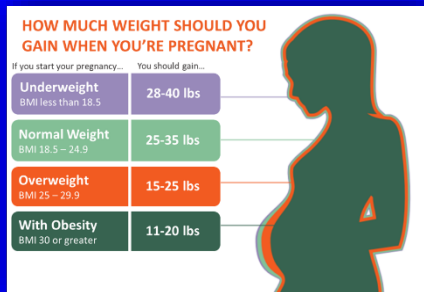# Systems Changes for Improving Maternal Nutrition During Pregnancy and Lactation Among U.S. Women

Rafael Pérez-Escamilla, PhD
Professor of Public Health
Director, Office of Public Health Practice & Global Health
Yale School of Public Health

HOW MUCH WEIGHT SHOULD YOU GAIN WHEN YOU'RE PREGNANT?

If you start your pregnancy... You should gain...

Underweight BMI less than 18.5	28-40 lbs
Normal Weight BMI 18.5 – 24.9	25-35 lbs
Overweight BMI 25 – 29.9	15-25 lbs
With Obesity BMI 30 or greater	11-20 lbs

Nutrition During Pregnancy and Lactation:
Exploring New Evidence
NASEM, Washington DC, January 30, 2020

@rperezescamilla

Takeaways

- Strong socio-economic inequities exist
- Social injustice is the main cause of these inequities
- Solutions need to be based on systems thinking across the life course
  - Intentional and assertive efforts to include equity principles throughout (design to evaluation)
- Moving forward systems-oriented research and modelling is needed
 - strong emphasis on implementation science

Strong socio-economic inequities exist: Women's Overweight/Obesity

Observed prevalence and adjusted odds and prevalence of pre-pregnancy overweight or obesity (BMI ≥ 25) among women in 31 ethnic-immigrant groups, United States, 2012–2014 ($N = 10,431,092$)

Ethnic-immigrant group	Prevalence percent	Prevalence ratio	Model 1[1]			Model 2[2]			Covariate-adjusted	
			OR	95% CI		OR	95% CI		Prevalence	SE
Non-Hispanic white, US-born	47.06	1.00	1.00	Reference		1.00	Reference		47.17	0.02
Non-Hispanic black, US-born	61.70	1.31*	1.81	1.81	1.82	1.84	1.83	1.85	61.66	0.05
American Indian/Alaska Native	61.69	1.31*	1.81	1.79	1.84	1.71	1.69	1.73	60.01	0.16
Mexican, US-born	58.45	1.24*	1.58	1.57	1.59	1.73	1.72	1.73	60.22	0.06

Singh, DiBari. J Obesity (2019)

Strong socio-economic inequities exist: Breastfeeding

A Ever breastfeeding by birth year and race/ethnicity

Legend: HP2020, Hispanic, White, Black, Asian, AIAN
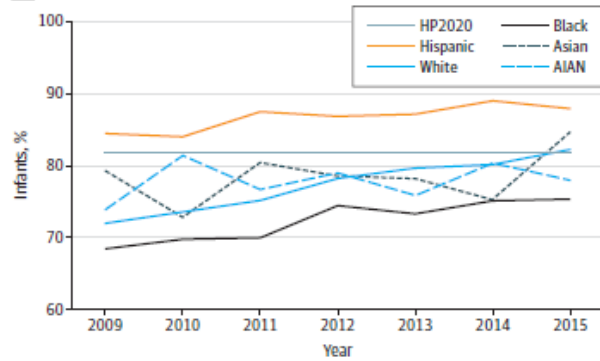
B Exclusive breastfeeding through 6 mo by birth year and race/ethnicity
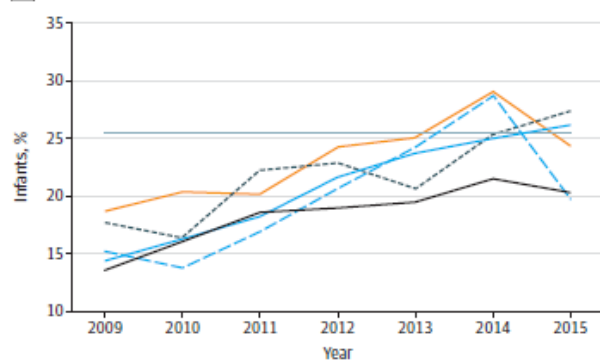
C Breastfeeding continuation at 12 mo by birth year and race/ethnicity
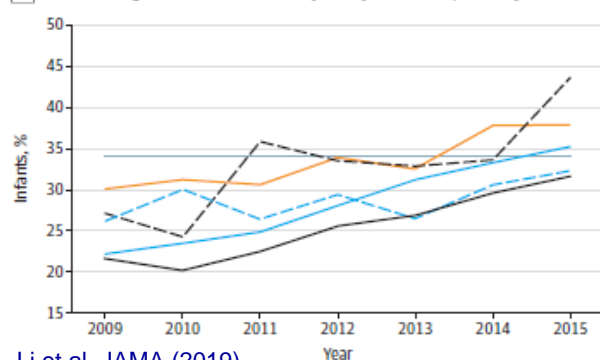
Li et al. JAMA (2019)

