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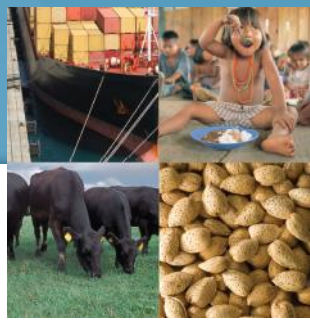

The Double Burden of Malnutrition

What is it and what can we do about it

Rafael Pérez-Escamilla, PhD

Yale School of Public Health

Des Moines, Iowa, October 11, 2016

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Topics

- The double burden of malnutrition (DBM)
- Maternal-child malnutrition cycle
- Conceptual framework for addressing DBM
- Intersectoral strategies

The Double burden of Malnutrition

- **Co-existence of undernutrition and overweight/obesity**
  - Country level
  - Household level
    - Child stunting and maternal obesity
  - Individual level
    - Obese & stunted individuals
  - Strong implications for infectious and non communicable diseases

http://www.cpc.unc.edu/projects/nutrans/whatis

Causes of DBM

- **Infectious diseases-malnutrition cycle**
- **Excessive caloric intake and sedentarism**
  - Urbanization
  - Ultra processed foods
    - Cheap, energy dense, low nutritional value
    - Sugar sweetened beverages
- **Environment-genome interactions**

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Lot's of interest in the DBM!

Introduction to the double burden of undernutrition and excess weight in Latin America[1–3]

Am J Clin Nutr 2014;100(suppl):1613S–6S

Juan A Rivera, Lilia S Pedraza, Reynaldo Martorell, and Angel Gil

"Double Burden of Malnutrition": Reexamining the Coexistence of Undernutrition and Overweight Among Women in India

International Journal of Health Services
0(0) 1–26
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DOI: 10.1177/0020731416664666
joh.sagepub.com
SAGE

Vani S. Kulkarni[1], Veena S. Kulkarni[2], and Raghav Gaiha[3]

RESEARCH ARTICLE

Patterns and Determinants of Double-Burden of Malnutrition among Rural Children: Evidence from China

PLOS ONE | DOI:10.1371/journal.pone.0158119, 2016

Nan Zhang[1]*, Laia Bécares[1,2], Tarani Chandola[1]

The epidemiological transition and the global childhood obesity epidemic

ST Broyles[1], KD Denstel[1], TS Church[1], J-P Chaput[2], M Fogelholm[3], G Hu[1], R Kuriyan[4], A Kurpad[4], EV Lambert[5], C Maher[6], J Maia[7], V Matsudo[8], T Olds[6], V Onywera[9], OL Sarmiento[10], M Standage[11], MS Tremblay[2], C Tudor-Locke[1,12], P Zhao[13] and PT Katzmarzyk[1] for the ISCOLE Research Group

International Journal of Obesity Supplements (2015) **5**, S3–S8

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Key message 1.

- **The world is losing hundred of billions of dollars in annual productivity as a result of the double burden of malnutrition**

Child Mortality Due to Nutritional Disorders

2013 MCN Lancet Series

Nutritional Disorders	Attributable deaths with UN prevalences*	Proportion of total deaths of children younger than 5 years
Fetal growth restriction (<1 month)	817,000	11.8%
Stunting (1-59 months)	1,017,000*	14.7%
Underweight (1-59 months)	999,000*	14.4%
Wasting (1-59 months) Severe Wasting (1-59 months)	875,000* 516,000*	12.6% 7.4%
Zinc deficiency (12-59 months)	116,000	1.7%
Vitamin A deficiency (6-59 months)	157,000	2.3%
Suboptimum breastfeeding (0-23 months)	804,000	11.6%
Joint effects of fetal growth restriction and suboptimum breastfeeding in neonates	1,348,000	19.4%
Joint effects of fetal growth restriction, suboptimum breastfeeding, stunting, wasting, and vitamin A and zinc deficiencies (<5 years)	3,097,000	44.7%

Data are to the nearest thousand. *Prevalence estimates from the UN.

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Non-communicable Diseases (NCDs) The Global Picture

- **Annual cost to global economy of NCDs: Over US$1 trillion**
  - If current trends persist experts forecast $35 trillion in economic output loss from 2005 to 2030 (*Bloom 2013*)
  - Due to diabetes, heart disease, breast cancer, and COPD (*Bloom 2013*)
- **NCD's risk factors include: Tobacco use, obesity, unhealthy diet, physical inactivity, and alcohol**
  - Context: aging of the population and negative effects of urbanization, international trade and marketing
- **Eight out of ten NCDs deaths occur in low- and middle-income countries**
  - 30 % of NCDs deaths in people < 60
  - If current trends continue by 2030 52 million people will die of an NCD annually (*WHO 2011*)

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Key Message 2

- **Almost all low and middle income countries undergoing nutrition transition and corresponding DBM**

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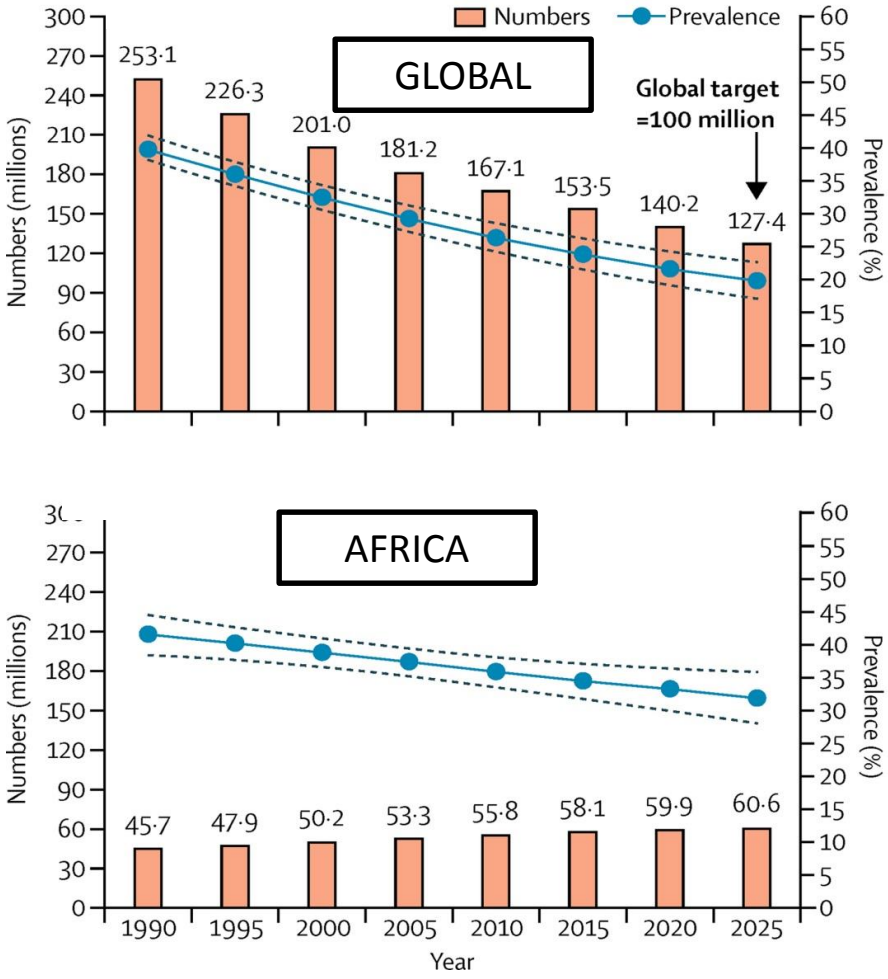
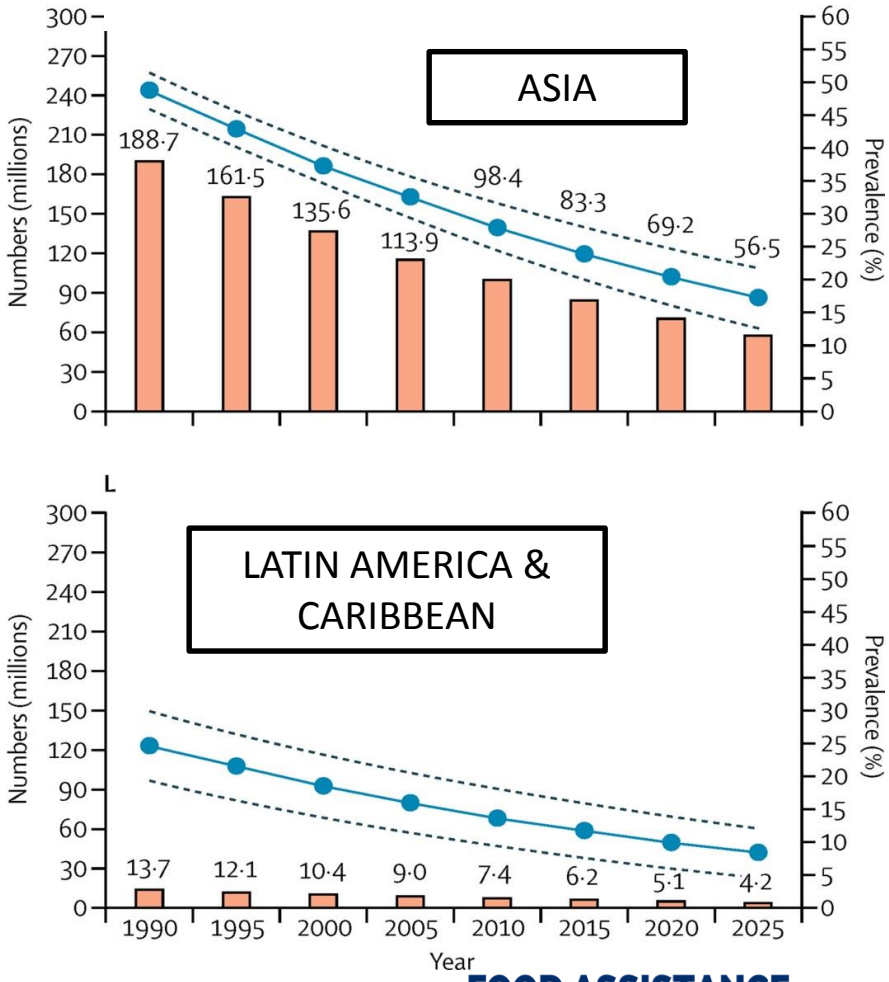
Trends in prevalence and numbers of children with stunted growth (HAZ<-2) , by selected UN regions and globally, 1990–2010, and projected to 2025





2013 MCN Lancet Series

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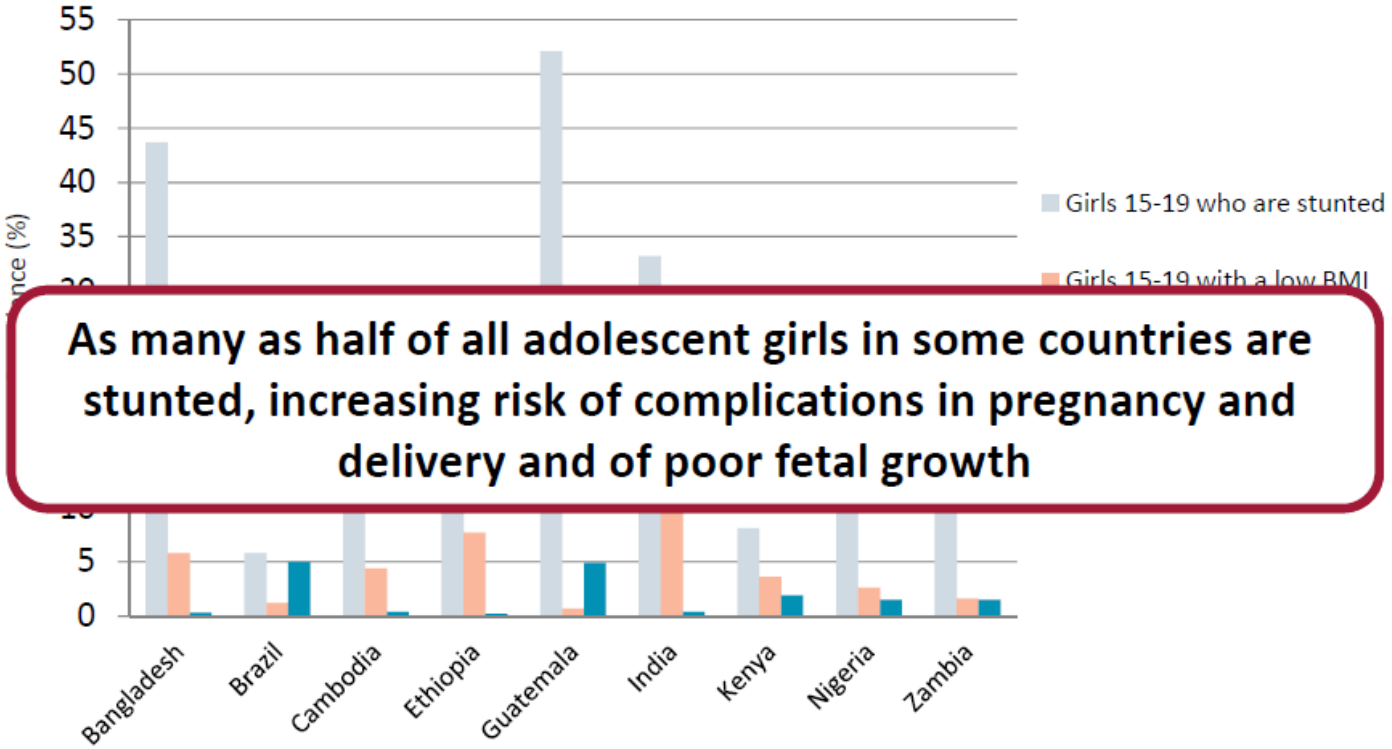
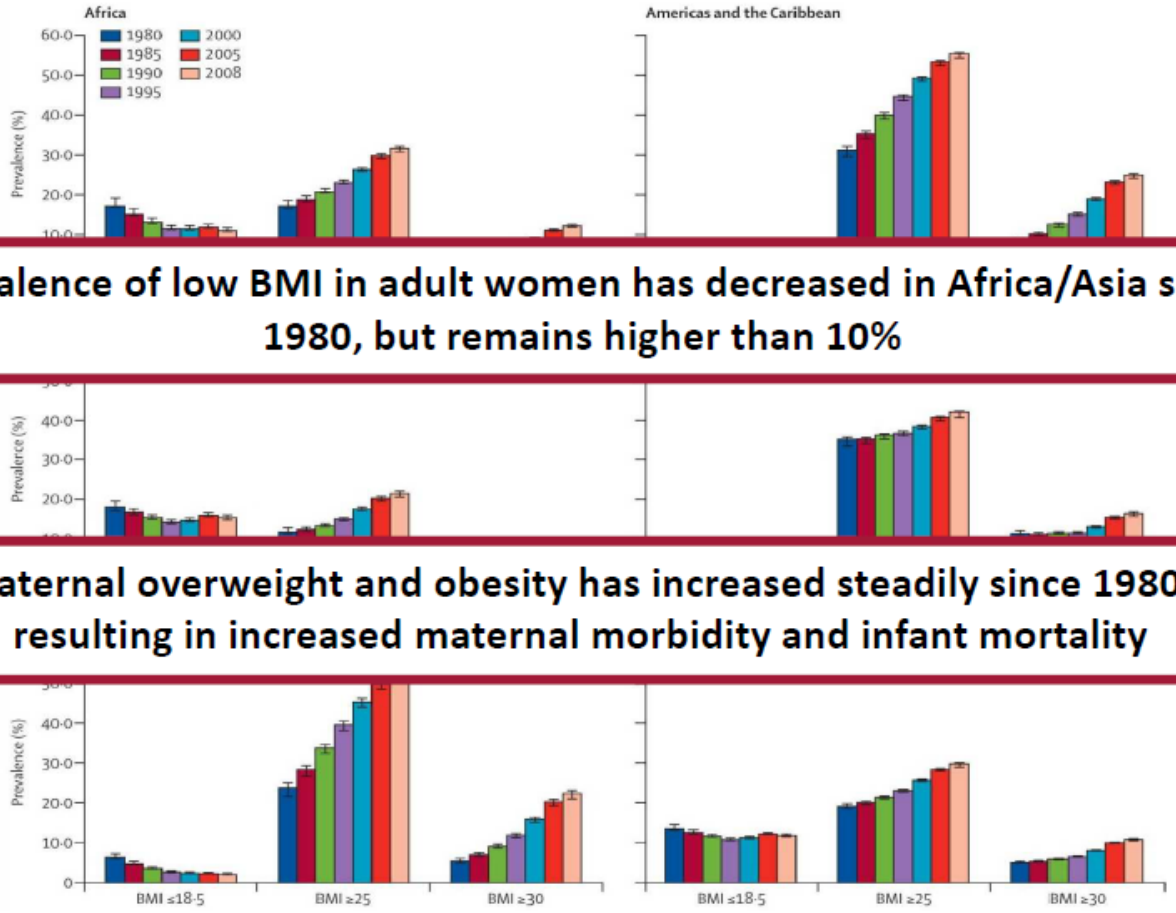
Adolescent Nutrition: Important for Girls, and for the Future Generation



As many as half of all adolescent girls in some countries are stunted, increasing risk of complications in pregnancy and delivery and of poor fetal growth

2013 MCN Lancet Series

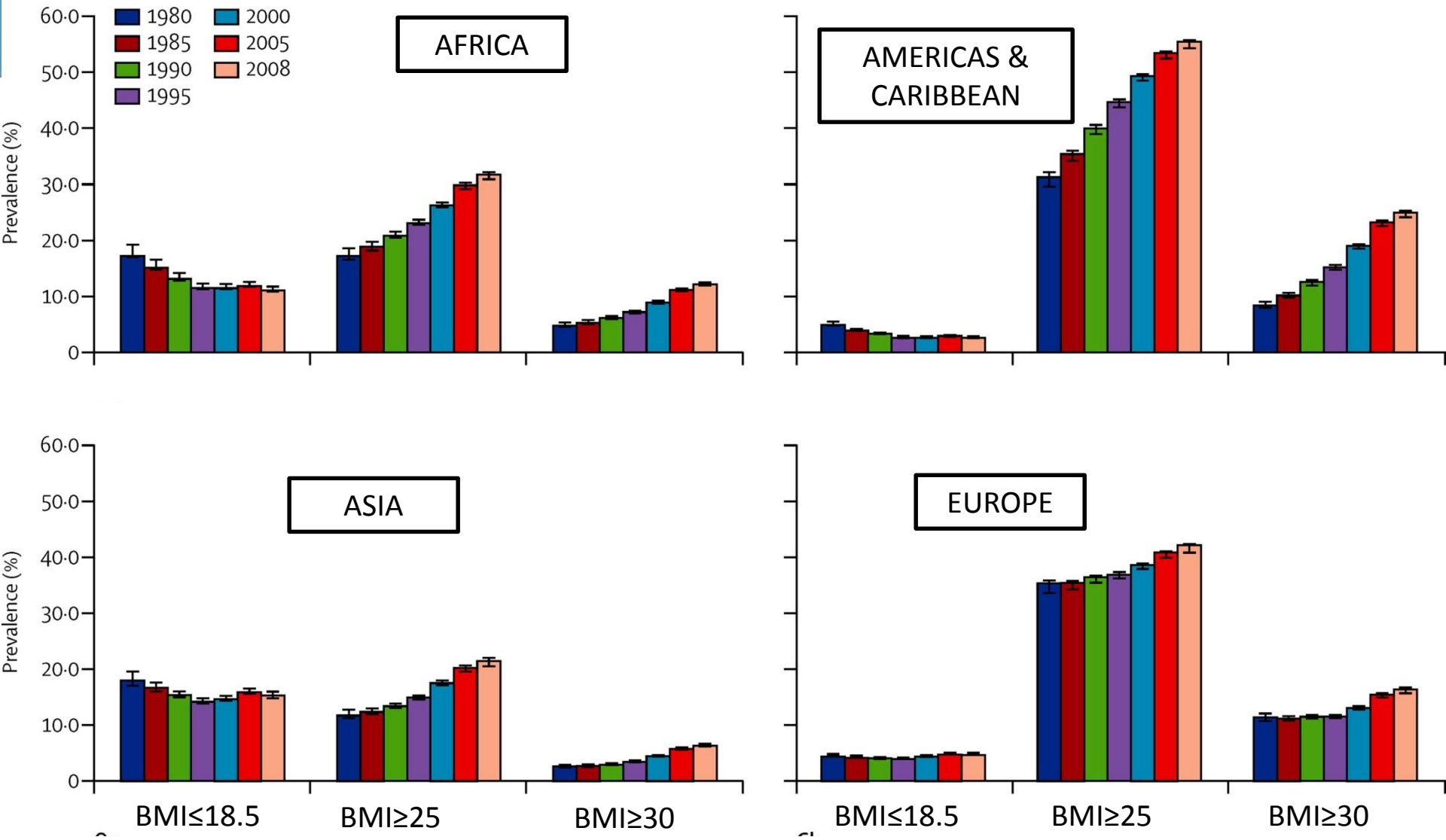
Trends in Thinness and Obesity for Women Aged 20-29 Years in UN Regions and Globally (1980-2008)



