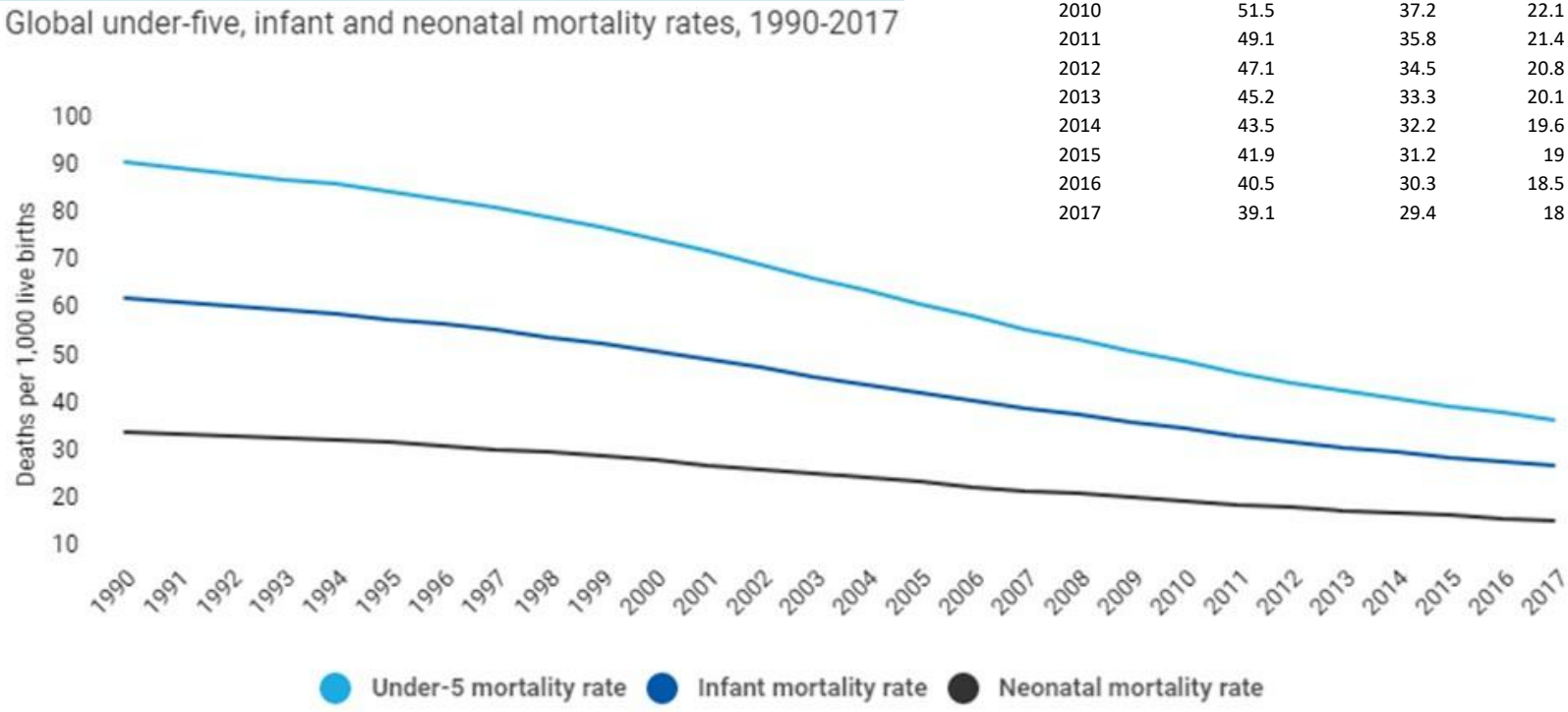


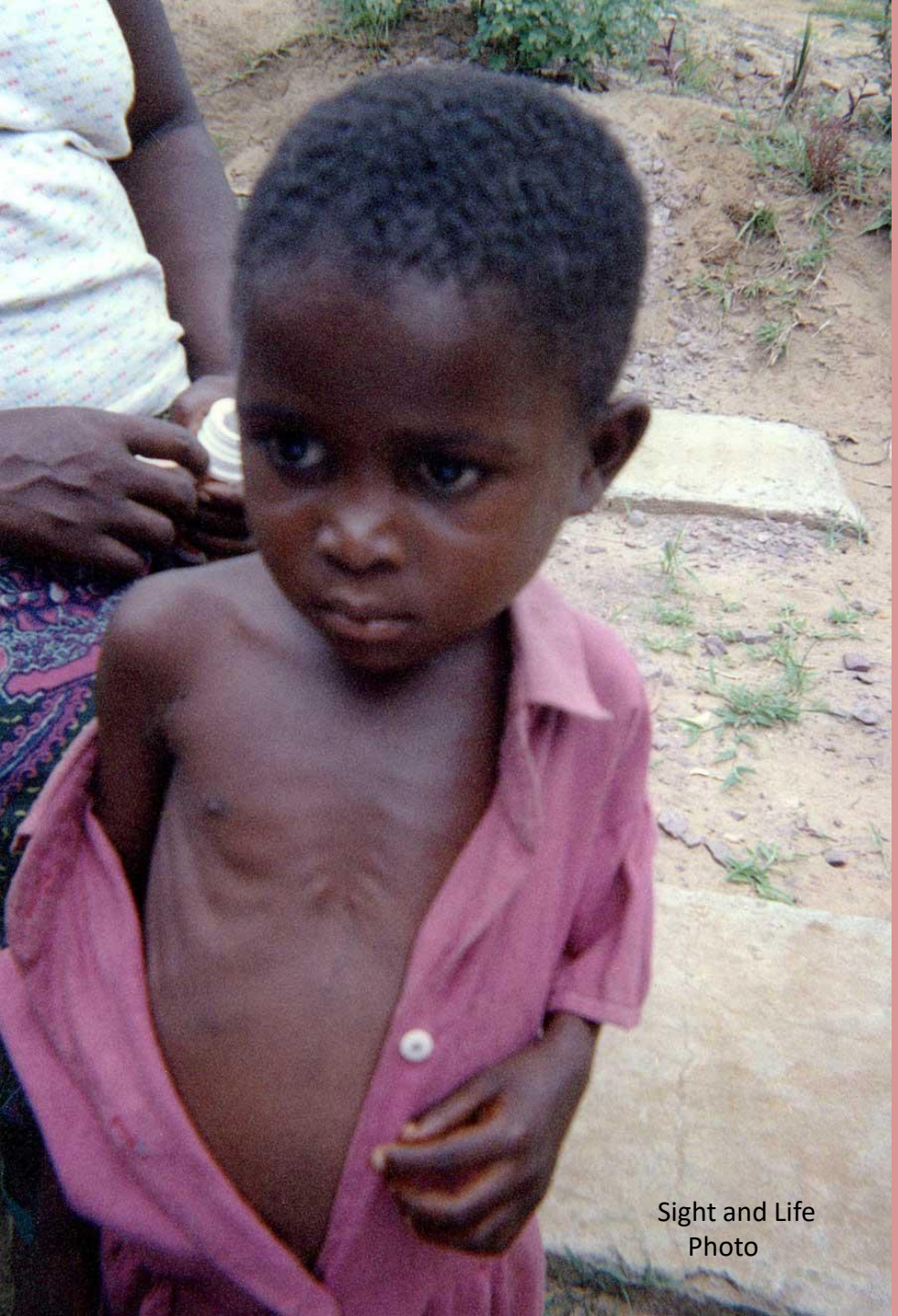
The shaded area shows the % of deaths from this infection that are due to the presence of undernutrition

As you can see, under-5 child deaths have dropped dramatically over the past 17 years. But in 2017, over 15,000 children still died every single day due to malnutrition and other conditions that are completely preventable. (source: UN inter-agency group for child mortality estimation, 2018)

For context, in the U.S., the median estimate is 6.6 children died per 1000 in 2017. The global average is 39.1. In places of scarce resource, the number is much higher. Somalia had 127.2 child deaths per 1000 in 2017. (source: UNICEF October, 2018 child mortality data)

	Under-5 mortality rate	Infant mortality rate	Neonatal mortality rate
1990	93.2	64.7	36.6
1991	92	63.8	36.2
1992	90.8	63	35.8
1993	89.6	62.2	35.3
1994	88.6	61.3	34.8
1995	87.1	60.3	34.3
1996	85.4	59.2	33.7
1997	83.7	58	33
1998	81.8	56.6	32.3
1999	79.5	55.1	31.5
2000	77.1	53.6	30.6
2001	74.5	51.9	29.7
2002	71.7	50.1	28.8
2003	69	48.3	27.8
2004	66.5	46.6	26.9
2005	63.5	44.9	26
2006	60.9	43.2	25.1
2007	58.3	41.6	24.3
2008	56	40.1	23.6
2009	53.5	38.6	22.8
2010	51.5	37.2	22.1
2011	49.1	35.8	21.4
2012	47.1	34.5	20.8
2013	45.2	33.3	20.1
2014	43.5	32.2	19.6
2015	41.9	31.2	19
2016	40.5	30.3	18.5
2017	39.1	29.4	18