% ever breastfed (2013)

Less than high school	69.3%
High school	71.2
Some college	83.6
College graduate	92.2

% breastfed at 6 months (2013)

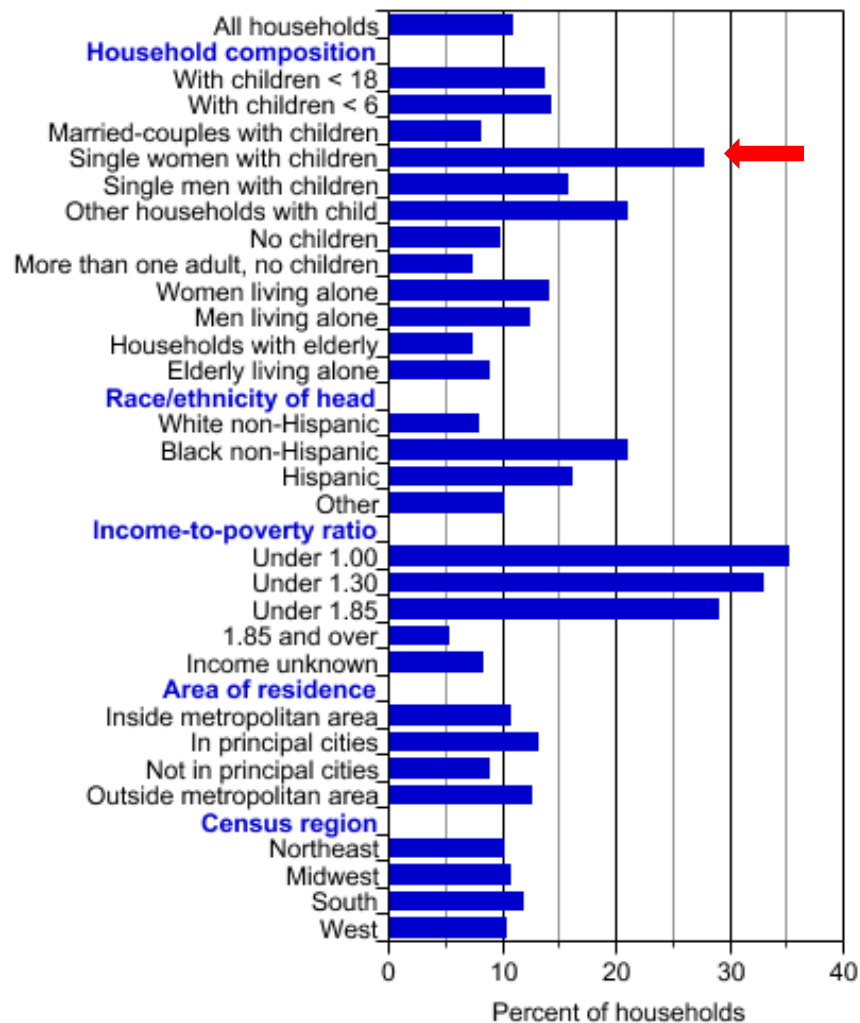|	
Less than high school	37.9%
High school	38.9
Some college	48.7
College graduate	70.1
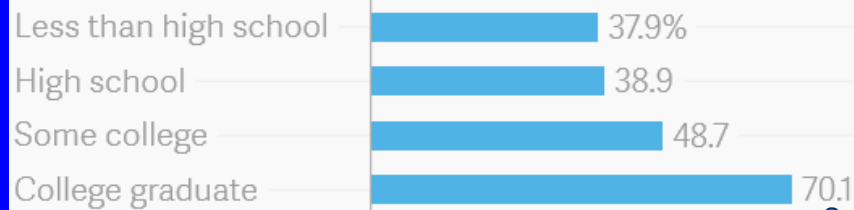
Source: CDC

Strong socio-economic inequities exist: Household Food Insecurity

Prevalence of food insecurity, 2018

Categories (top to bottom):
- All households
- **Household composition**
  - With children < 18
  - With children < 6
  - Married-couples with children
  - Single women with children
  - Single men with children
  - Other households with child
  - No children
  - More than one adult, no children
  - Women living alone
  - Men living alone
  - Households with elderly
  - Elderly living alone
- **Race/ethnicity of head**
  - White non-Hispanic
  - Black non-Hispanic
  - Hispanic
  - Other
- **Income-to-poverty ratio**
  - Under 1.00
  - Under 1.30
  - Under 1.85
  - 1.85 and over
  - Income unknown
- **Area of residence**
  - Inside metropolitan area
  - In principal cities
  - Not in principal cities
  - Outside metropolitan area
- **Census region**
  - Northeast
  - Midwest
  - South
  - West

Percent of households (x-axis 0 to 40)

Source: USDA, Economic Research Service, using data from the December 2018 Current Population Survey Food Security Supplement.