Prevalence of low BMI in adult women has decreased in Africa/Asia since 1980, but remains higher than 10%

Maternal overweight and obesity has increased steadily since 1980; resulting in increased maternal morbidity and infant mortality

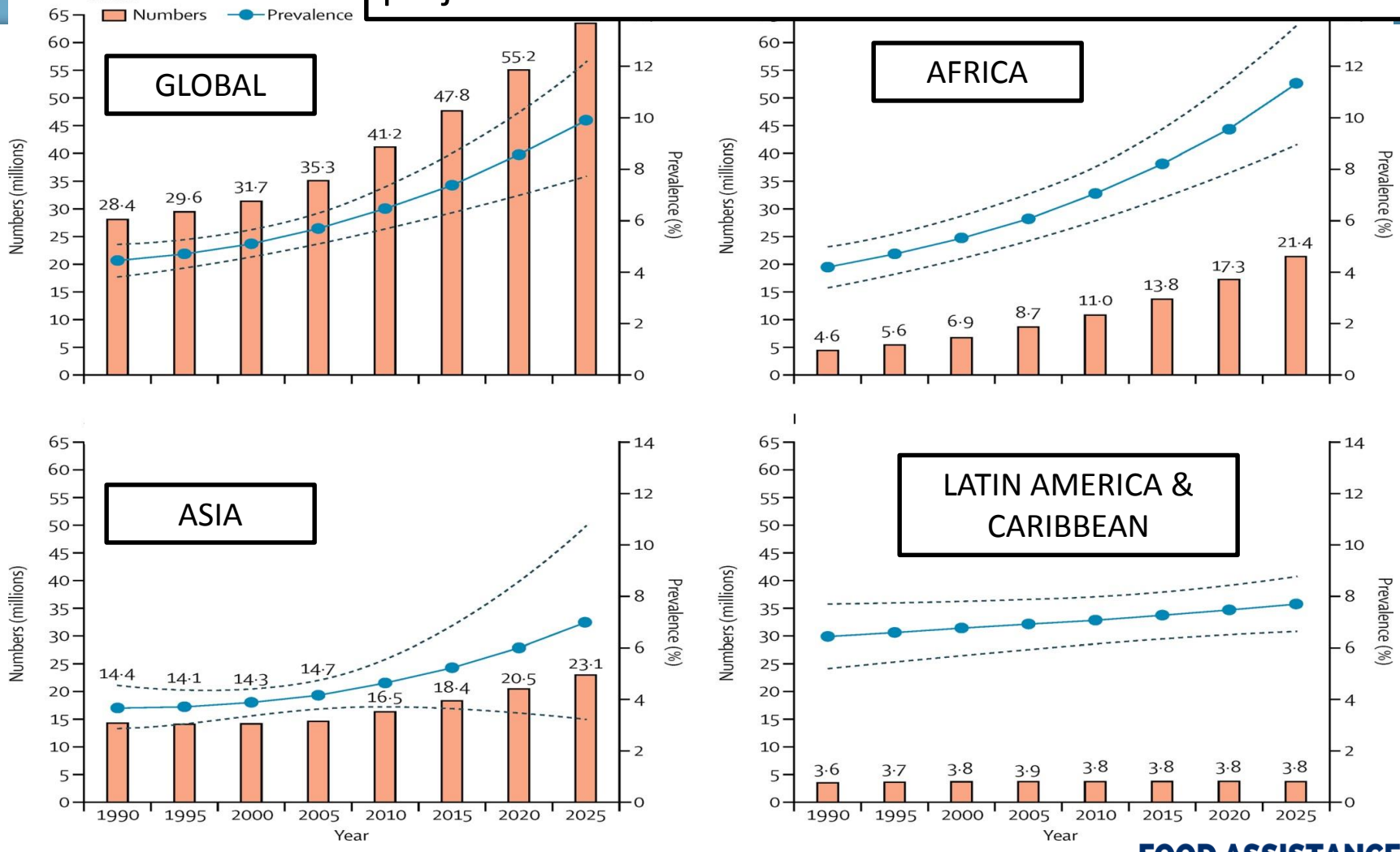
2013 MCN Lancet Series



BMI trends among 20-49 y old women: 1980-2008

2013 Lancet Series

Trends in prevalence and numbers of children with overweight (WHZ>2) , by selected UN regions and globally, 1990–2010, and projected to 2025



2013 MCN Lancet Series

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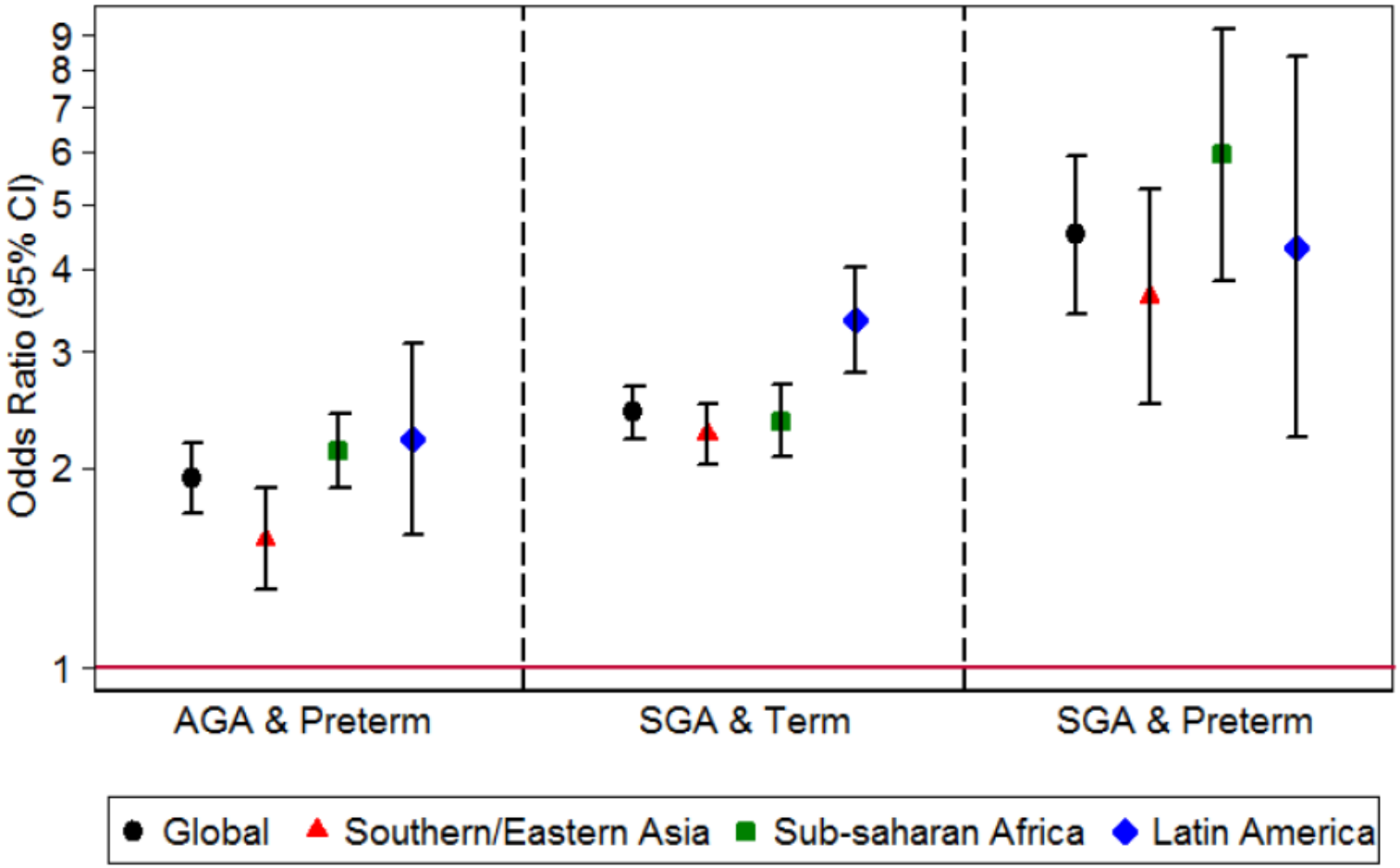
Key Message 3

- **Both chronic malnutrition (i.e., stunting) and obesity risk transmitted from mother to offspring**
  - Maternal-child intergenerational cycles

Odds ratios for stunting in early childhood by small for gestational age (SGA), appropriate for gestational age (AGA) and preterm categories by United Nations region



Christian P et al Int. J Epidemiol. (in press)

2013 MCN Lancet Series

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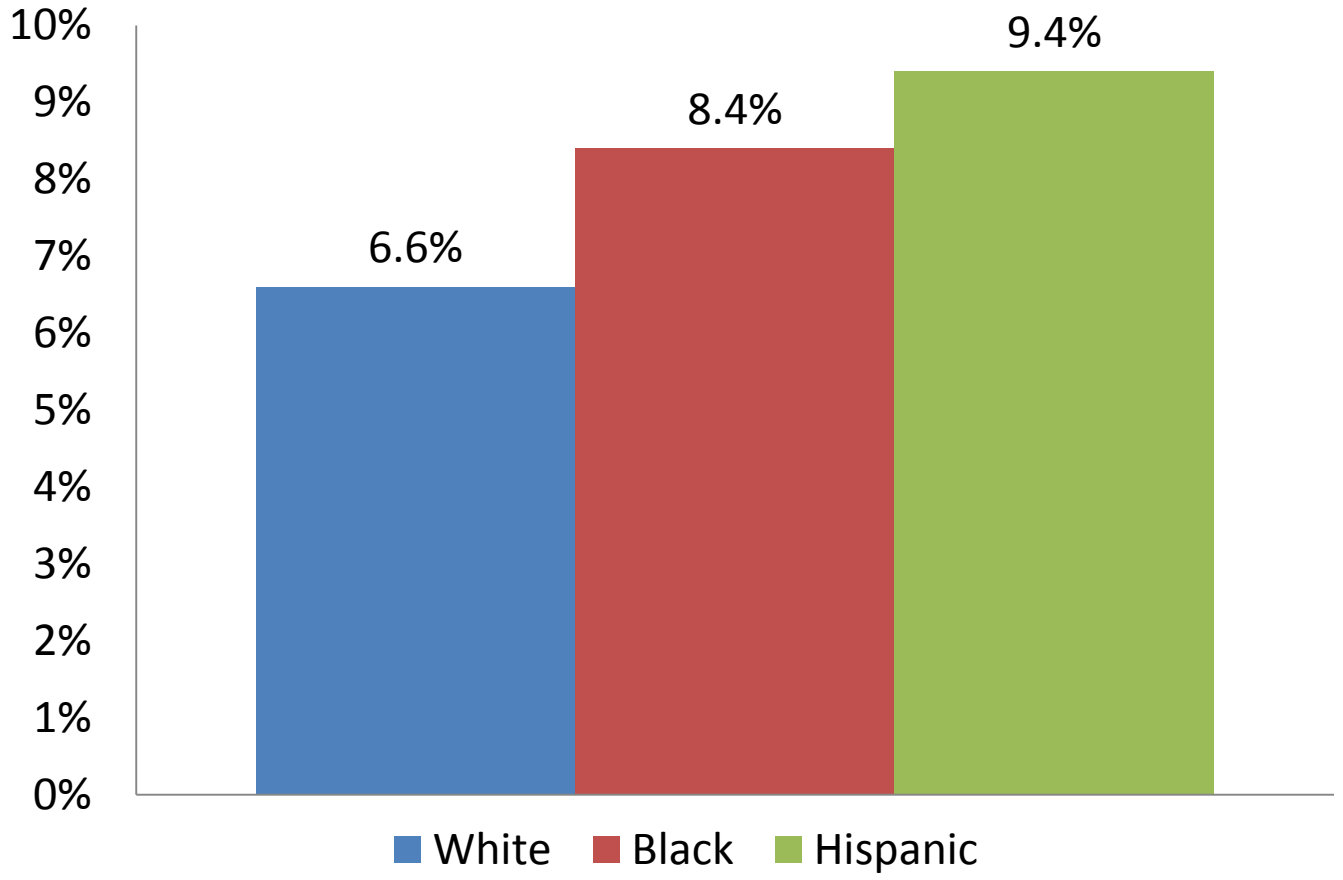
Prevalence of Weight for Recumbent Length > 95th %ile among US Children From Birth to 2 Years of Age, 2011-2012



Ogden, C. L. et al. JAMA 2014;311:806-814

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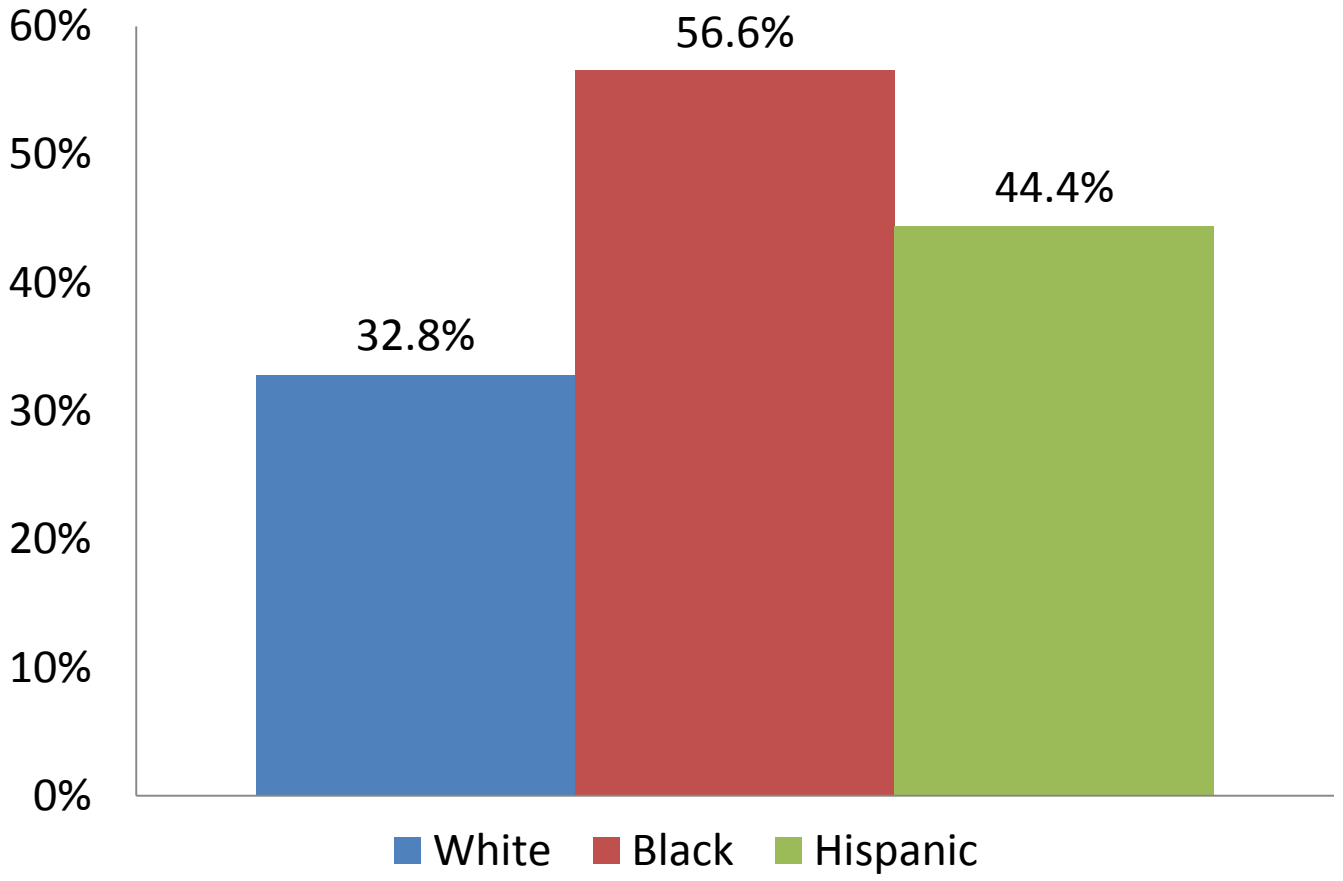
Prevalence of BMI> 30 among US Women >19 Years of Age, 2011-2012



Ogden, C. L. et al. JAMA 2014;311:806-814

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Disparities in Early Nutrition: Where the Problem Begins?