ACUTE MALNUTRITION

- Not Hidden
- Easy to recognize
- Only accounts for 17% of the deaths from malnutrition

CHRONIC MALNUTRITION

- Hidden
- Hard to recognize
- Accounts for 83% of the deaths from malnutrition

There is a great urgency to start attending to children even before birth


If children are denied robust intake of micronutrients in their early childhood, they will not achieve their genetic potential.


The first 1000 days after conception are most critical


But attention to the nutrition
of all children is urgent-


How do we find children at risk for Hidden Hunger?

STUNTING OF GROWTH IS A MARKER FOR IMPAIRED:
IMMUNE FUNCTION, METABOLISM, INTELLECTUAL DEVELOPMENT,
TISSUE INTEGRITY & HEALING

Failure to grow in height indicates high mortality risk

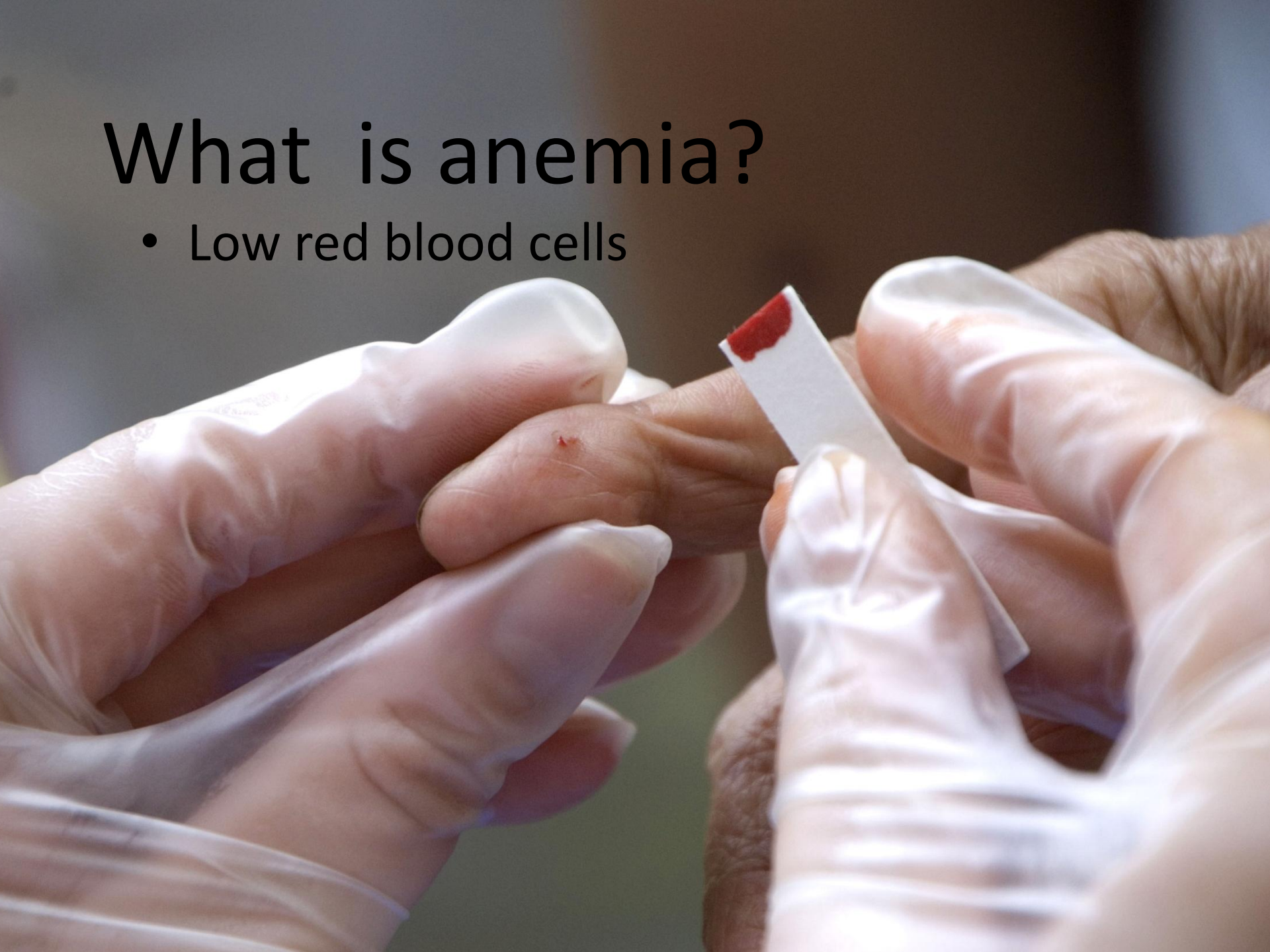
Anemia

Another marker of chronic malnutrition

- Marker for all neglected tropical diseases- Parasites, Malaria
- Major risk factor in maternal mortality

What is anemia?

- Low red blood cells



Why do children become anemic?

- Diet
- Parasites
- Illnesses that cause loss or blood
- Inflammation that causes lack of blood production (“anemia of chronic disease”)

How can we find anemia?

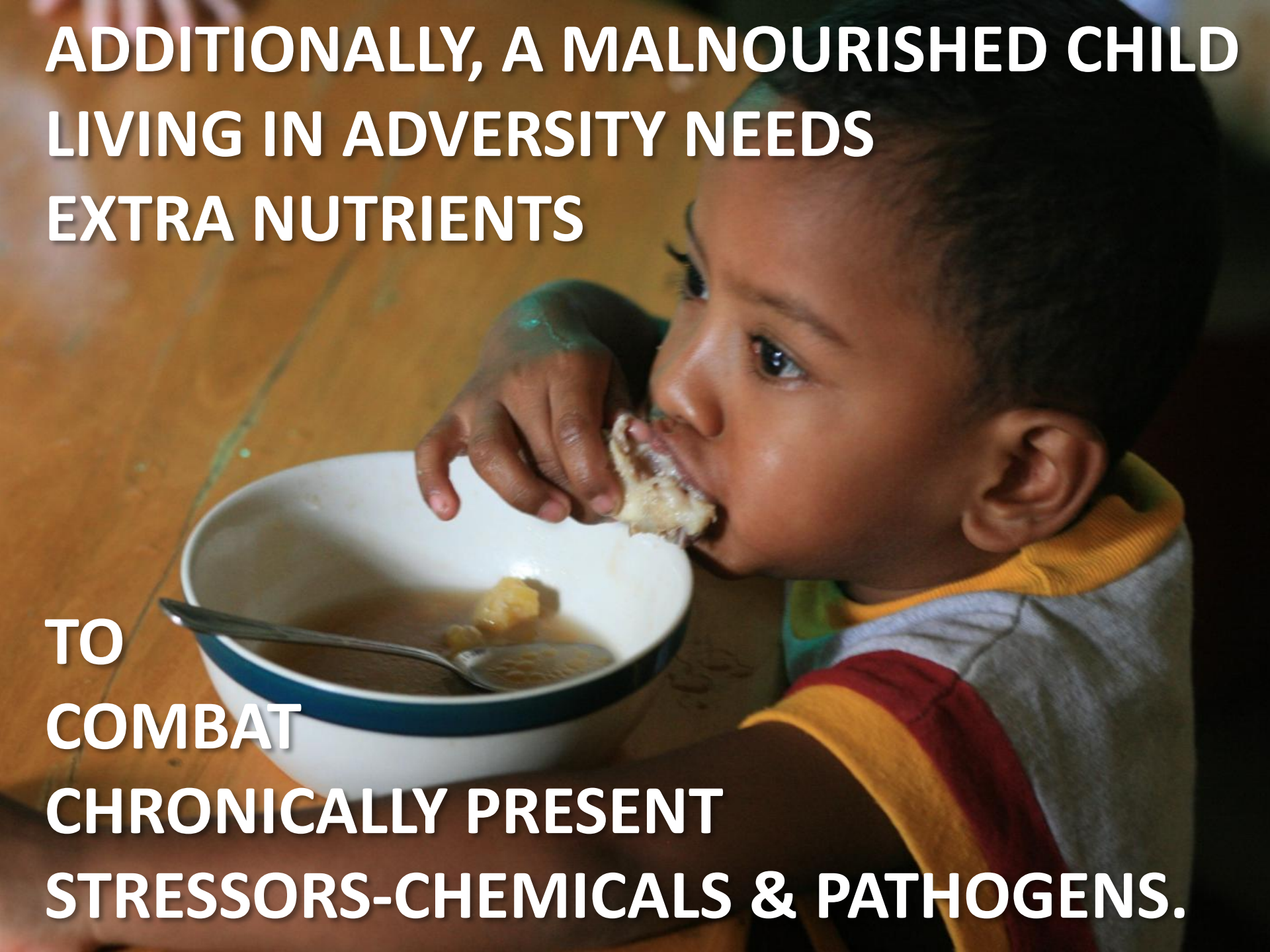
- Hemoglobin Color Scale
- Important tool for rapid assessment and monitoring communities and individuals