Prevalence of very low food security, 2018

Categories (top to bottom):
- All households
- **Household composition**
  - With children < 18
  - With children < 6
  - Married couples with children
  - Single women with children
  - Single men with children
  - With no children < 18
  - More than one adult
  - Women living alone
  - Men living alone
  - With elderly
  - Elderly living alone
- **Race/ethnicity of head**
  - White non-Hispanic
  - Black non-Hispanic
  - Hispanic
  - Other
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  - South
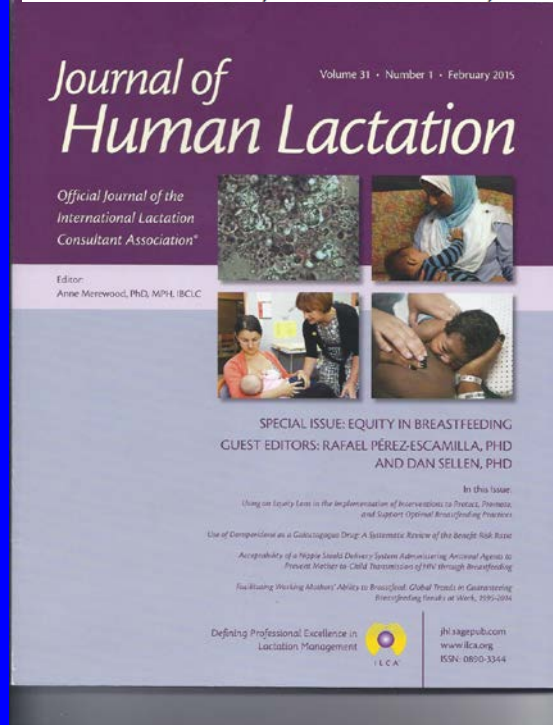 - West

Percent of households (x-axis 0 to 20)

Note: Prevalence of very low food security in other households with children is not reported; fewer than 10 households in the survey with this characteristic had very low food security.

Source: USDA, Economic Research Service, using data from the December 2018 Current Population Survey Food Security Supplement.

Social injustice is the main cause of inequities

Equity in Breastfeeding: Where Do We Go from Here? *JHL Feb 2015*
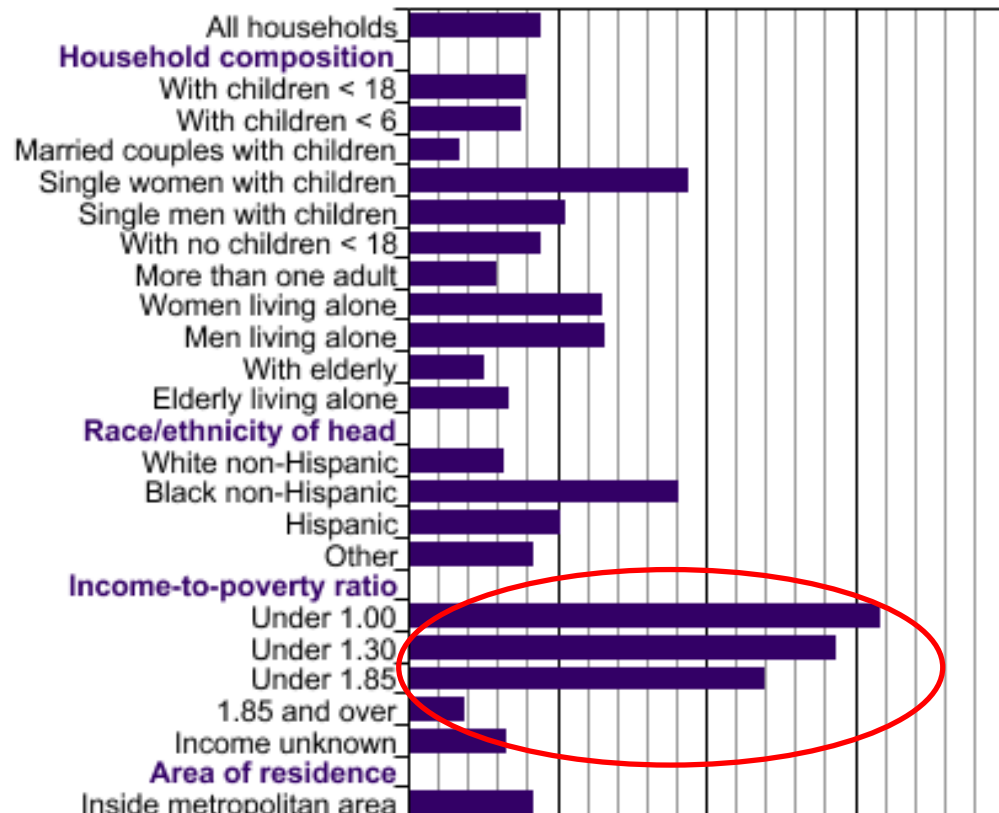
Rafael Pérez-Escamilla, PhD[1] and Dan Sellen, PhD[2]