ASN Symposium
Experimental Biology Meetings
Tuesday April 12, 2011
Washington DC

Chair: R. Perez-Escamilla, Yale University
Co-Chair: O. Bermudez, Tufts

***Advances in Nutrition* (2012)**

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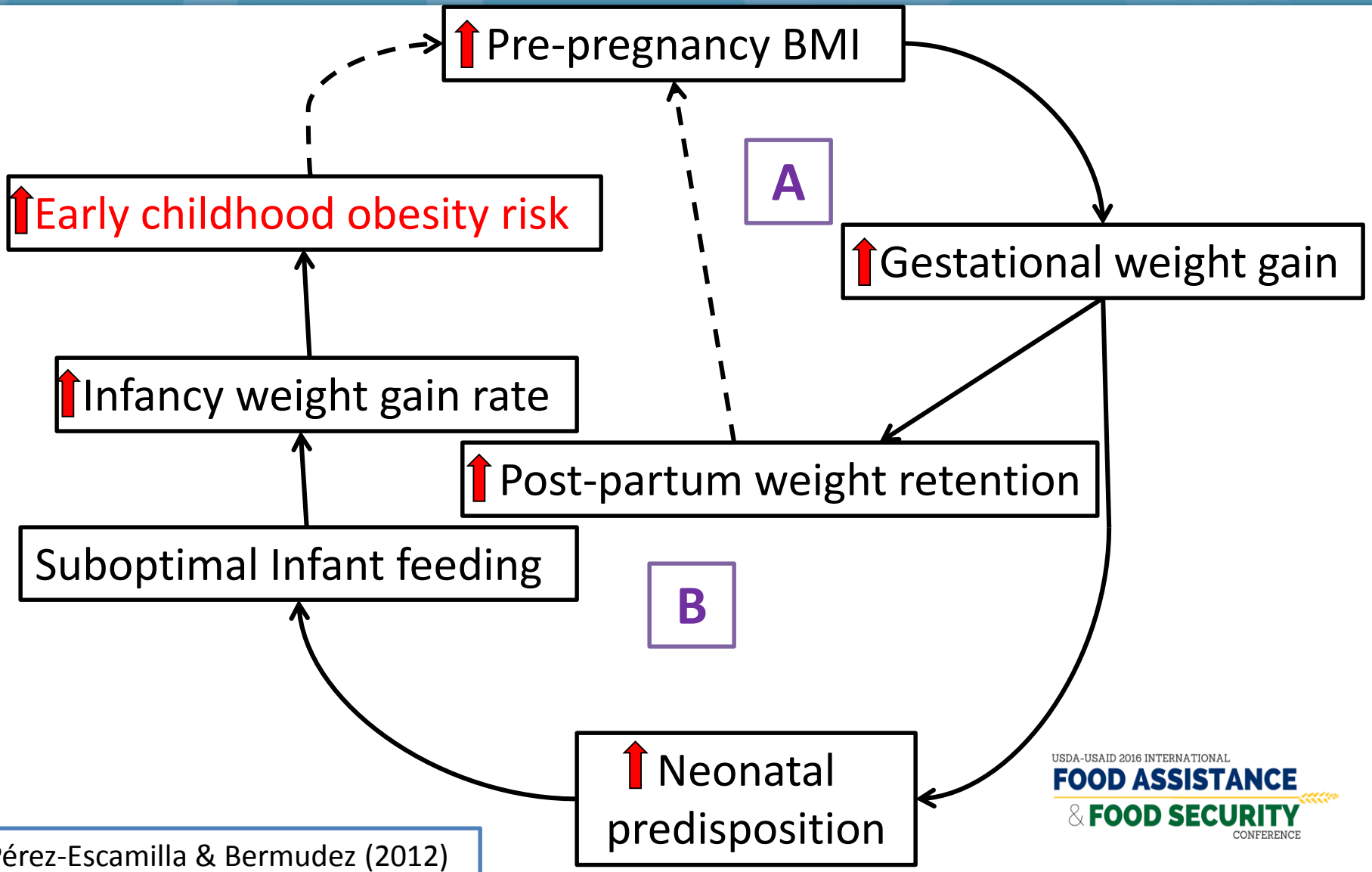
Maternal-Child obesity life course framework



Pérez-Escamilla & Bermudez (2012)

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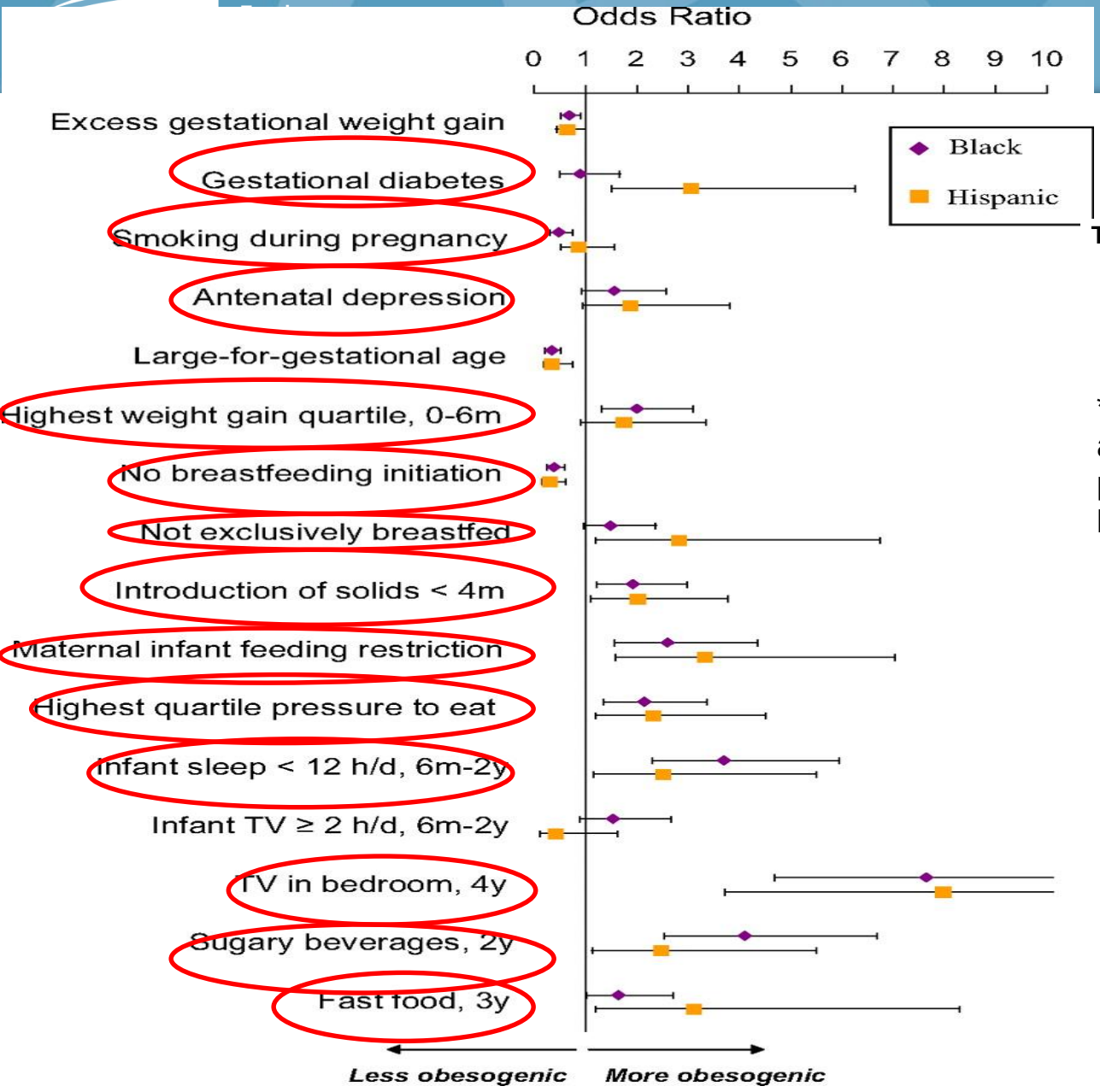
Odds of each childhood obesity risk factor in black and Hispanic participants, relative to white participants*



PEDIATRICS

Taveras E M et al. Pediatrics 2010;125:686-695

©2010 by American Academy of Pediatrics

*Odds ratios adjusted for maternal age, education, parity, and prepregnancy BMI; paternal BMI; household income; and child gender..

United States Department of Agriculture

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Executive summary: evaluating the evidence base to support the inclusion of infants and children from birth to 24 mo of age in the *Dietary Guidelines for Americans*—"the B-24 Project"[1–3]

Daniel J Raiten, Ramkripa Raghavan, Alexandra Porter, Julie E Obbagy, and Joanne M Spahn

AJCN (2014)

- **WG1**: 0-6 months
- **WG2**: 6-12 months
- **WG3**: 12-24 months
- **WG4**: Caregivers

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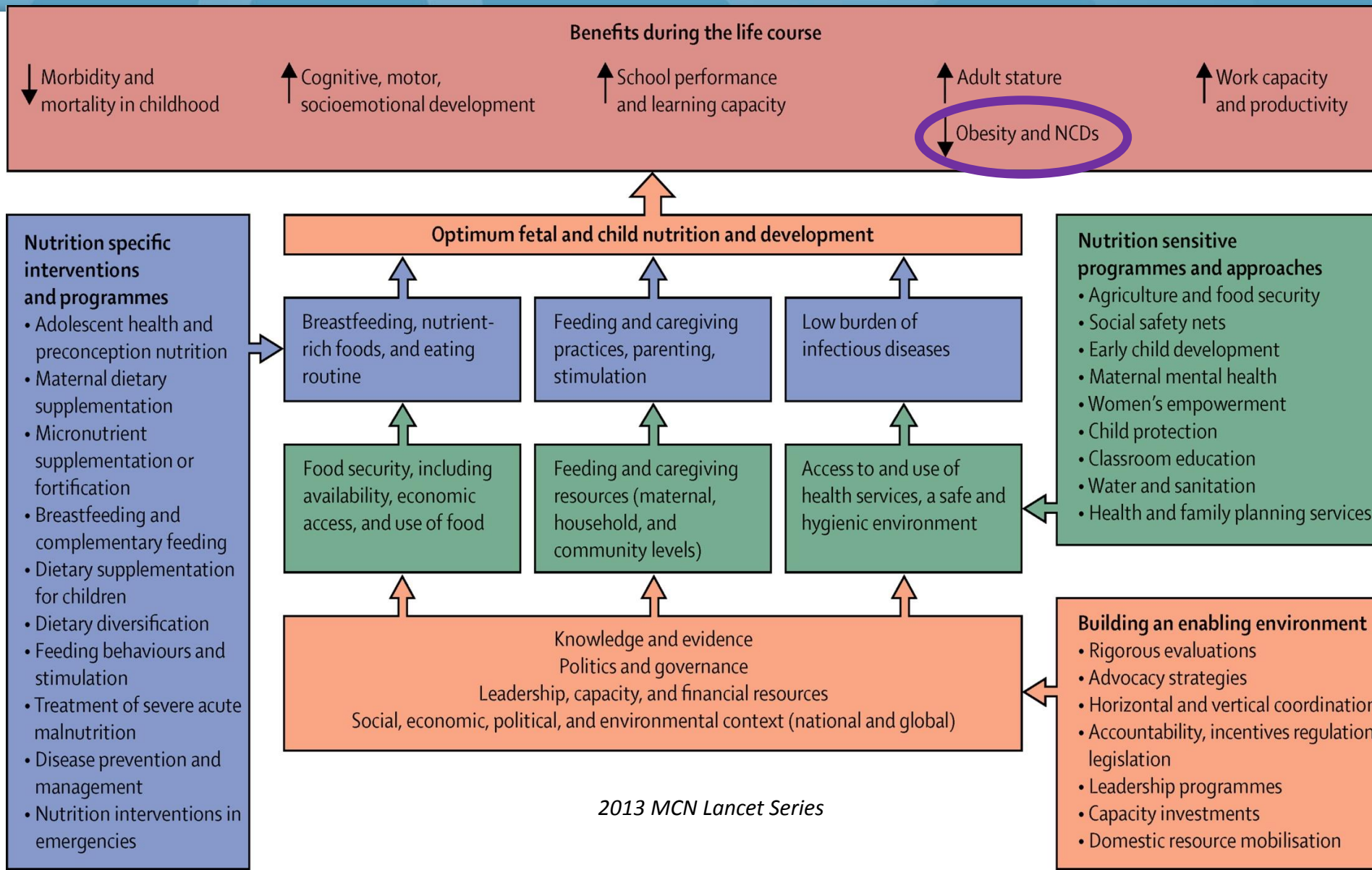
Framework for actions to achieve optimum fetal and child nutrition and development



2013 MCN Lancet Series

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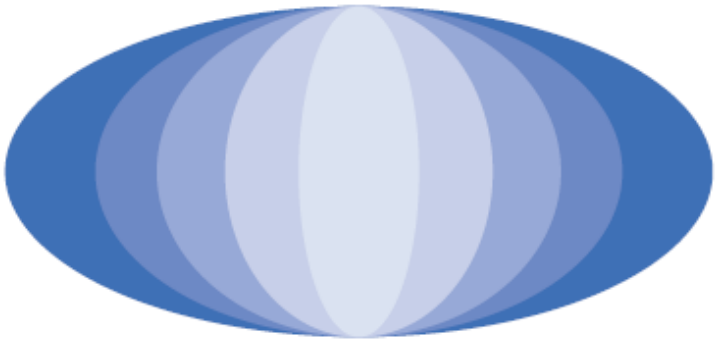
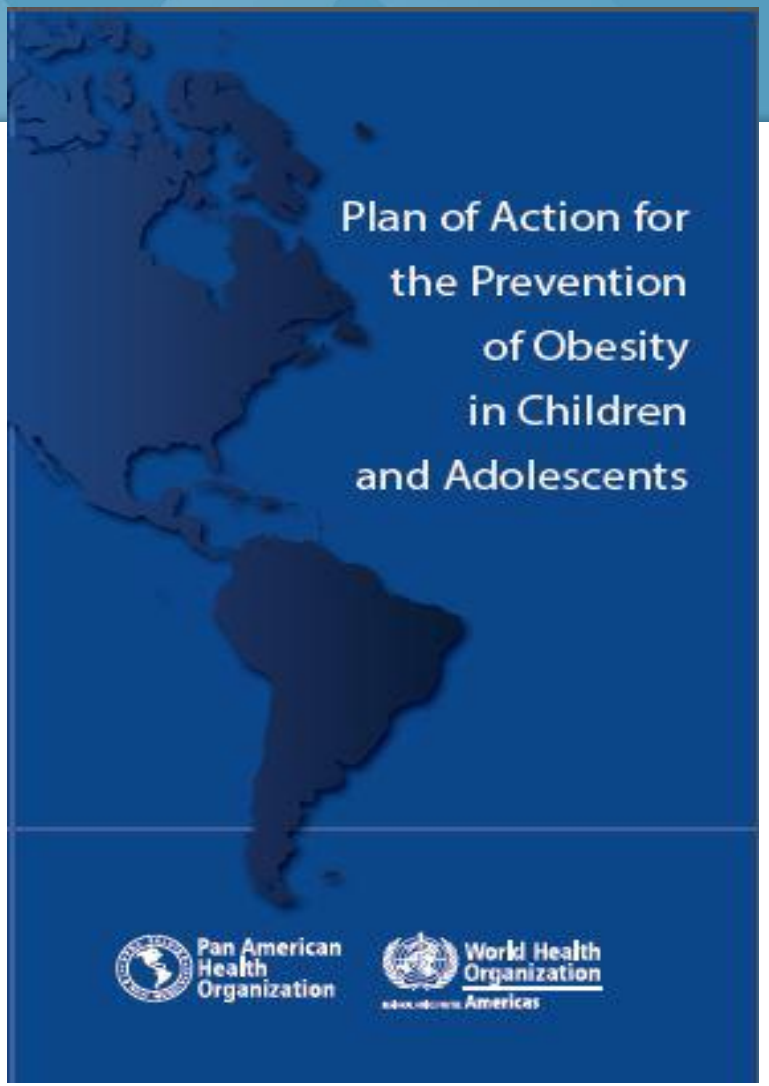


Preventing Childhood Obesity in the Americas: The Life-Course Framework

Guest Editors: Dr. Rafael Pérez-Escamilla and Dr. Gilberto Kac



iaso

nature publishing group npg

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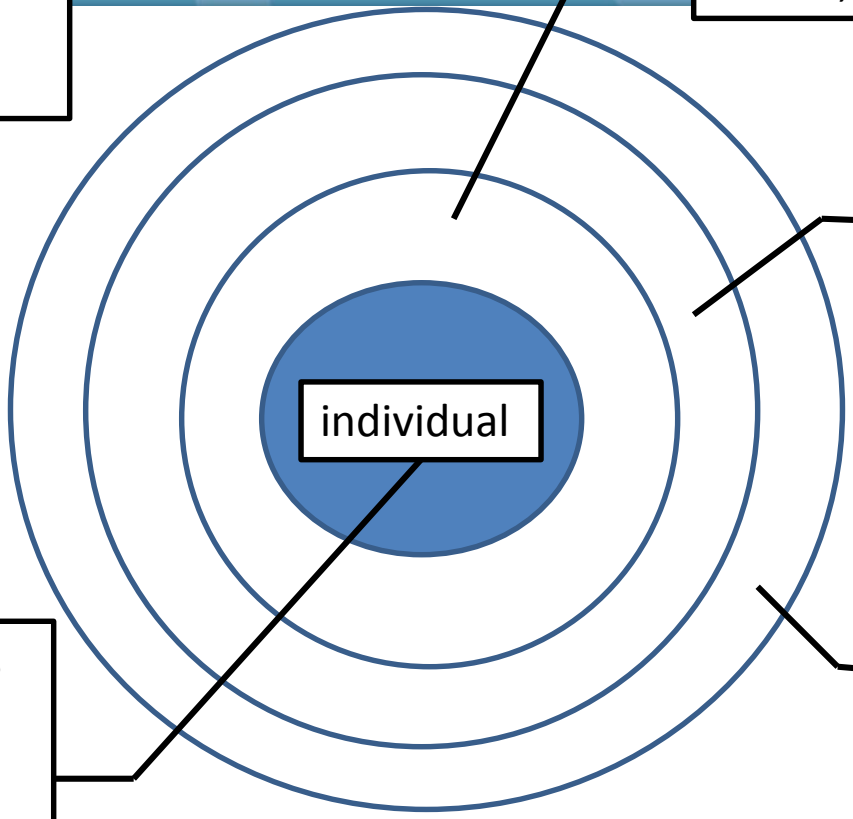
Perez-Escamilla & Kac (IJOS, 2013)