WHAT CAN WE DO ABOUT IT?


MALNOURISHED CHILDREN
MUST CONSUME ALL
40 NECESSARY
NUTRIENTS
IN
HIGHER
THAN NORMAL
QUANTITIES!


There are reasons that children living in adverse environments need a MORE ROBUST nutrient intake than do children living in safe places.


FIRST, ALL CHILDREN NEED BASIC
NORMAL MAINTAINENCE
LEVELS OF
NUTRITION
FOR THEIR
AGE
NO
MATTER
WHETHER
THEIR ENVIRONMENT IS SAFE OR NOT.


ADDITIONALLY, A MALNOURISHED CHILD
LIVING IN ADVERSITY NEEDS
EXTRA NUTRIENTS
TO
COMBAT
CHRONICALLY PRESENT
STRESSORS-CHEMICALS & PATHOGENS.


MALNOURISHED CHILDREN HAVE MORE ILLNESSES DURING WHICH THEY ENTER A CATABOLIC OR TISSUE WASTING STATE.
EXTRA NUTRIENTS ARE NEEDED FOR HEALING AND REBUILDING.


FOR CATCH UP GROWTH,
STUNTED CHILDREN
NEED EXTRA
NUTRIENTS
TO
REPLETE THEIR ACCUMULATED
DEFICIT SINCE CONCEPTION.

The rate of recovery from malnutrition depends on availability of nutrients

Energy requirements for recovery are high. Child needs extra calories from carbohydrates and fats, but that is not enough!

If attention is limited to replacing calories, Child will regain lost weight as fat.

Without balanced nutrition, including robust micronutrients, child will not catch up in linear growth, replenishment of lost tissues or restoration of immune function

MICRONUTRIENTS

Don't be fooled by their minute quantities!

- They are very important for the maintenance of homeostasis - meaning "well balanced organism“.
- Some of these trace elements are co-factors of critical enzymes in the body - meaning that without them, the enzyme cannot work at all and that even low concentrations of them can make the enzyme work very well.

MICRONUTRIENTES ESENCIALES

Los micronutrientes, ¿cómo impactan la vida?

	Inmuno deficiencia Mas vulnerables a enfermedades y muerte por serias infecciones – neumonia, VIH, TB, sarampión, malaria y SIDA Nutricional	Anemia nutricional	Enfermedades neurológicas, mentales o retardo	Hemorragias	Poco desarrollo Lenta curación y pobres tejidos	Ceguera nutricional	Noma Tejidos orales, inmunidad	Malformaciones	Beriberi	Pelagra	Huesos débiles Osteoporosis	Enfermedades de la tiroides Hipotiroidismo	Escorbuto
A: Retinol	◆	◆			◆	◆	◆	◆					
B1: Tiamina		◆					◆	◆	◆				
B2: Riboflavina	◆	◆			◆		◆	◆		◆			
B3: Niacina	◆	◆	◆				◆	◆		◆			
B5: Ácido Pentotenico		◆	◆										
B6: Piridoxina		◆						◆		◆			
B9: Ácido Fólico	◆	◆					◆	◆					
B12: Cianocobalamina		◆	◆	◆	◆		◆	◆					
C: Ácido Ascórbico	◆			◆	◆		◆	◆					◆
D3: Calciferol	◆			◆	◆		◆				◆		
E: Tocoferol	◆	◆	◆		◆								
H: Biotina								◆					
K: Filoquinona				◆	◆		◆				◆		
Hierro	◆	◆	◆					◆		◆			
Yodo			◆		◆			◆				◆	
Selenio	◆	◆			◆		◆					◆	
Cobre		◆						◆		◆	◆	◆	
Zinc	◆	◆	◆		◆	◆	◆						

Enfermedades causadas por la deficiencia de más de un micronutriente, son mejor prevenidas y tratadas al restablecer todos los nutrientes necesarios.