Macrosystem: Social and health policies, cultural norms and values

Microsystem: Home, school, work

Mesosystem: Neighborhood, home-work-social life relationships



Exosystem: Decision from town council regarding use of public spaces for leisure

Individual: Lifestyles (nutrition, physical activity), obesity status

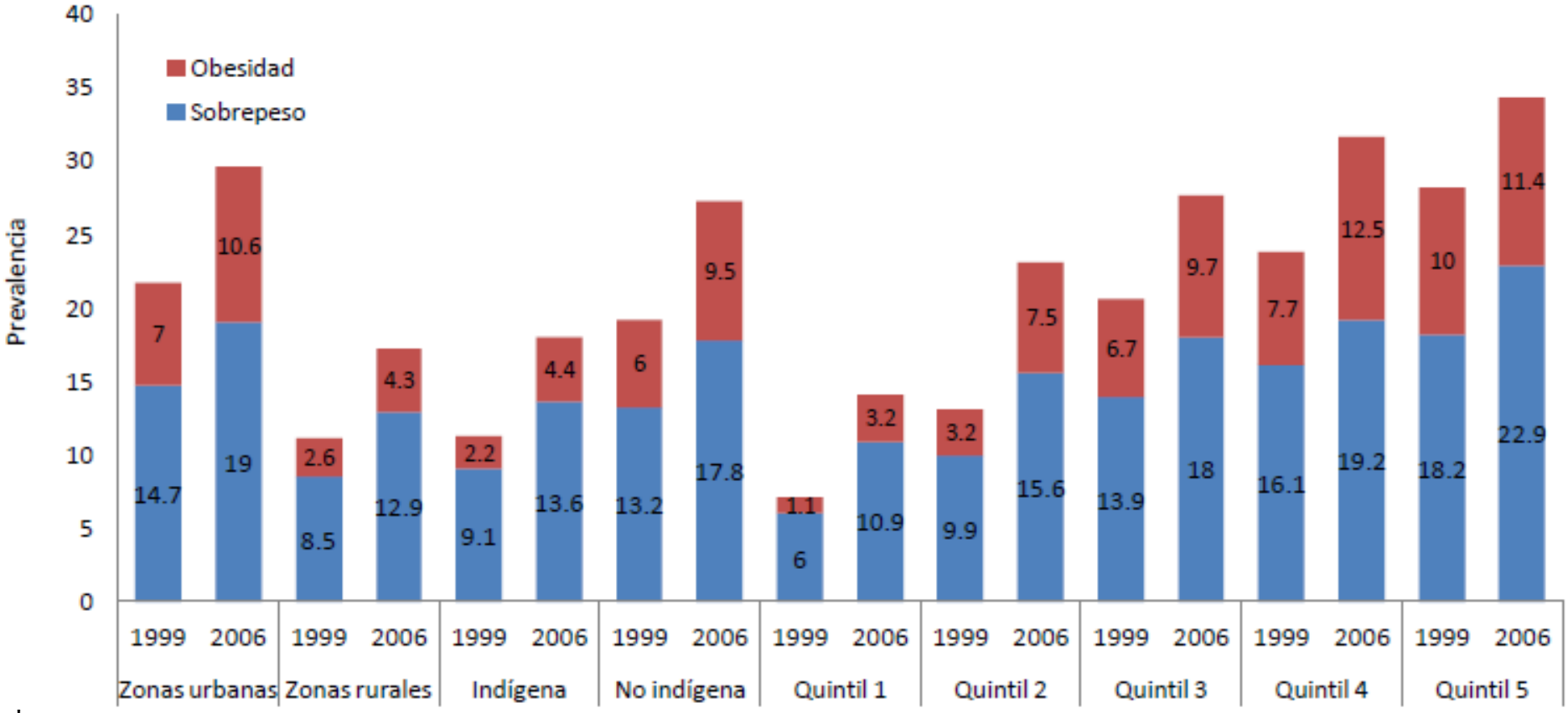
time

gestation …infant…toddler…preschooler…child…teen… adult

Key Message 4

- **Maternal-child obesity concentrating among the poor**

Overweight and Obesity* among 5 to 11 Mexican year olds; 1999 & 2006 by rural/urban, ethnicity and wealth



* According to obesity task force criteria

Source: Rivera JA, Gonzalez de Cossio T. Pobreza, nutrición y salud. En: Los determinantes sociales de la salud en México. pp. 269-320, 2012

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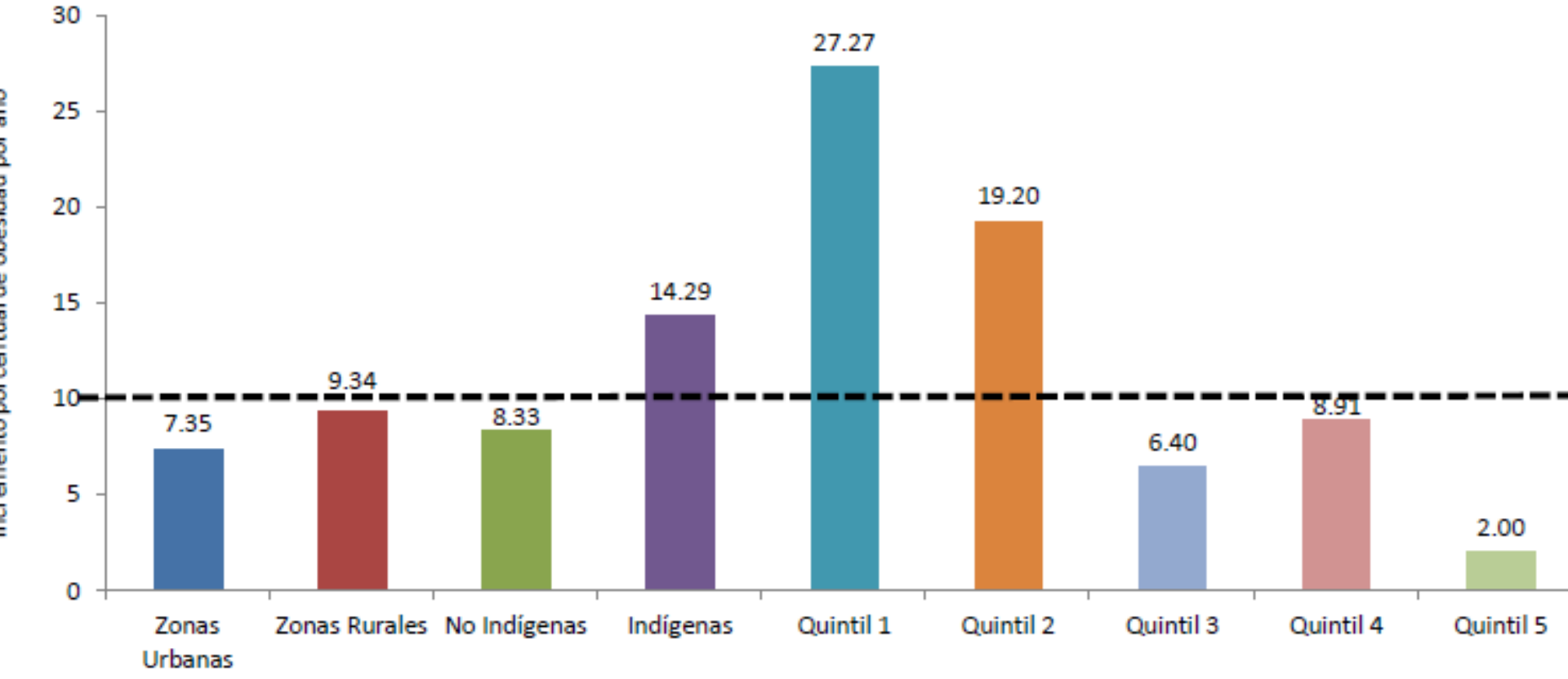
Annual Percent Increase in Obesity Among Mexican Schoolers; 1999-2006; by rural/urban, ethnicity and wealth



Source: Rivera JA, Gonzalez de Cossio T. Pobreza, nutrición y salud. En: Los determinantes sociales de la salud en México. pp: 269-320, 2012

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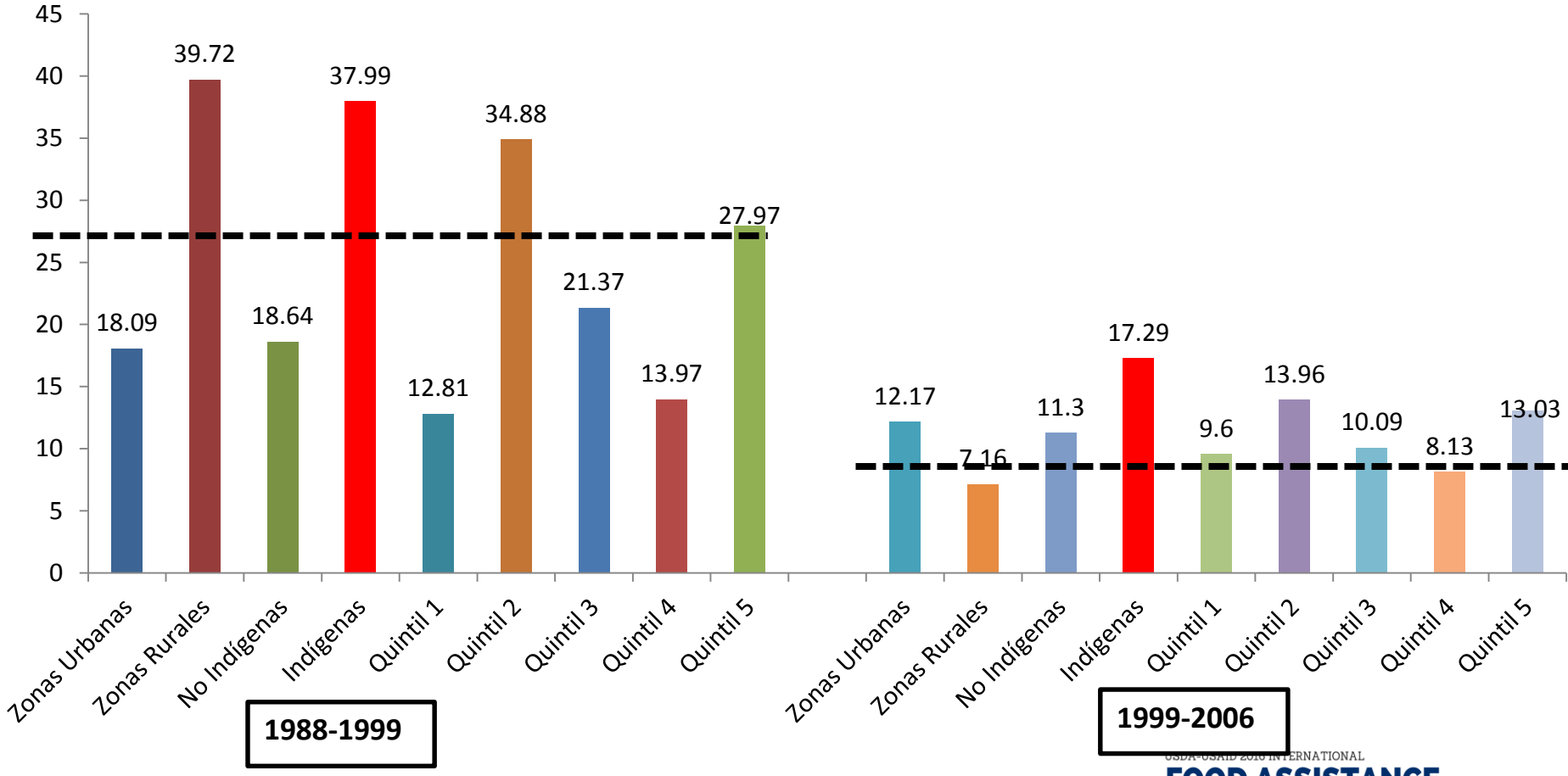
Annual Percent Increase in Obesity Among Mexican Adolescents between 1988-1999 and 1999-2006; by rural/urban, ethnicity and wealth



Source: Rivera JA, Gonzalez de Cossio T. Pobreza, nutrición y salud. En: Los determinantes sociales de la salud en México. pp. 269-320, 2012

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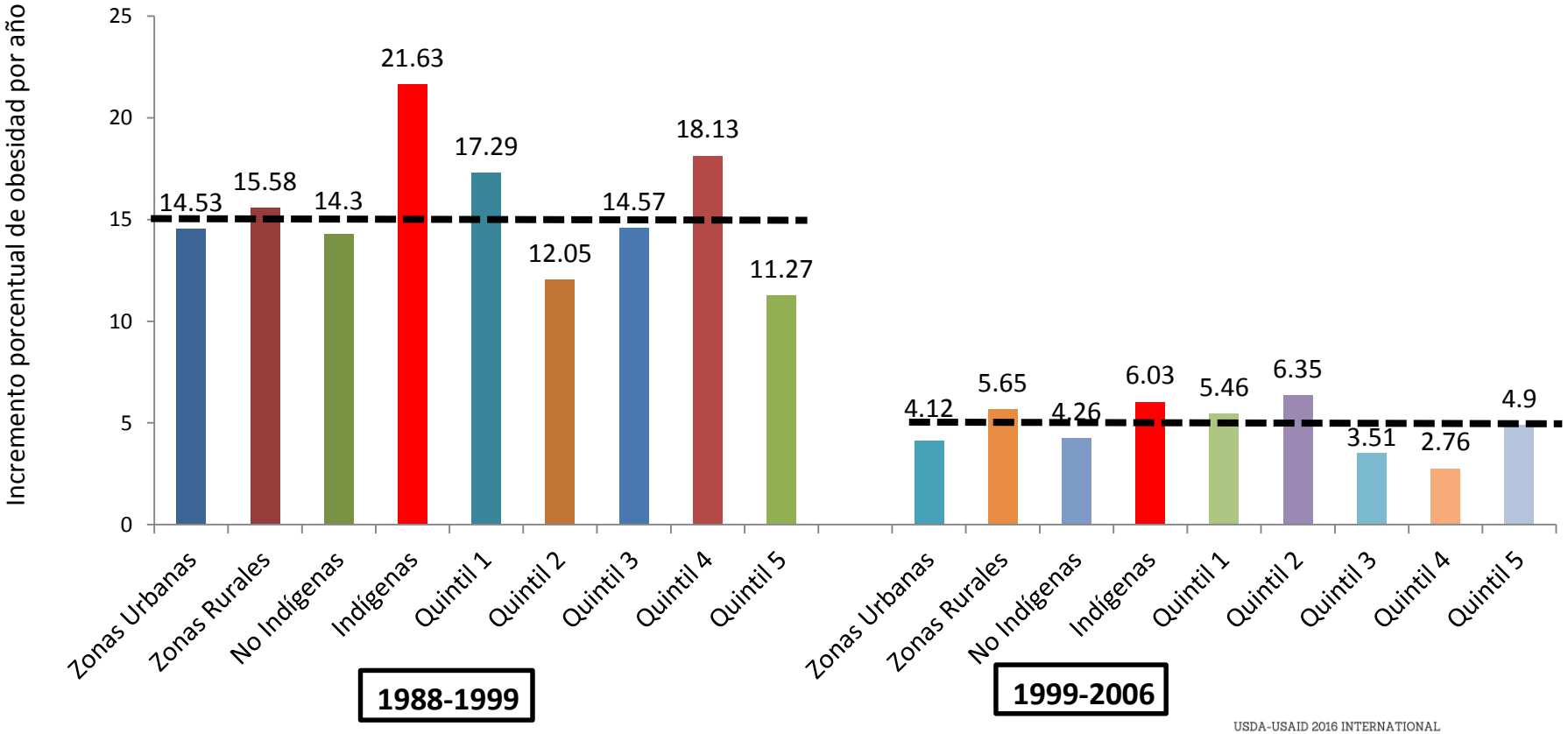
Annual Percent Increase in Obesity Among Mexican Women between 1988-1999 and 1999-2006; by rural/urban, ethnicity and wealth



Source: Rivera JA, Gonzalez de Cossio T. Pobreza, nutrición y salud. En: Los determinantes sociales de la salud en México. pp. 269-320, 2012

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Key Message 5

- **SGA is prevalent and a risk factor for childhood obesity and future chronic diseases**

  maternal overweight/obesity highly prevalent in countries with high burden of stunting and infant mortality

Child Mortality Due to Nutritional Disorders

Nutritional Disorders	Attributable deaths with UN prevalences*	Proportion of total deaths of children younger than 5 years
Fetal growth restriction (<1 month)	817,000	11.8%
Stunting (1-59 months)	1,017,000*	14.7%
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Joint effects of fetal growth restriction, suboptimum breastfeeding, stunting, wasting, and vitamin A and zinc deficiencies (<5 years)	3,097,000	44.7%

Data are to the nearest thousand. *Prevalence estimates from the UN.

2013 MCN Lancet Series

SGA also linked with obesity and NCD risk later on in life

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Countries with the highest burden of malnutrition
These 34 countries account for 90% of the global burden of malnutrition

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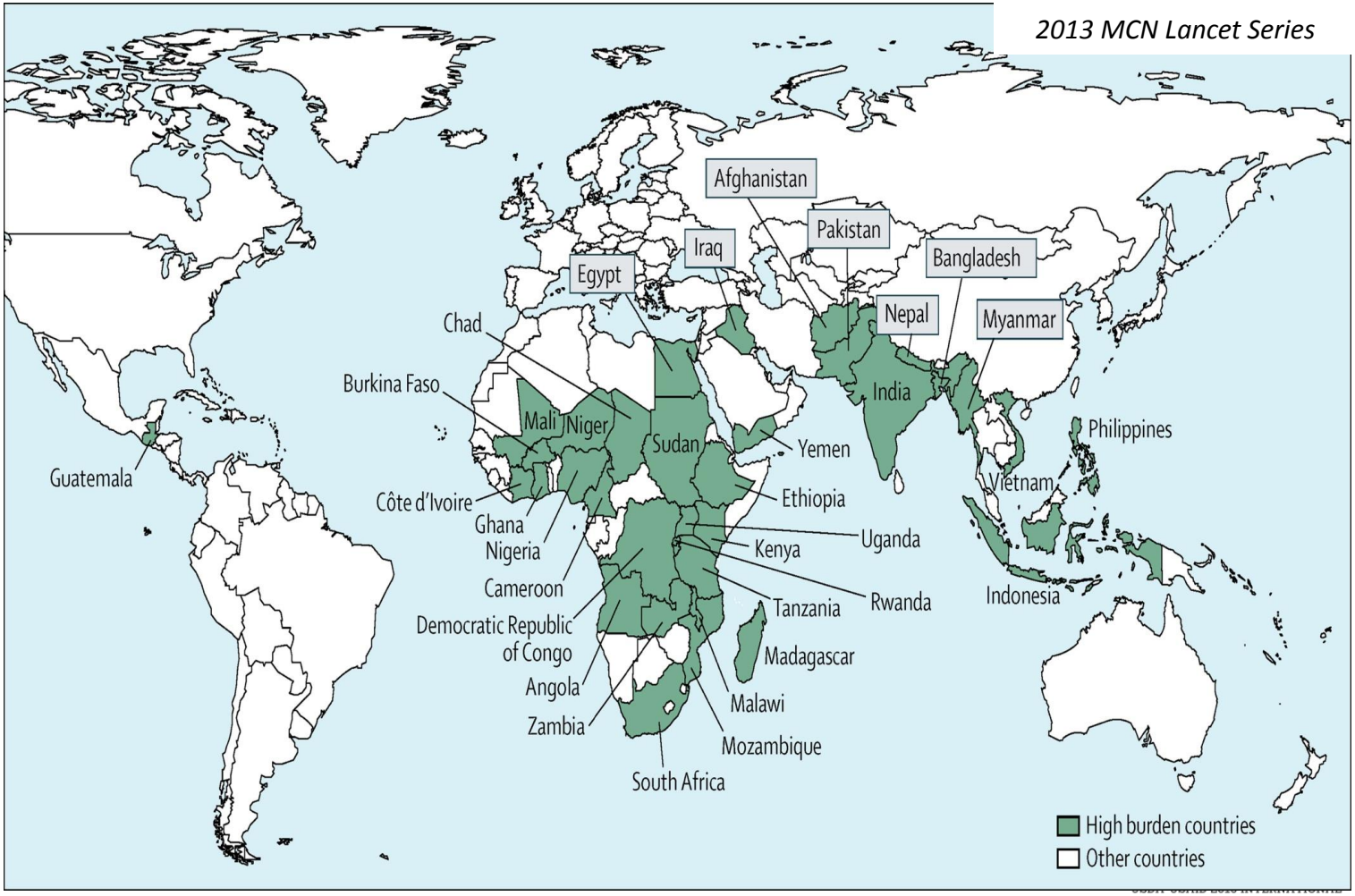

Many of these countries have every high maternal overweight/obesity rates

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Key Message 6

- **Major scientific advances in our understanding of how food preferences develop and how children learn to it**

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Learning to eat: birth to age 2 y[1–4]

Am J Clin Nutr 2014;99(suppl):723S–8S

Leann L Birch and Allison E Doub

PHOTO ILLUSTRATION/THINKSTOCK

Learning to eat: birth to age 2 y[1–4]

Am J Clin Nutr 2014;99(suppl):723S–8S

Leann L Birch and Allison E Doub

- **Familiarization**
  - Repeatedly offer healthy foods such as vegetables to young children
- **Associative learning**
  - Food preferences develop based on the context and psycho-emotional atmosphere in which it's offered
- **Observation learning**
  - Children may also establish food preferences by observing what their caregivers eat

Infancy and the toddlerhood and preschool periods represent major sensitive periods for the development of food preferences

The Journal of Nutrition
Symposium: Responsive Feeding—Promoting Healthy Growth and Development for Infants and Toddlers

Responsive Feeding and Child Undernutrition in Low- and Middle-Income Countries[1,2]

Margaret E. Bentley,[3]* Heather M. Wasser,[3] and Hilary M. Creed-Kanashiro[4]

[3]Nutrition Department, Gillings School of Global Public Health, University of North Carolina, Chapel Hill, NC, 27516; and [4]Instituto de Investigacion Nutricional, La Molina Lima 12, Perú

J. Nutr. 141: 502–507, 2011

- Positive caregiver verbalizations during feeding may increase child acceptance of food
- Need consensus on what responsive feeding is
- Prospective studies needed

Ontogeny of taste preferences: basic biology and implications for health[1–5]

Am J Clin Nutr 2014;99(suppl):704S–11S

Julie A Mennella

- **Flavors passed from mother to fetus through amniotic fluid**
- **Flavors passed from mother to infant through breast milk**
- **Breastfed babies accept more easily fruits and vegetables than children who were formula fed.**
  - However, formula fed infants can end up accepting food low in sugar, salt and bitter tasting if the mothers are advised on repeatedly exposing the infants to them
  - Promoting the consumption of complementary foods low in salt and sugar is likely to have a positive influence on dietary choices, growth and weight outcomes later on in life

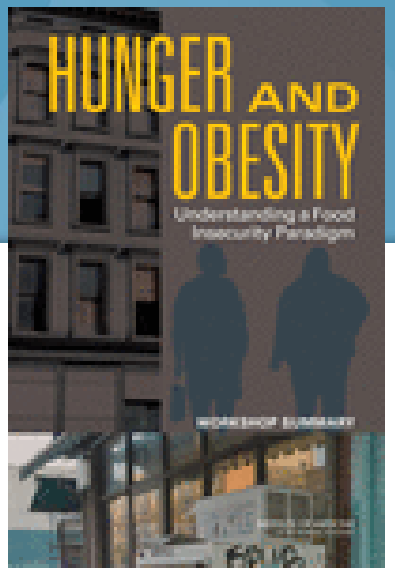
Implications for Development Agencies

- **Prenatal care**
- **Infant and Young Child feedings programs**
- **Parenting programs**
- **Early Child Development programs**
- **Youth programs**
- **Food security programs**
  - Conditional cash transfer programs

Challenge: Requires strong coordination between health, education, and social development sectors

Key Message 7

- **Household food insecurity associated with child stunting, maternal obesity, and the DBM**



Hunger and Obesity: Understanding a food insecurity paradigm. IOM Workshop Report, 2011.

Household food insecurity and excess weight/ obesity among Brazilian women and children: a life-course approach

Michael Maia Schlüssel [1]
Antonio Augusto Moura da Silva [2]
Rafael Pérez-Escamilla [3]
Gilberto Kac [1]

Cad. Saúde Pública, Rio de Janeiro, 29(2):219-241, fev, 2013

Dietary Energy Density and Body Weight in Adults and Children: A Systematic Review

Rafael Pérez-Escamilla, PhD; Julie E. Obbagy, PhD, RD; Jean M. Altman, MS; Eve V. Essery, PhD; Mary M. McGrane, PhD; Yat Ping Wong, MLS, MPH; Joanne M. Spahn, MS, RD, FADA; Christine L. Williams, MD, MPH

J Acad Nutr Diet. 2012;112:671-684.

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Household FI and the DBM

Understanding the double burden of malnutrition in food insecure households in Brazil

Mat Chld Nutr 2016

Muriel Bauermann Gubert[*,‡], Ana Maria Spaniol[*], Ana Maria Segall-Corrêa[†] and Rafael Pérez-Escamilla[‡]

Key messages

- In Brazil, severe household food insecurity was associated with the double burden malnutrition in the same household.
- Life course policies and programmes targeting household food insecurity are needed to prevent the double burden malnutrition.
- Household food insecurity should be included as a key evaluation indicator of maternal-child nutrition programmes.
- Prospective research is needed to better understand the mechanisms explaining the simultaneous risk for maternal overweight/obesity and child stunting and to identify modifiable factors that affect this relationship.

Key Message 8

- **Better systems thinking frameworks needed to address the double burden of malnutrition**

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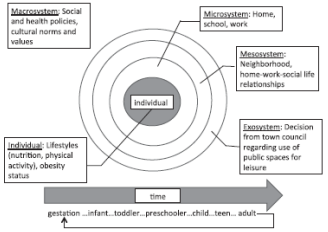
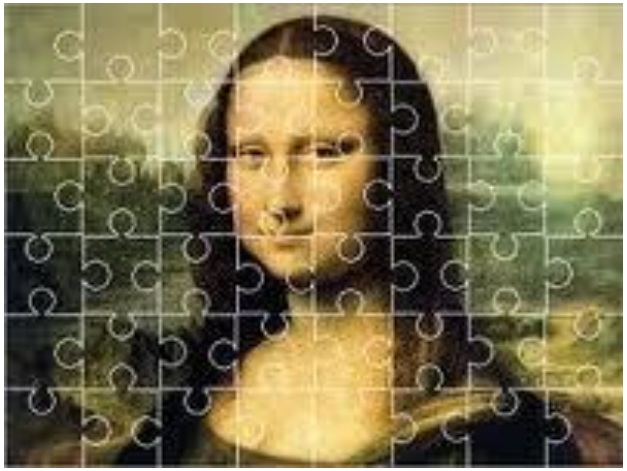
The need for global visionary leadership to prevent malnutrition in all its forms

Strategic Plans based on sound policy and program evaluation framework

Past Results



Future Results



Impact of new paradigm should be much more than the sum of silos' results

Interdisciplinary, multi-level, multi-sectorial collaborations

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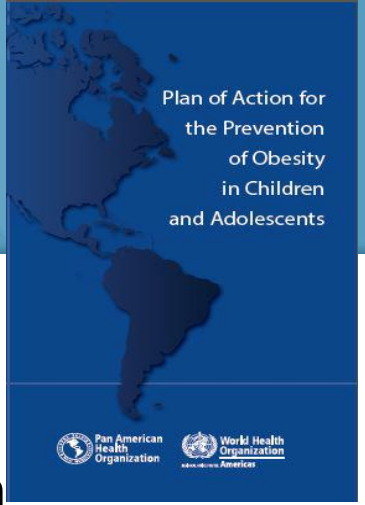
Addressing the DBM Conclusions

- Integrate **preconceptional**, **gestational**, **post-partum** and **infancy and early childhood** as part of national childhood obesity prevention strategies
- Social-ecological model
- Social marketing framework
    - Generate political support
    - Mass media
    - Intersectoral initiatives/programs



- **Obesity among children and adolescents is on the rise in the countries of the Americas. The countries of the Americas have unanimously signed a 5-year Plan of Action for the Prevention of Obesity in Children and Adolescents, during the 53rd Directing Council of PAHO.**
- **The plan calls for the implementation of fiscal policies, regulation of food marketing and labelling, improvement of school nutrition and physical activity environments, and promotion of breastfeeding and healthy eating.**
- **Each Member State is encouraged to implement policies and regulations proposed in this Plan of Action according to its national needs and objectives.**

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Canada-United States-Mexico Trilateral Cooperation on Childhood Obesity Initiative

Cristina Rabadán-Diehl,[1] Margarita Safdie,[2] Rachel Rodin,[3] and the Trilateral Working Group on Childhood Obesity

Rev Panam Salud Publica. 2016;40(2):80–84.

TABLE 1. Principles and objectives of the Canada-US-Mexico Trilateral Cooperation on Childhood Obesity Initiative

Principles

1. As governments, we have a responsibility to lead our countries' efforts to address the public health challenge of childhood obesity.
2. We recognize that complex public health issues such as childhood obesity require the engagement of all sectors of our societies to achieve effective and sustained change.
3. Our trilateral collaboration will be visibly present, taking action in each country while drawing on the expertise, resources, and efforts of each trilateral partner State.
4. Our trilateral collaboration will build on our common interest to accelerate action while valuing and respecting the different experiences and national contexts of our three countries.

Objectives

1. Facilitate the exchange of relevant information, including policies, program activities, guidelines, and regulations, with a view to informing the work of other trilateral partners.
2. Promote the exchange of lessons learned and best practices.
3. Encourage and facilitate individual contacts and networks between technical experts.
4. Identify opportunities for adopting and implementing the promising practices and successful initiatives of other trilateral partners.

TABLE 2. Interventions supportive of the Canada-US-Mexico Trilateral Cooperation on Childhood Obesity Initiative, 2016

1. Decreasing sedentary behavior among children and their families.
2. Improving the levels of awareness, skills, and knowledge, including among parents and caregivers, regarding the importance of physical activity.
3. Designing the built (man-made) environment of communities, including transportation systems, to facilitate active living.
4. Designing specific initiatives to improve physical activity among vulnerable children and their families.
5. Enhancing physical activity during school and in the before-and after-school period.
6. Increasing access to community locations and safe, affordable opportunities for physical activity.

Rabadán-Diehl et al. Rev Panam Salud Publica. 2016;40(2):80–84.

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Dietary & Physical Activity Guidelines

The Mexican Dietary and Physical Activity Guidelines: Moving Public Nutrition Forward in a Globalized World[1–3]

Rafael Pérez-Escamilla* *J Nutr* 2016;146(Suppl):1924S–7S

The 2015 Dietary Guidelines Advisory Committee Scientific Report: Development and Major Conclusions[1–3]

Adv Nutr 2016;7:438–44

Barbara E Millen,[4] Steve Abrams,[5] Lucile Adams-Campbell,[6] Cheryl AM Anderson,[7] J Thomas Brenna,[8] Wayne W Campbell,[9] Steven Clinton,[10] Frank Hu,[11] Miriam Nelson,[12] Marian L Neuhouser,[13] Rafael Perez-Escamilla,[14] Anna Maria Siega-Riz,[15] Mary Story,[16] and Alice H Lichtenstein[17]*

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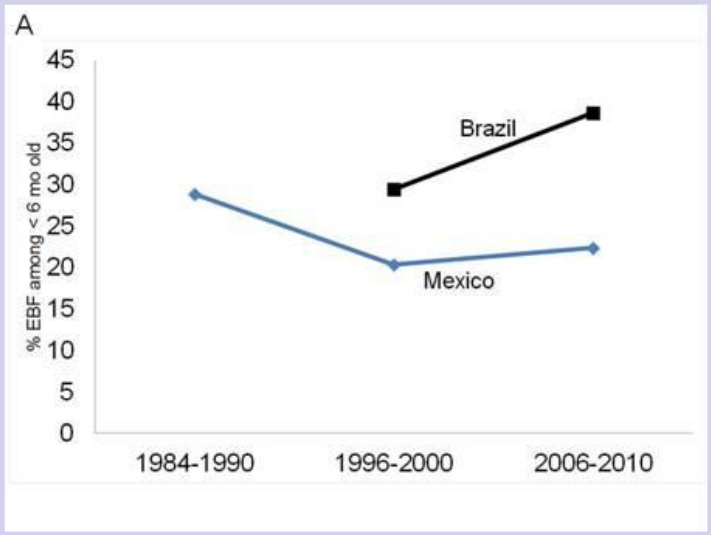
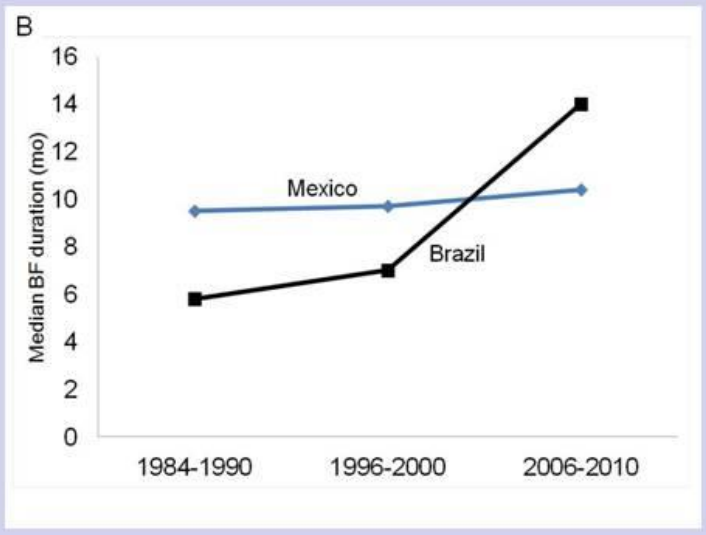
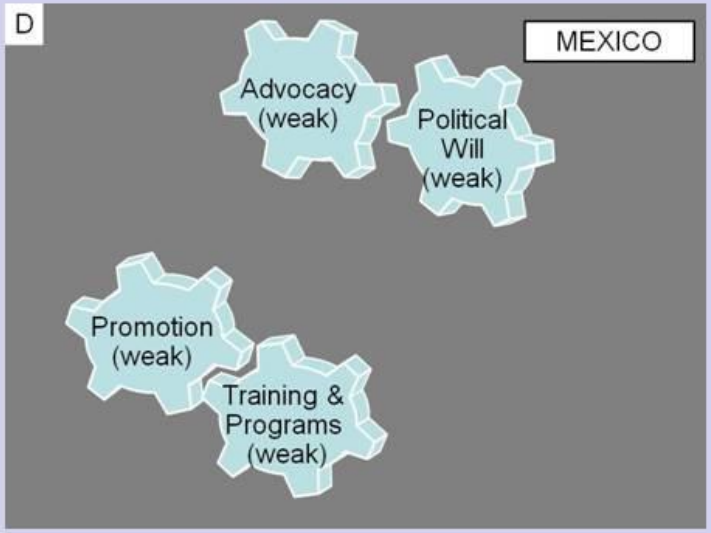
Breastfeeding Gear Model







Perez-Escamilla et al., Adv Nutr. (2012)

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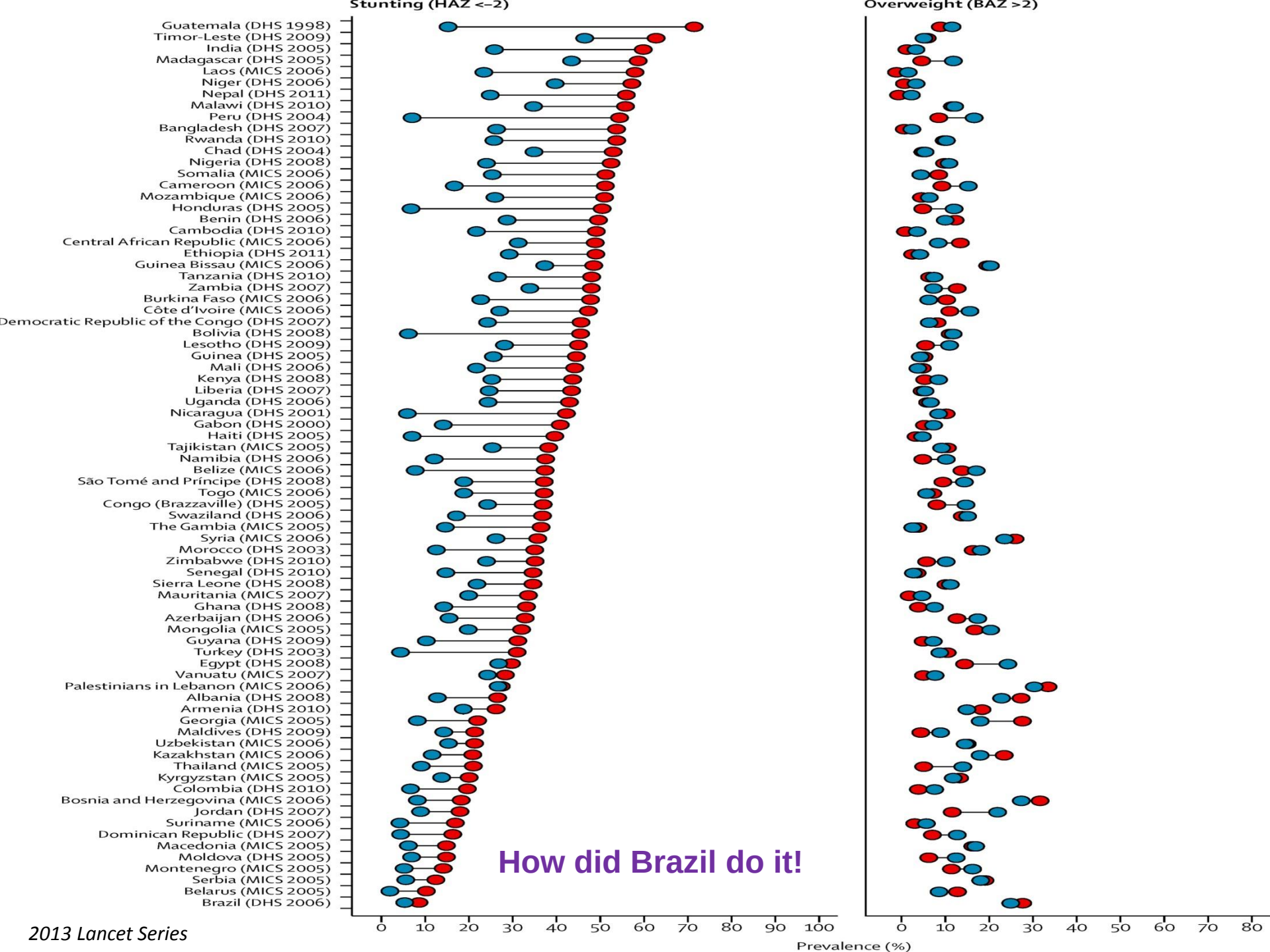

2013 Lancet Series

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Monitoring & Evaluation

Multi-component maternal-child "life course" indicator

-e.g., proportion of women who:

- **enter pregnancy with appropriate weight**
- **gain weight during gestation within recommendations**
- **return to pre-pregnancy weight by 6 months post-partum**
- **breastfeed their babies exclusively for 6 months**
- **introduce nutritious complementary foods at 6 months**
- **continue breastfeeding until child is two years old**

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Evidence Highlights Importance of Nutritional Status in Women Before and During Pregnancy

Short maternal stature may lead to obstructed labour and maternal and fetal or neonatal death

Maternal stunting and low Body Mass Index increases the risk of fetal growth restriction (small for gestational age)

Maternal obesity leads to gestational diabetes, pre-eclampsia, haemorrhage and higher risk of neonatal and infant death

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Key message 9. The Double Burden of Malnutrition needs to be addressed for the SDGs to be met

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Key messages summary

1. The world is losing hundred of billions of dollars in annual productivity as a result of the double burden of malnutrition
2. Almost all low and middle income countries undergoing nutrition transition and corresponding DBM
3. Maternal-child cycles explain intergenerational transmission of both stunting and obesity
4. Maternal-child obesity concentrating among the poor
5. SGA is prevalent and a risk factor for childhood obesity and future chronic diseases
6. Major scientific advances in our understanding of how food preferences develop and how children learn to it
7. Household food insecurity associated with child stunting, maternal obesity, and the DBM
8. Better systems thinking frameworks needed to address the double burden of malnutrition
9. The Double Burden of Malnutrition needs to be addressed for the SDGs to be met

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Thank you!

rafael.perez-escamilla@yale.edu

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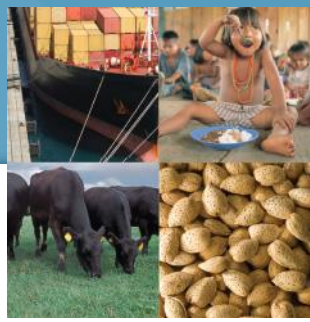

Nutrition-sensitive Agriculture:
Maximizing nutritional outcomes from food systems

October 11, 2016

Heather Danton

Director, Food Security and Nutrition

JSI/SPRING Project

FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

USAID
FROM THE AMERICAN PEOPLE

SPRING
Strengthening Partnerships, Results, and Innovations in Nutrition Globally

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Reductions in Poverty and Undernutrition

- Extreme poverty rates have been cut by more than half
- 17,000 fewer children will die today than on any given day in 1990
- In 2015, 91 % of the global population is using an improved drinking water source, compared to 76 % in 1990.