Otros micronutrientes que no se asocian generalmente con una deficiencia específica incluyen tres minerales esenciales: **Cromo** que está implicado en el metabolismo; **Manganeso** que desempeña un papel en la cicatrización de heridas, el cartílago y el desarrollo de los huesos, actúa como un antioxidante y activa las enzimas importantes; **Molibdeno** que es involucrado en muchas vías enzimáticas.

 www.MAMAProject.org MAMA Proyect Inc. en Honduras

Food Fortification with Micronutrients has made populations healthier in developed countries.

However, communities combating chronic malnutrition often lack access to fortified foods.


MANY FAMILIES MAY NEVER
HAVE ENOUGH ACCESS TO HIGHLY
NUTRITIOUS FOODS


There will never be enough nutrition centers or programs for all of the malnourished children

So, what can be done to make a difference NOW?


In order to combat malnutrition, we must have a feasible community based approach

The strategy of home food fortification can bring the benefits of nutrition science to those who most need it, and it can be implemented in the community.


It is especially valuable for families to increase food production in their communities. Eggs are an ideal food for fortification.


EGGS ARE THE MOST COMPLETE READY TO EAT THERAPEUTIC FOOD ON EARTH!


EGGS CONTAIN ALL OF THE
ESSENTIAL NUTRIENTS

Phytic Acid

- Grain based diets(e.g.: corn, beans) low in many essential nutrients
- PHYTIC ACID or “PLANT ACID” is anti-nutrient!
- Binds zinc, calcium, iron, phosphorous, magnesium, and protein
- Increases malnutrition
- Soaking, fermenting and germinating helps
- Research topic
- All of the nutrients that are endangered by PHYTIC ACID, are found in eggs,
- This is another reason for HOME FOOD FORTIFICATION

Iron

- Deficiency: Anemia and learning impairment
- ALONE WILL NOT CORRECT anemia in a many malnourished children
- Better: balanced HEMATINIC micronutrients - folate, cobalamin, riboflavin, pyridoxine, Vitamin C, Vitamin E, and copper
- High dose iron alone may be toxic to severely malnourished child
- Adding iron to food just before serving (Home Fortification) prevents iron from altering color and shelf life of food by chemical reaction
- Can “feed” malaria, so prevent and treat first

Copper

- Deficiency very common especially in the Andes
- Deficiency causes: anemia, diarrhea osteoporosis
- Important to supplement, especially since zinc (which is life-saving) can lower absorption of copper!
- Better, like iron, to mix with food just before eating (chemical reaction lowers other nutrients shelf life)
- When environment is contaminated by excess molybdenum, copper deficiency can occur- making supplement even more important

Selenium

- SOIL dependent levels in plants and animals
- Africa, and China but also wet tropics, Caribbean and Central America
- With iodine deficiency and causes larger goiters
- White muscle disease, Kashin-Beck (cartilage), Keshan (heart disease due to increased pathogenicity of coxsackievirus)
- May prevent viral mutations to more virulent strains!!! –Public health concern
- Important protection against oxidative stress of toxin exposure, infections and critical in survival of Kwashiorkor patients
- US grains, especially corn are sometimes deficient in Selenium – (Donated food for aid may be selenium deficient; example of why fortification of foods used in feeding programs is essential)

Iodine

- Widespread deficiency
- Salt iodinization controls
- Cretinism-Growth impairment/Mental retardation
- Goiter
- Hypothyroidism

Thiamine-B1

Adults - Cardiovascular and Nervous system, including Wernicke / Korsakoff (especially with alcoholism)

Children – Heart failure, vocal paralysis, marasmus, vomiting, diarrhea, convulsions, pallor, irritability

Associated with white rice, raw fish, and Betel nuts, bacteria in food, chlorine

Cooking destroys up to 60%

Riboflavin-B2

- Meat, milk and green leafy vegetables
- Deficiency is common - 80 % of normal Jamaican children
- Anemia- children low in Riboflavin will not recover with iron supplements
- Malabsorption worsens malnutrition