Source: *The Millennium Development Goals Report* 2015, United Nations, New York

And, yet…

- A projected **702 million** people still live in **extreme poverty**
- Nearly **800 million** people around the world are **chronically undernourished**
- At least **159 million** children under five **are stunted**
- About **1 billion** people still **chronically hungry**; even more **overweight** and **obese**
- **Two billion** people suffer from micronutrient deficiencies

Source: U.S. Government Global Food Security Strategy, September 2016

So, why should we care about nutrition?

45% of child deaths - that's nearly half -

are due to undernutrition!

Not to mention…

Malnutrition has many **short term** and **long term** consequences

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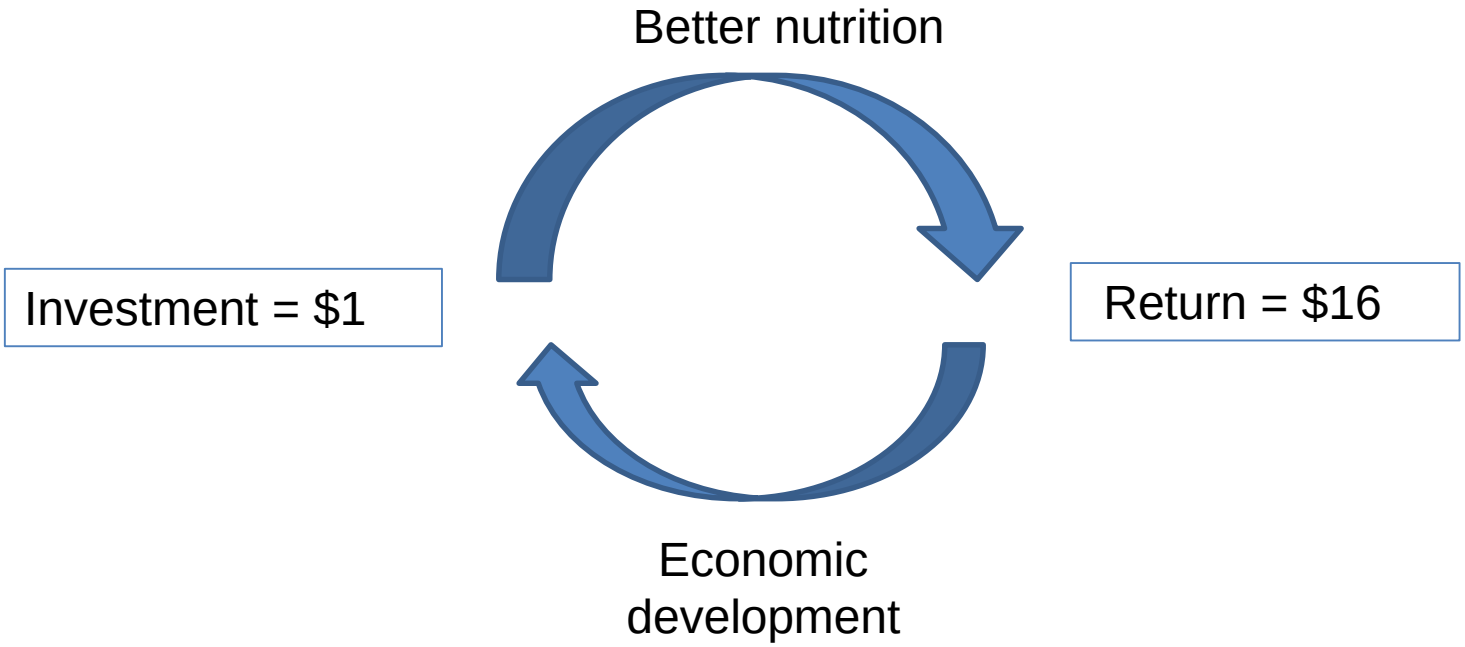
They are five

TOM MAGUIRE/RESULTS

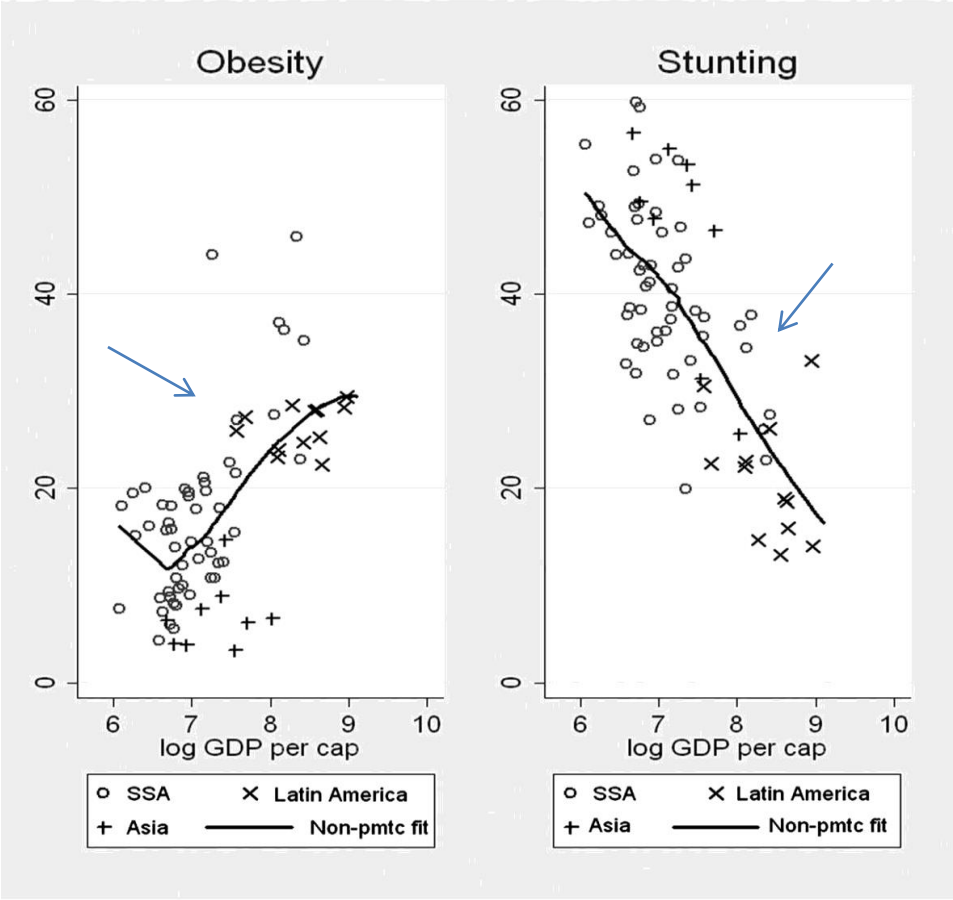
Weber, Lauren. 2016. "Two Boys With The Same Birth Story Will Live Vastly Different Lives."
The Huffington Post, June 29.

Improved nutrition drives economic growth



Sources:
Global Nutrition Report (2016); John Hoddinott, "The economics of reducing malnutrition in Sub-Saharan Africa," May 13, 2016, produced for the Global Panel on Agriculture and Food Systems for Nutrition.

Malnutrition has two faces



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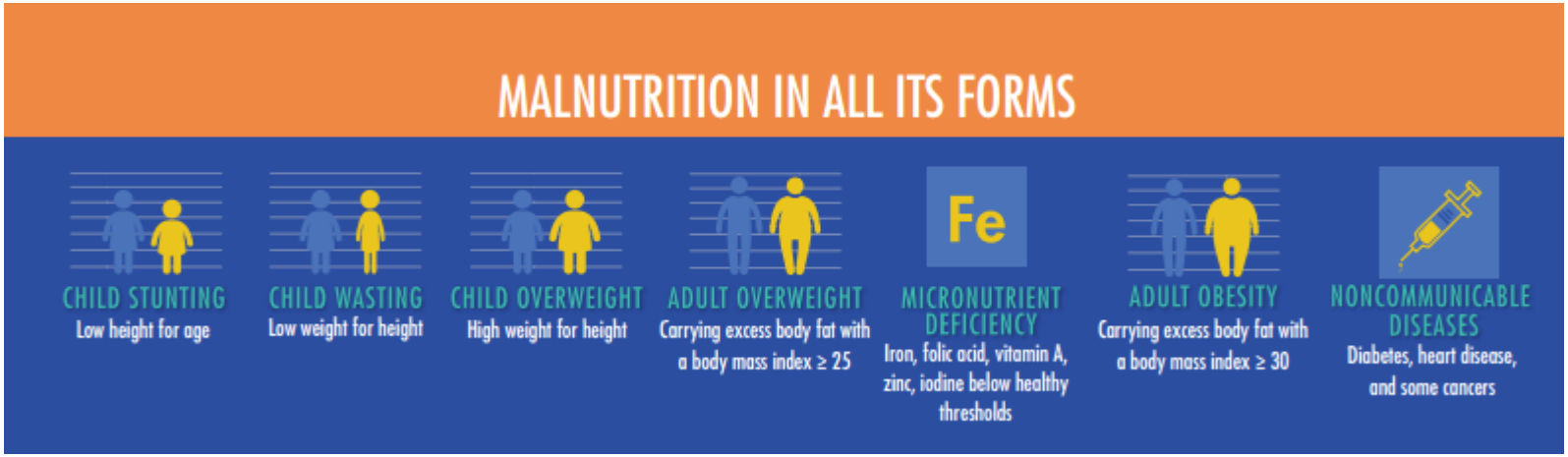
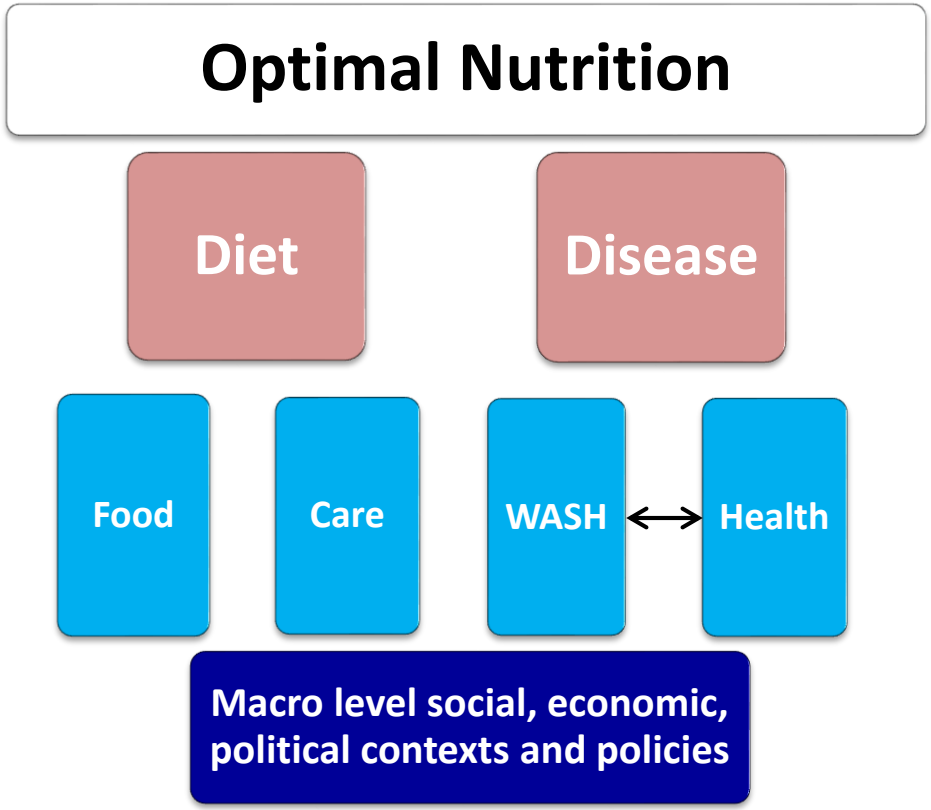
Patrick Webb, and Steven Block PNAS 2012;109:12309-12314

Forms of malnutrition



Source: Global Nutrition Report, 2016

Conceptual framework for nutrition



Adapted from: *Improving Child Nutrition: The achievable imperative for global progress, United Nations Children's Fund (UNICEF).* April 2013; USAID Multi-Sectoral Nutrition Strategy, 2014-2025

Nutrition-sensitive programming

- Scaling up of ten core nutrition interventions to 90% coverage may result in only a 20% reduction in stunting in the 34 countries where 90% of world's undernutrition is concentrated (Lancet 2013).
- Underlying contributors to undernutrition must also be addressed → Need multi sectoral efforts and approaches

How can the agriculture sector contribute?

How does agriculture affect nutrition?

Food consumed

- Calories
- Protein
- Micronutrients

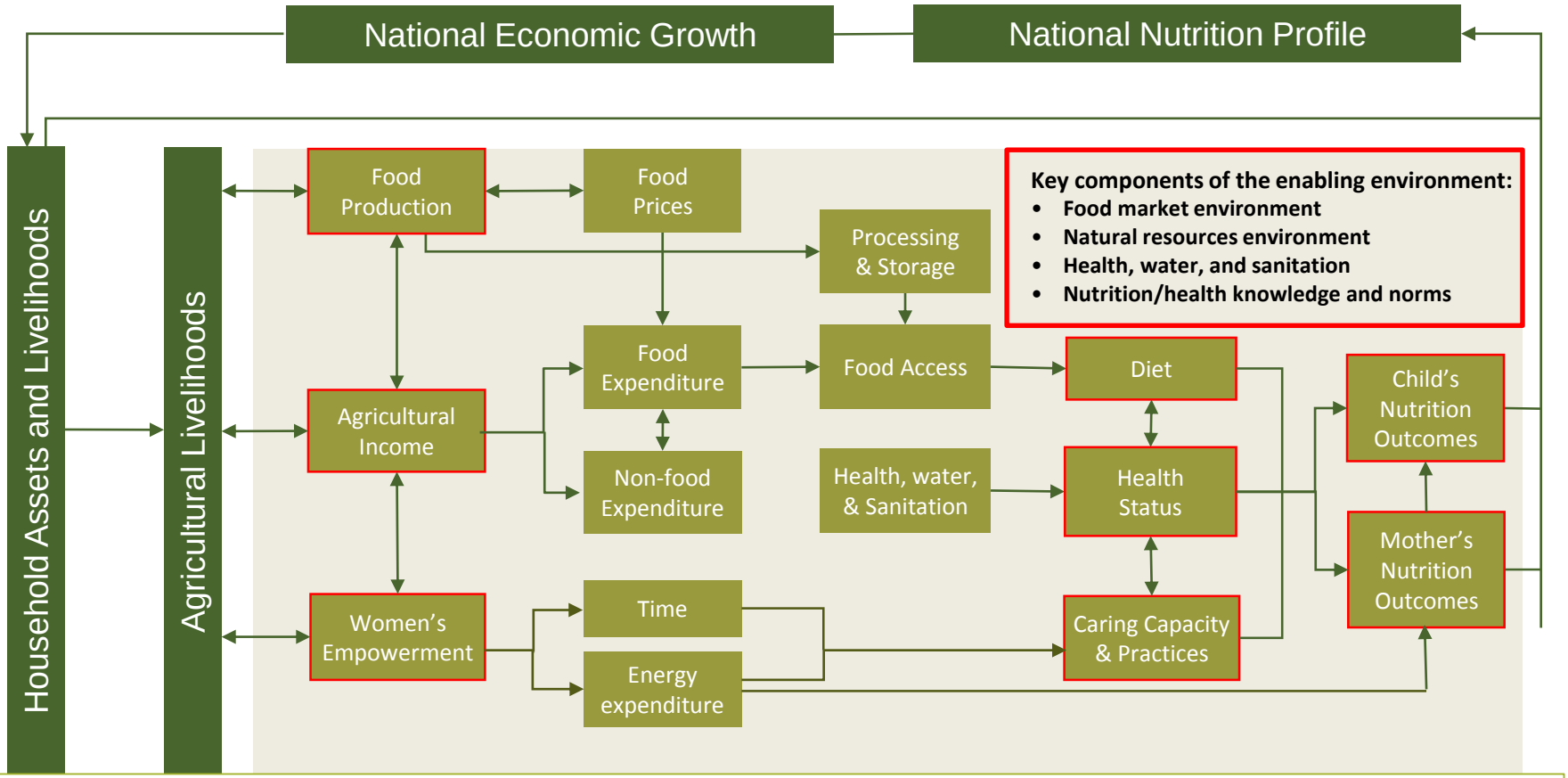
Farm income invested in…

- Diverse diet and nutrient-rich foods
- Health and WASH services and products

Gender in agriculture

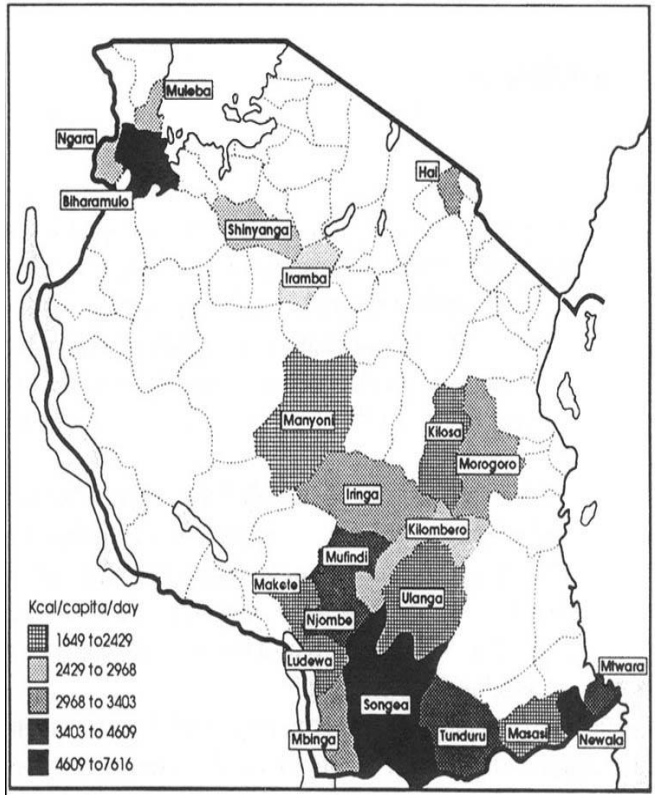
- Maximizing women's control of income
- Managing demand of women's time and energy

Agriculture-to-Nutrition Pathways

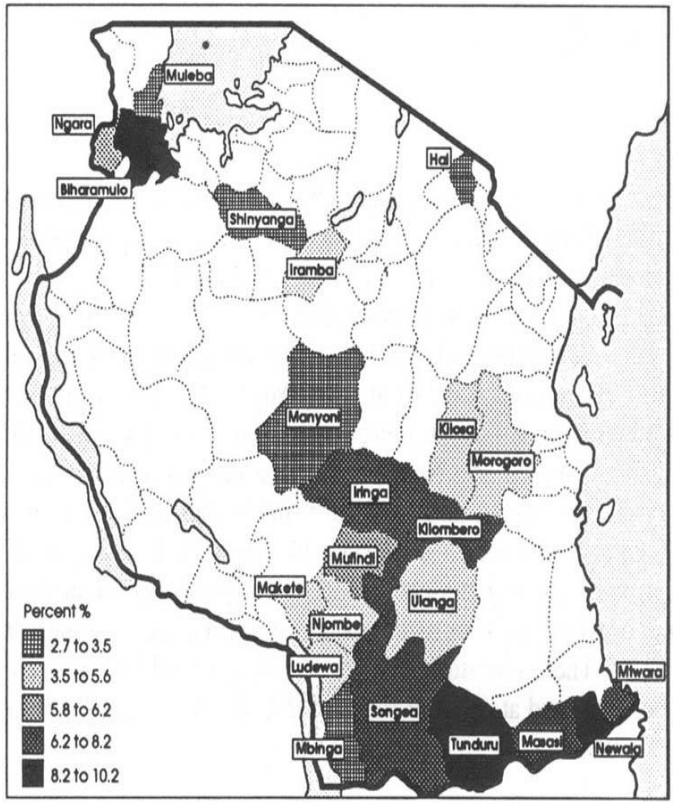


1. Headey, D., Chiu, A., & Kadiyala, S. (2011). Agriculture's role in the Indian enigma: Help or hindrance to the undernutrition crisis?: IFPRI discussion paper 01085. Washington, DC: IFPRI.
2. Kadiyala S, Harris J, Headey D, Yosef S, Gillespie S., Agriculture and nutrition in India: mapping evidence to pathways., Ann N Y Acad Sci. 2014 Dec;1331:43-56.

High agricultural production and malnutrition can be counter-intuitive



Food production in Tanzania



Prevalence of malnutrition in Tanzania

http://www.unsystem.org/SCN/archives/tanzania/ch09.htm

Agriculture as a source of food: Homestead food production

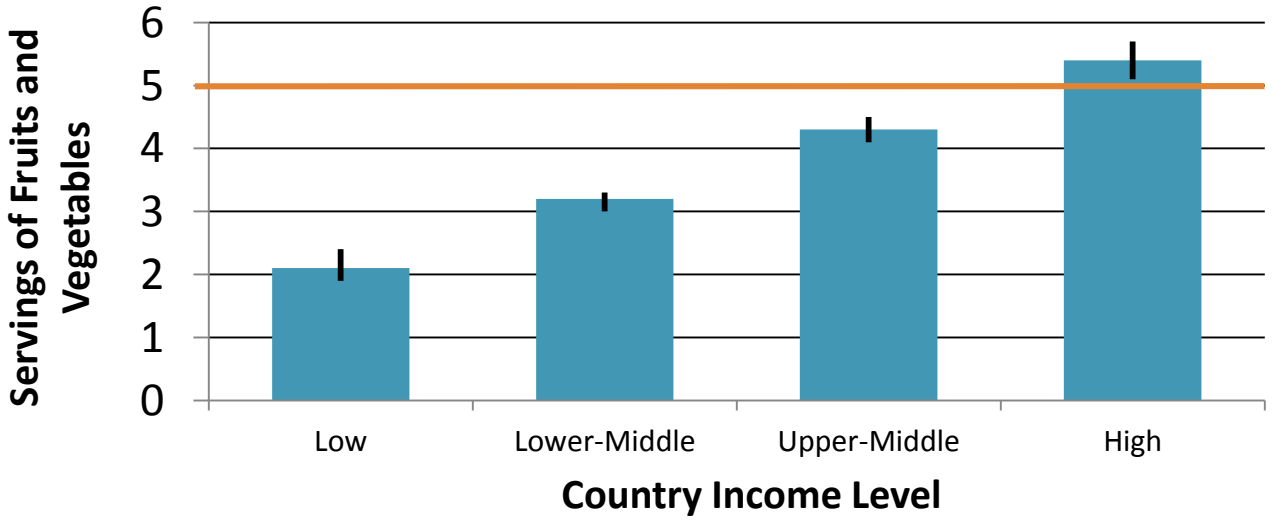
- Producer households more likely to consume a diversity of foods than non-producing households
- Home production associated with better household and women's dietary diversity; **however** market access may play a more important role in dietary quality
- Production decisions influenced by market prices, relative costs and risks, productive assets, preferences, and cultural norms
- Processing and storage impact food access and nutrient content

Agriculture as a source of income

- Improved year-round income to meet household needs, including diverse, nutritious foods, and health care
- Assumes nutritious foods and health services are accessible and affordable – reflects the importance of generating demand for nutritious foods to stimulate timely supply

Cost of good nutrition

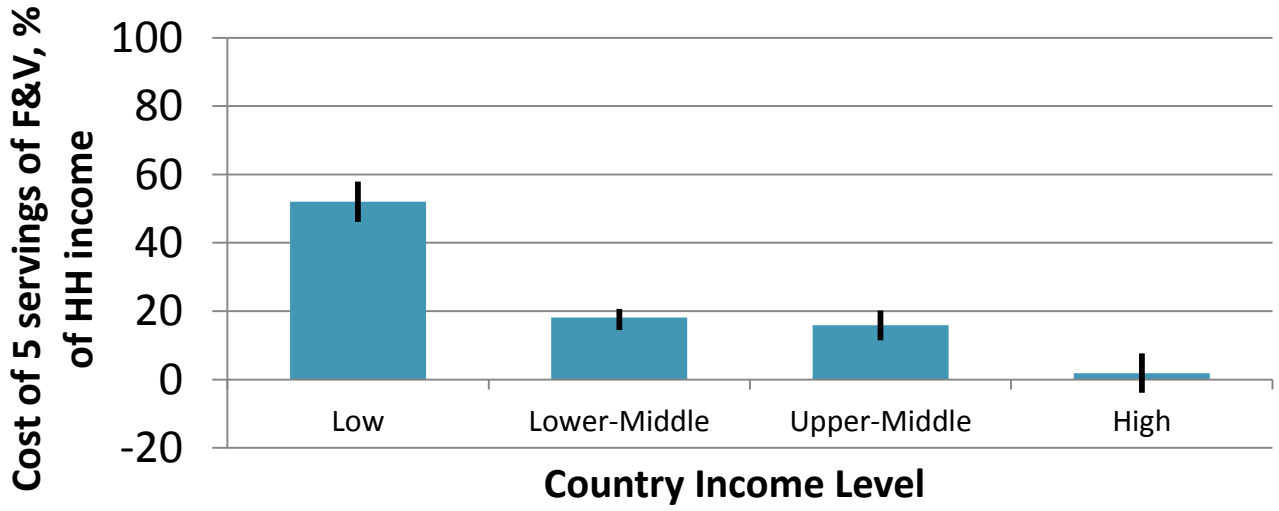
Only individuals in high-income countries consume the recommended 5 servings of fruits and vegetables



(Miller et al. 2016)

Cost of good nutrition

Households in low-income countries pay more for fruits and vegetables than those in HICs.



(Miller et al. 2016)

Agriculture affects gender

Control over assets and use of income

- Women's control lead to better diets for women and children

Time use & childcare

- Tension between earning income and childcare

Female energy expenditure

- Physical work compromises pregnancy and lactation nutrition

Food Systems

Food system challenges

- Unsustainable use of resources – fossil fuels, water, soil, agro-chemicals
- Huge contribution to greenhouse gas emissions through agri-food system
- Degradation of biodiversity – both wild and agro-biodiversity
- Enormous food wastage
- Poor nutritional quality of food
- Food distribution: skewed & unequal

Changes that can be made in food systems to achieve dietary goals: Examples…

Dietary Goal	Food System Elements		
	Food Production	**Food Storage, Transport and Distribution**	**Food Packaging and processing**
Increase fruit and vegetable consumption	Invest in mixed and integrated cropping systems, especially where markets are poorly developed	Invest in distribution infrastructure to strengthen local markets; develop public procurement mechanisms to ensure fruits and vegetables are served in public institutions	Develop microenterprises for local processing to reduce waste
Increase legumes/pulses consumption	Improve varieties to boost yields	Train farmers on management practices to reduce loss during storage to insect damage or improper drying	Develop quick-cooking bean flours.
Increase consumption of higher protein grains, micronutrients and fiber	Incentivize production of underutilized grains; promote biofortification using conventional breeds	Develop more efficient threshing and milling technologies for underutilized grains	Set standards and marketing incentives for use of whole grains in processed food products; develop novel food with underutilized species.
Encourage balanced consumption of safe milk and dairy products	Improve availability of animal health services; ensure women can have title to or, at least, some say in decisions about the animals they milk and care for	Invest in infrastructure to ensure safe transport of milk from farm to cooling center	Train milk processors in food safety and quality assurance.
Replace saturated and trans fats with unsaturated fats	Switch investments in palm oil to oils with healthier fatty acid profiles	Encourage cooperatives between healthier oil producers and consumers to lower prices.	Prohibit or disincentivize public investment in facilities producing hydrogenated oils.
Reduce consumption of high calorie, nutrient poor sugary drinks and salty snacks	Use competition laws to combat excessive concentration in the agribusiness sector	Tax transportation of high-calorie, nutrient-poor sugary drinks and salty snacks	Mandate downsizing of all package sizes of sugar-sweetened beverages sold through retail outlets

Adapted from information in Anand et al (2015); Bereuter and Glickman (2015); de Schutter (2014), Fanzo et al (2013); FAO (2013); Global Panel on Agriculture and Food Systems for Nutrition (2014); Hawkes and Ruel (2015); Nugent (2011); UNSCN (2014).

In summary

To maximize nutrition outcomes from food systems:

- Increase and diversify food and income sources
- Promote the use of income for nutrition-related food and non-food needs
- Support gender-equitable roles and responsibilities in use of HH income
- Strengthen institutional frameworks and government policies to make key nutritious foods more affordable
- Target nutrition-sensitive interventions – know the context

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Thank you!

For more information, visit:
www.spring-nutrition.org

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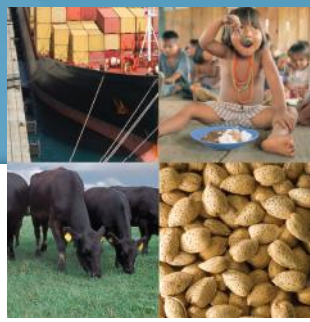

USDA Food & Nutrition Service
Domestic Nutrition Assistance Programs

Stella Nash, R.D., M.A.
Regional Nutrition Director
USDA FNS Mountain Plains Regional Office
Denver, Colorado
October 2016

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United States Department of Agriculture

Secretary of Agriculture

↓

Under Secretary of Food, Nutrition and Consumer Services

↓

Deputy Under Secretary

↓

Administrator

↓

Regional Offices:

MARO	MPRO	MWRO	NERO	SERO	SWRO	WRO
NJ	CO	IL	MA	GA	TX	CA

Food, Nutrition, and Consumer Service (FNCS)

- **Food and Nutrition Service (FNS)**
  and
- **Center for Nutrition Policy and Promotion (CNPP)**

FNCS Vision: To End Hunger and Improve Nutrition in America

Food and Nutrition Service

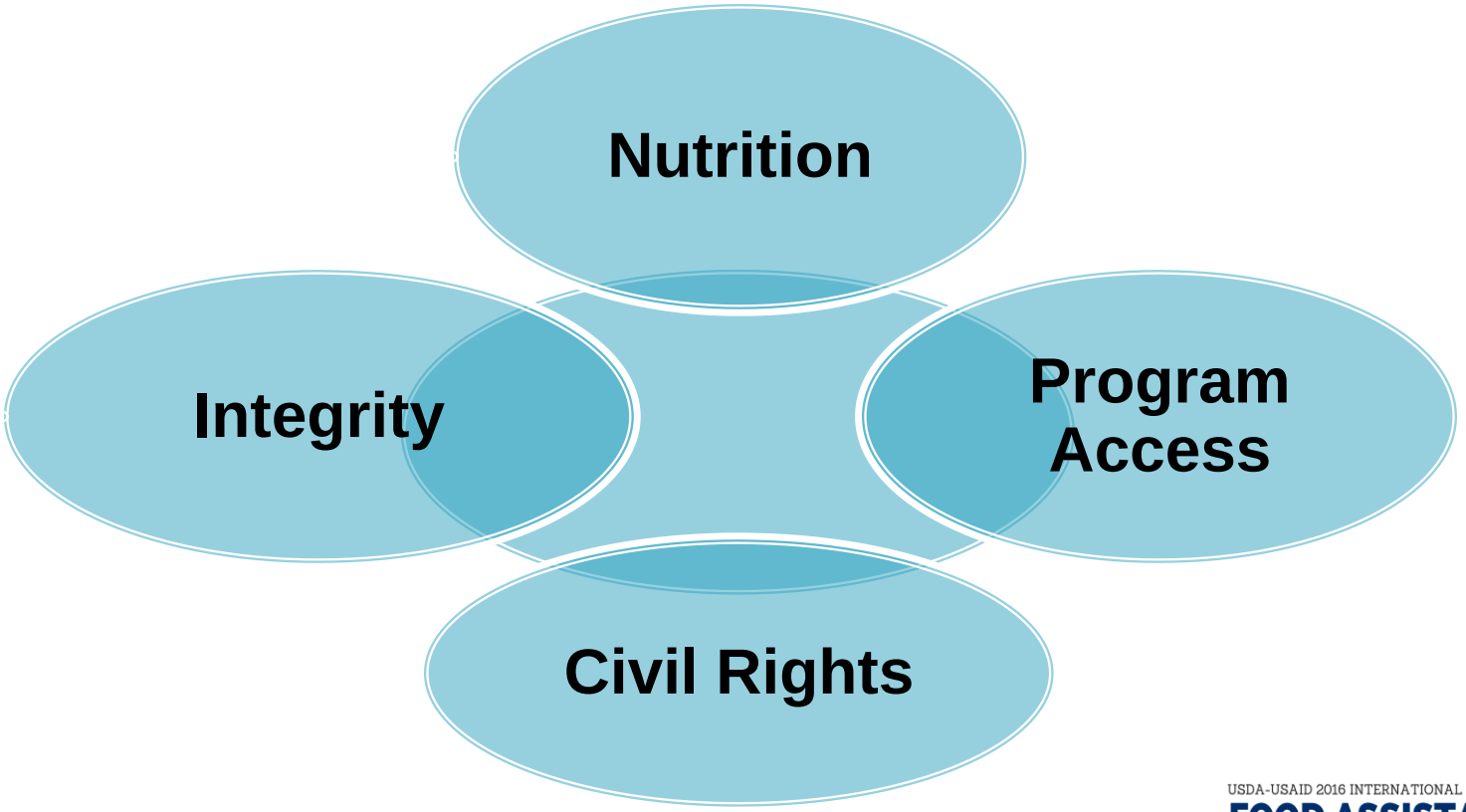
Mission:

We work with partners to provide food and nutrition education to people in need in a way that inspires public confidence and supports American agriculture.

USDA – FNCS Key Priorities

- **Help Americans Eat Smart and Maintain Healthy Weight**
- **Preserve Public Trust in Our Programs**
- **FNCS is an Efficient, High Performing and Adaptable Organization**
- **Reduce Food Insecurity by Helping Feed those in Need**
- **Civil Rights – Ensuring Access, Equality and Respect in FNS Programs and Activities**

FNS Program Priorities



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Food & Nutrition Service
Administers 15 Nutrition Assistance Programs
One in four people are touched by FNS Programs

School Lunch

SNAP Supplemental Nutrition Assistance Program

USDA FOODS
HEALTHY CHOICES
AMERICAN GROWN

Summer Food Service Program
USDA

Women, Infants and Children (WIC)

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Supplemental Nutrition Assistance Programs (SNAP)

The Cornerstone Program:

- **Employment and Training**
- **SNAP ED**
- **Disaster SNAP**
- **Farmers Markets**

Food and Nutrition Service

Child Nutrition Programs:

- School Breakfast Program (SBP)
- National School Lunch Program (NSLP)

-Afterschool Snacks
-Fresh Fruits and Vegetables Program
-Seamless Summer
-Special Milk Program

- Child and Adult Care Food Program (CACFP)
- Summer Food Service Program

Food and Nutrition Service

USDA Foods

- The Emergency Food Assistance Program (TEFAP)

- Commodity Supplemental Food Program (CSFP)
- Food Distribution Program on Indian Reservations (FDPIR)

- Nutrition Services Incentive Program (NSIP)

Food and Nutrition Service

- Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
- Farmers Market Nutrition Program (FMNP)
- Senior Farmers Market Nutrition Program

Food and Nutrition Service

Nutrition guidance and education are emphasized in all FNS Programs with the help of the Dietary Guidelines for Americans

The Dietary Guidelines for Americans are:

- Jointly published every five years by USDA and DHHS

- Designed for nutrition and health professionals to help individuals two years and older and their families to consume a healthy, nutritionally adequate diet

- Used by policy makers in developing federal food, nutrition and health practices and programs

- The basis for federal nutrition and education materials designed for the public and for nutrition education in USDA food programs and the DHHS

The Dietary Guidelines

1. Follow a healthy eating pattern across the lifespan
2. Focus on variety, nutrient density and amount
3. Limit calories from added sugars and saturated fats and reduce sodium intake
4. Shift to healthier food and beverage choices
5. Support healthy eating patterns

Impact

ChooseMyPlate.gov

- **Coordinated Messaging with Supporting Resources**

- **Interactive/Personalized Tools**

- **Social Media Engagement**

- **Partnerships**

CHOP CHOP

COOPERATIVE EXTENSION

Food and Nutrition Service

- Price Support & Surplus Removal
- Nutrition Education
- Economic Benefits
- State Nutrition Action Coalitions (SNAC)
- Tribal Nutrition Action Coalitions (TNAC)

United States Department of Agriculture

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Food and Nutrition Service Websites

United States Department of Agriculture

Foreign Agricultural Service

www.usda.gov

http://fncs/aboutFNCS

www.fns.usda.gov

www.ChooseMyPlate.gov

www.health.gov

www.nutrition.gov

www.LetsMove.gov

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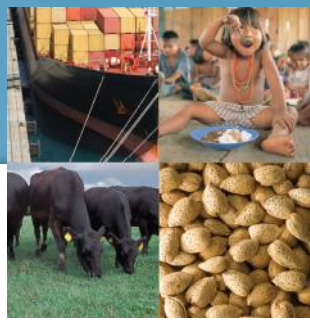

Biofortification: Better Crops, Better Nutrition

Howarth Bouis, Ph.D.

Founding Director, HarvestPlus

Date or other info

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Why are Mineral and Vitamin Deficiencies Such A Significant Public Health Problem?