Niacin-B3

- Corn/Maize based diet (Including food aid Corn/Soy Blends)
- Diarrhea, cerebral dysfunction (dementia), and pellagra-phototoxic rash
- Soaking corn in lime (cal) as is done Central America, but not in Africa helps prevent deficiency
- Lack of dietary NIACIN alone does not cause pellagra without lack of tryptophan (found in milk), pyridoxine, riboflavin, iron and zinc
- Growth may be normal

Pyridoxine-B6

- Deficiency can cause seborrheic dermatitis, anemia, fatty liver, mouth lesions, neuropathy, seizures, and mental changes-MAY NOT BE RECOGNIZED
- Low levels of pyridoxine can affect behavior of both mother and child, and may impair success of programs aimed at improving care of children!
- Mother who is pyridoxine may not be as attentive to her children.
- Not very bio-available from grains, or beans
- Even low in BREAST MILK in poor communities

Cobalamin-B12

- Not found in plants-So Absent in a vegetarian diet
- Synthesized in GI tract –efficiently in ruminants-Cows, goats
- Low in Breast milk in Guatemalan women
- Anemia
- Absorption affected by stomach and bowel disease
- If a person is B12 deficient, and gets very high dose folic acid without B12, they may develop severe IRREVERSIBLE spinal cord damage or dementia, even without anemia
- Public Health program in countries with risk of B12 deficiency should give B12 along with folic acid

Folic Acid-B9

- Deficiency is common cause of neural tube defects
- Bioavailability requires a good levels of iron, Vitamin C, and zinc
- The zinc dependent enzyme in intestine is inhibited by beans corn, and bananas (!!!)
- Lost in sunlight and cooking, but levels are higher with good levels of iron, zinc and Vitamin C

Ascorbic acid (Vitamin C)

- Fresh fruits and green vegetables
- Enhances iron absorption
- Antioxidant important in polluted environment and smoke exposure
- Destroyed by prolonged storage of harvest
- Scurvy gums and scorbutic rosary

Vitamin E

- Fat soluble antioxidant protecting cell membranes, brain, essential fatty acids and immune system
- Works with Selenium to combat viral illness
- Relatively low in breast milk
- Whenever measured in malnourished children is found to be low- associated with low fat diet

Retinol-Vitamin A

Deficiency is a major component of “Hidden Hunger” causing:

- Blindness
- Mucosal surface dysfunction and loss of integrity
- Poor immune system-Nutritional AIDS
- Failure to grow
- Mortality

Dosages have been studied and safety of mega-dosage when used correctly is well-established

Capsules distribution programs around the world now well accepted as part of child survival strategies

Vitamin D

- Most deficiency is seen in hot dry dusty climates. Atmospheric dust can block suns rays
- Rickets with swelling of joints, rosary in chest, and bowed legs
- Can occur in breast-fed children
- Cultural practice may keep sick children indoors, and mothers may be covered when outside
- Immune system &cardiovascular health becoming recognized.
- Well-known role in bone strength

Biotin-B7 (Vitamin H)

- Uncooked egg white can bind biotin
- Infants with deficiency have lack of facial fat, skin rashes, flat affect, withdrawn social behavior- looking like severe zinc deficiency and kwashiorkor
- Severe hair loss as is often seen in malnourished

Does Biotin deficiency contribute to the clinical picture of malnutrition more than previously recognized?

Recommendations vary widely, but even high levels are not toxic in any way

Pantothenic Acid-B5

- Afghanistan refugees relying on donated refined non-fortified wheat flour developed deficiency with painful neuropathy
- Recommended for fortified food programs for “safety”

Manganese, chromium, molybdenum and fluorine

- Manganese-deficiency noted in epilepsy; associated with anemia, skin lesions-Significance?
- Chromium-Carbohydrate metabolism
- Molybdenum-Cofactor for enzymes involved in energy production
- Fluorine role is strong dental enamel- Excessive levels in parts of Africa

Choline

- Deficiency causes neurological dysfunction and fatty liver in animals
- Most diets used to address malnutrition do not contain added choline, and fatty liver may persist in children even during rehabilitation
- Eggs are an excellent source of choline, and can be incorporated into strategies to combat malnutrition


There will never be enough nutrition centers for all of the malnourished children


In order to combat malnutrition, we must have a feasible community based approach

CHILDREN BORN INTO ADVERSITY CAN SURVIVE, THRIVE, AND GROW UP TO BE HAPPY AND PRODUCTIVE MEMBERS OF THEIR FAMILIES AND COMMUNITIES.


Thank you!