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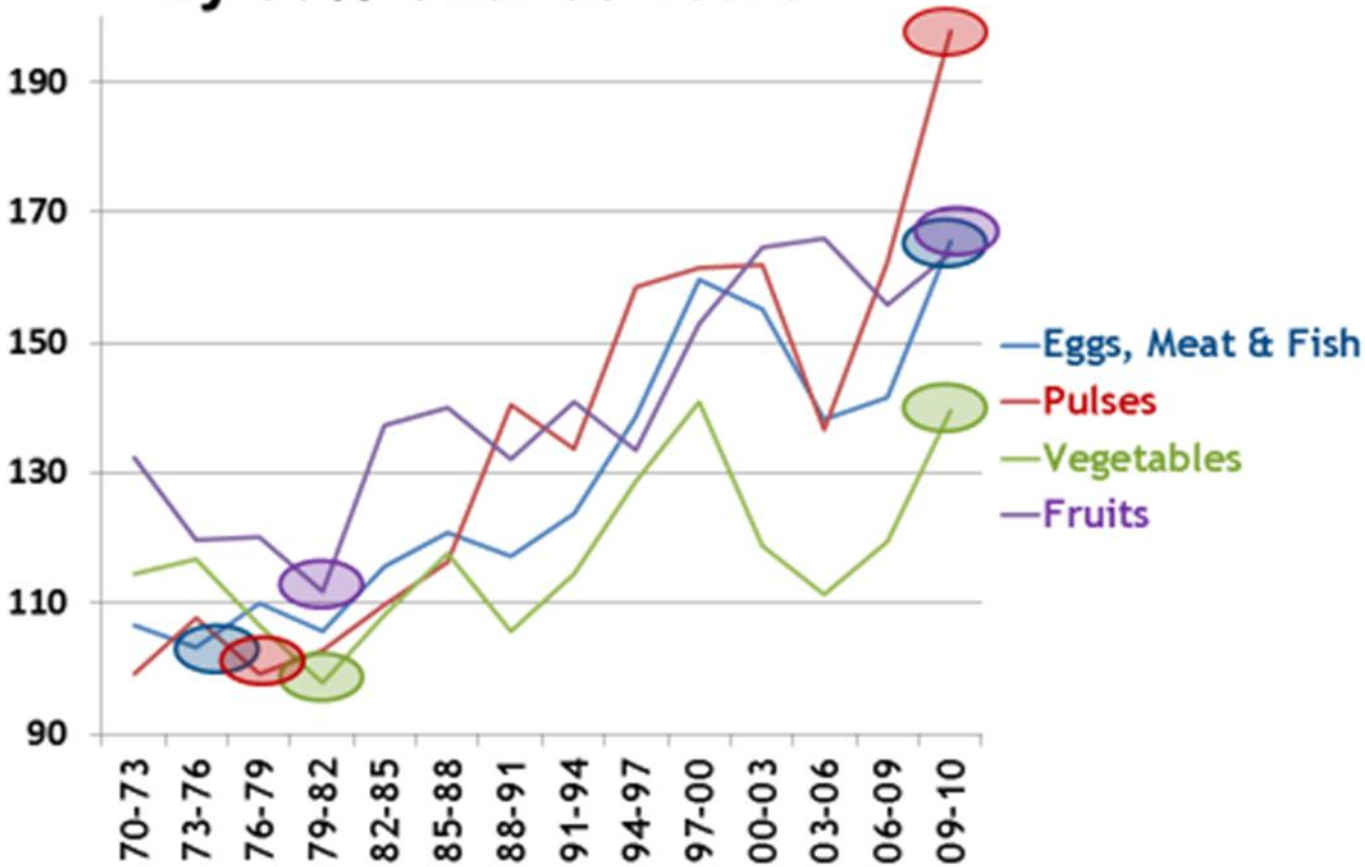
Non-Staple Food Prices in India Have Risen by 50% Over 30 Years



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Biofortified crops released in 30 countries

In-testing in another 25 countries

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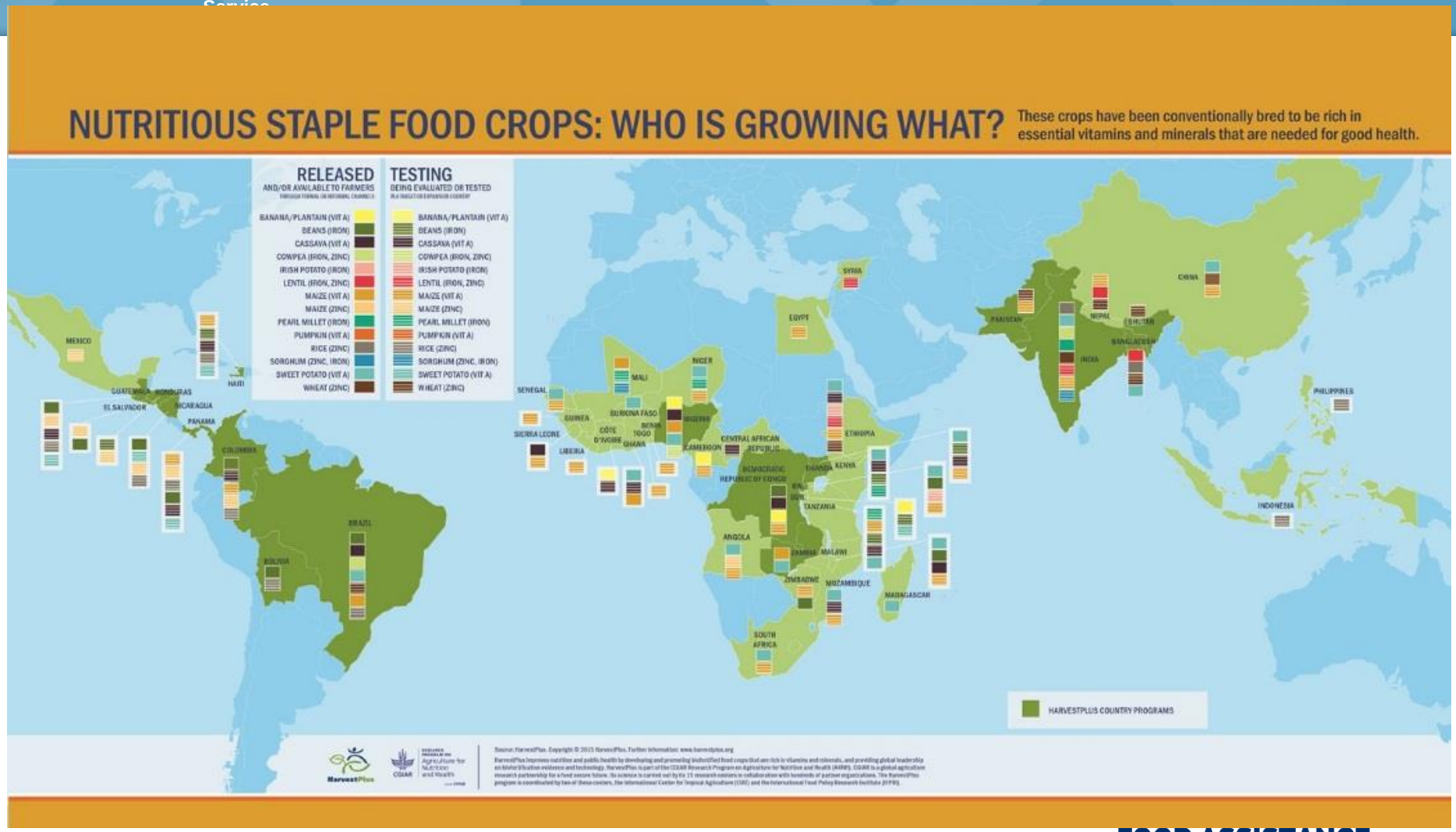
Biofortification: Global Momentum



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Nutritious crops released in 30 countries; in testing in another 25

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What is the Way Forward? Mainstreaming

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Thank You!

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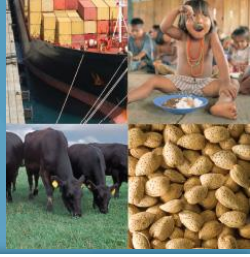
MICHIGAN STATE UNIVERSITY



West Africa Integrated Pest Management (IPM) Cowpea Program: Discovery pipeline to scaling

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This research/project was made possible through support provided by Feed the Future through the United States Agency for International Development (USAID), as part of, the U.S. Government's global hunger and food security initiative, under the terms of Cooperative Agreement No. EDH-A-00-07-00005-00. The opinions expressed herein are those of the authors and do not necessarily reflect the views of USAID or the U.S. Government.

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Cowpea

- Protein source
- Production limited by pest insect complex
- Challenges of pesticide use
- IPM strategies
  - Understanding systems
  - Developing solutions
  - Scaling strategies

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Solutions

- **Discovery**
  - Understanding pest biology leads to discovery of effective solutions
- **Solutions**
  - Biocontrol agents
  - Biopesticides
  - Educational solutions
  - Other
- **Scaling of Solutions**
  - Systems approaches

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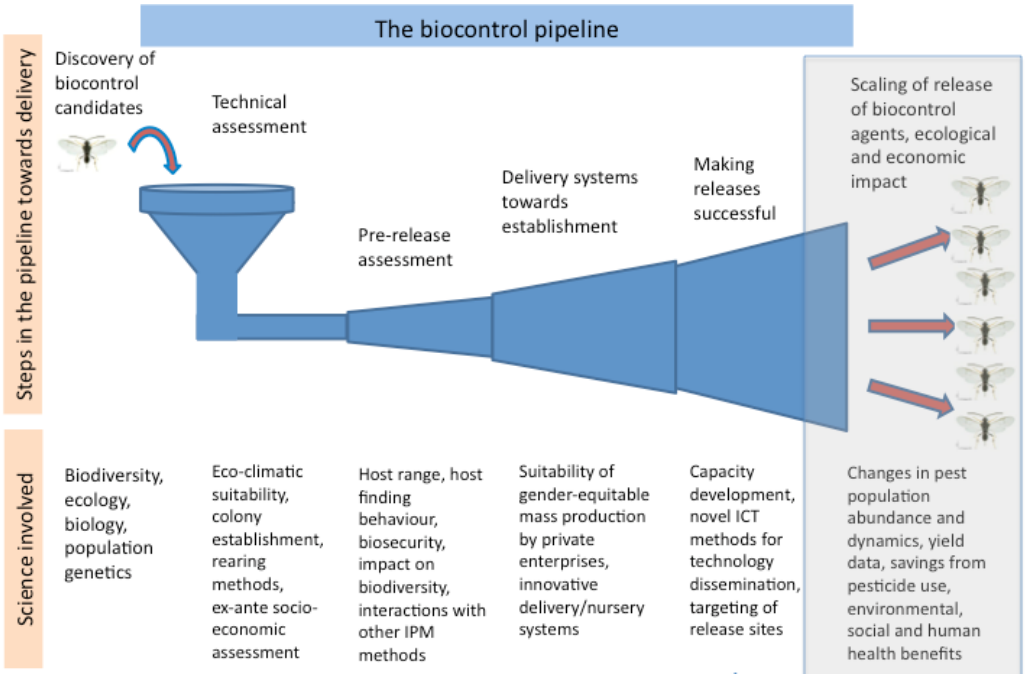
Solutions

- **Biocontrol agent pipeline – all pests of cowpea**



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Solutions

- Discovery of natural enemies
- Assessing their performance using a biocontrol pipeline
- After 2 years of confined testing
  - First experimental releases of the parasitic wasps (parasitoids) *Therophilus javanus* (32,000) and *Phanerotoma syleptae* (17,000)
  - Benin and Burkina Faso

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Solutions

- **Farmer-based interventions - Biopesticides**

Treatment	1st rainy season Cowpea yield kg/ha
Unsprayed control	522,95 ± 28,20a
Chemical control (Decis®)	868,62 ± 68,09b
Neem oil	826,42 ± 52,80b
Jatropha oil	867,90 ± 28,29b
MaviMNPV	875,12 ± 47,83b
Neem oil+ MaviMNPV	1082,10 ± 58,78c
Jatropha oil + MaviMNPV	1096,30 ± 26,05c

Neem oil made in Benin

Pod borer specific virus

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Business Model #1: Social Enterprise

Biopesticide Value Chain
(Bio-Phyto, Glazoue, Benin)

- **130 tons of neem seeds collected per year**
  - 800 women
- **Neem oil extraction**,
  - 500 liters per week
- **Biofertilizers**
  - Useful and income-generating by-products
  - Nematicidal effect
  - Over 110 tons sold
  - Supply cannot cover demand

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Business model #2: Community-based production

Viral Biopesticide

- Women and youth groups mass-produce *Maruca vitrata*, infest larvae with the virus
- Sell the dead larvae to the social enterprise for extraction, purification, and use
- Training and compliance with regulatory requirements

Training session with women and youth participants

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Farmer Interventions in IPM

- **Need scalable educational strategies**
- **Strategies that can be passed off to partner groups**
  - Easy to use and deploy
  - Expert knowledge to end user
  - Local language
  - Scalable in a highly cost-effective manner

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Knowledge Chains

Scientific Animations Without Borders

Experts | **Content** | **Scalable Deployment Strategies** | **End Users**

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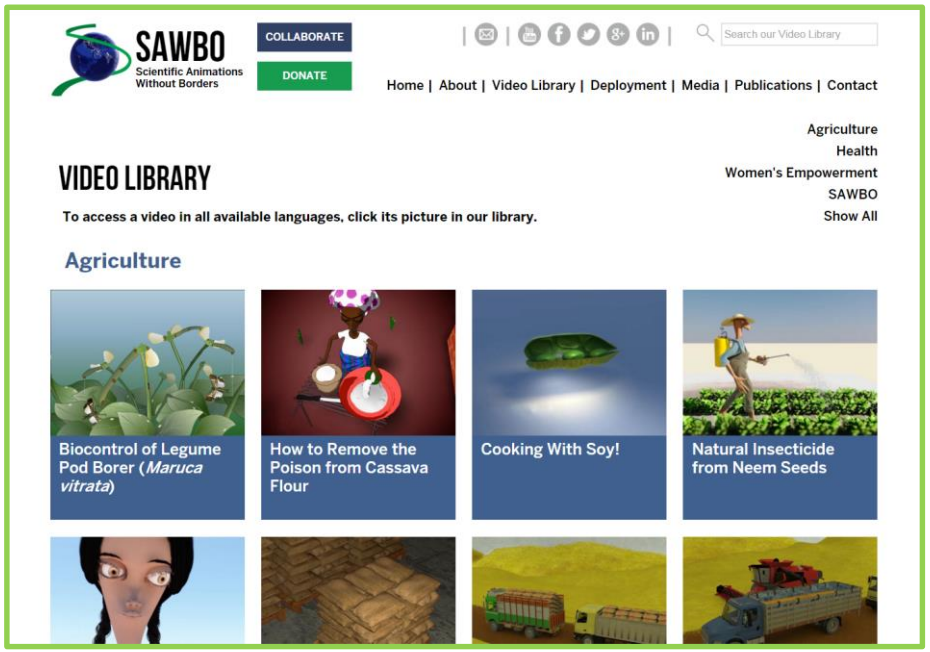
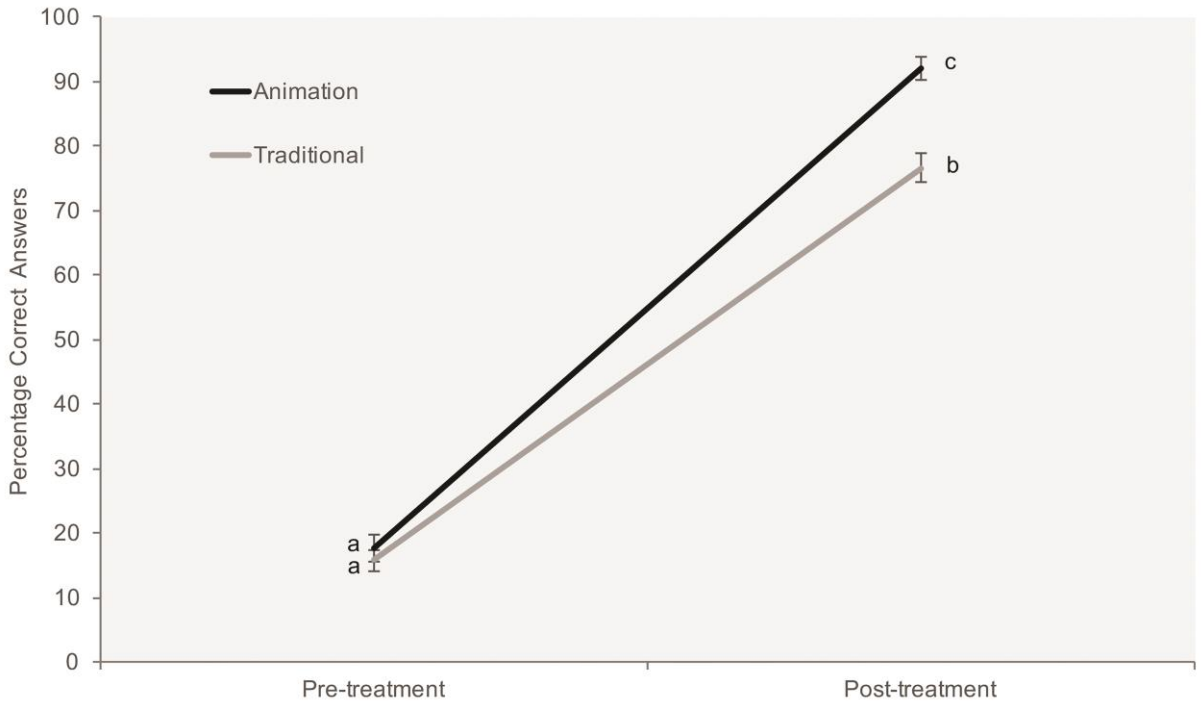
Highly accessible content



- Field pest control strategies (e.g., neem and biocontrol) and storage solutions for cowpea pest management

Studies on Educational Content

- Content acceptability studies
- Learning gains studies across multiple countries
- Adoption, long-term retention, and economic studies in progress



(Studies have been performed in collaboration with ISU, MSU, IITA, INERA, INRAN, ASTU, IIAM, etc.)

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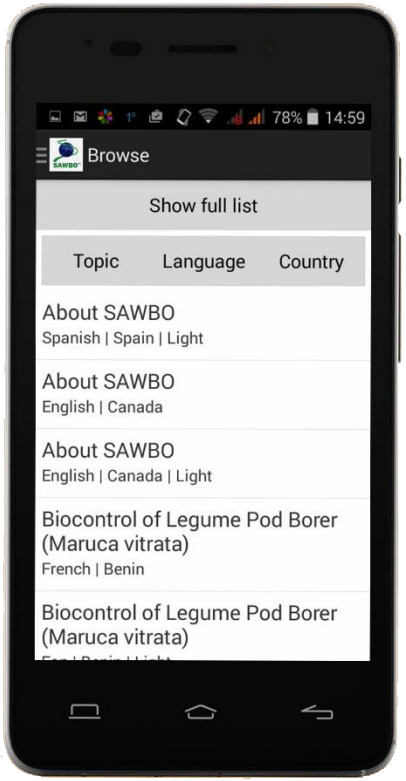
Accessible and scalabe content



- Systems of pass-off to other groups
- Broadly applicable beyond cowpea IPM
- SAWBO system used by the WHO, Ministries of Health and Agriculture, NGOs, "NGOs of one", global TV stations, US-based programs, etc.
- Famers Interface App

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MICHIGAN STATE UNIVERSITY

2016 INTERNATIONAL YEAR OF PULSES

Research to Deployment - Sustainable and Scalable IPM Solutions

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