Journal of Human Lactation

Volume 31 · Number 1 · February 2015

Official Journal of the International Lactation Consultant Association®

Editor: Anne Merewood, PhD, MPH, IBCLC

SPECIAL ISSUE: EQUITY IN BREASTFEEDING
GUEST EDITORS: RAFAEL PÉREZ-ESCAMILLA, PHD AND DAN SELLEN, PHD

VIEWPOINT Perinatal Origins of Cardiovascular Health Disparities Across the Life Course

JAMA Pediatrics Published online December 9, 2019

'Racial/ethnic disparities in CVD and its risk factors may also be related to similar disparities that exist in the prevalence of preterm birth…The underlying reasons are not established [for the much higher incidence pf PT birth among African American women] but may involve the **effects of chronic psychosocial stress on neuroendocrine, inflammatory, and epigenetic mechanisms that are related to**

Prevalence of very low food security, 2018

Source: USDA ERS

Solutions need to be based on life course systems thinking
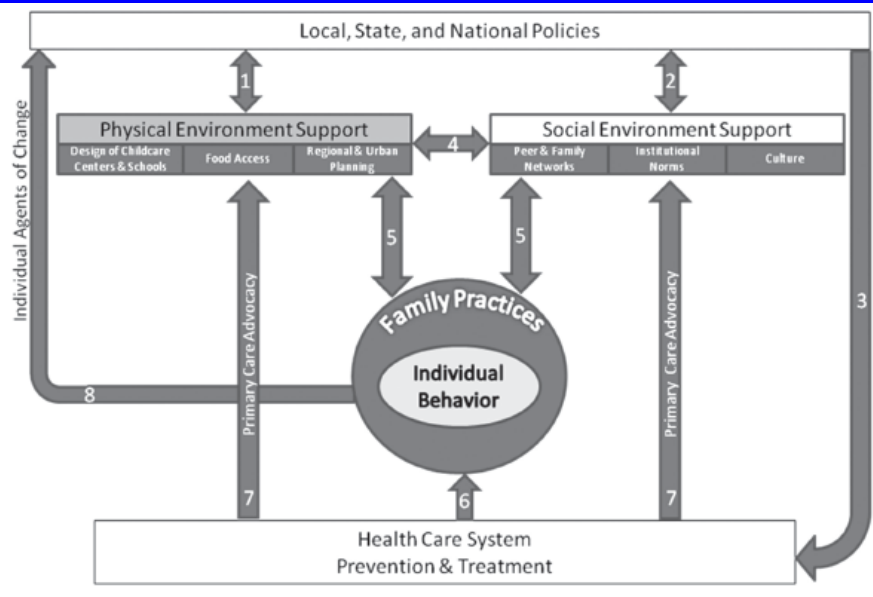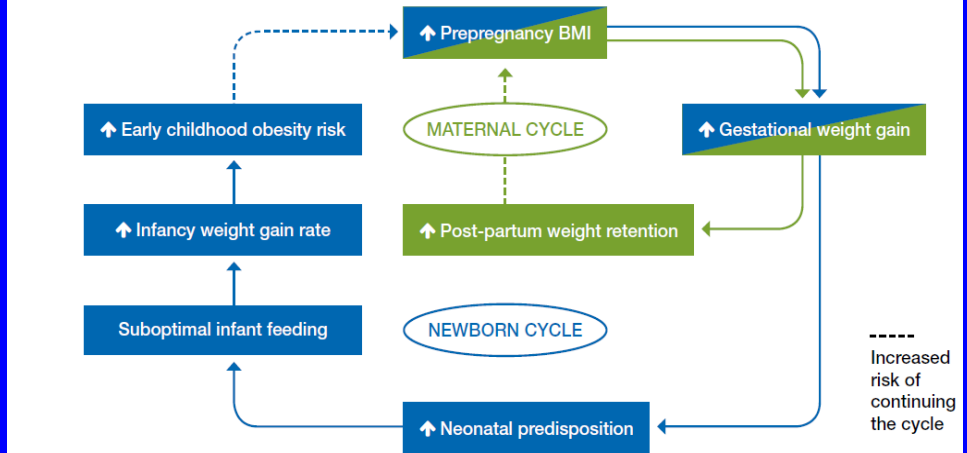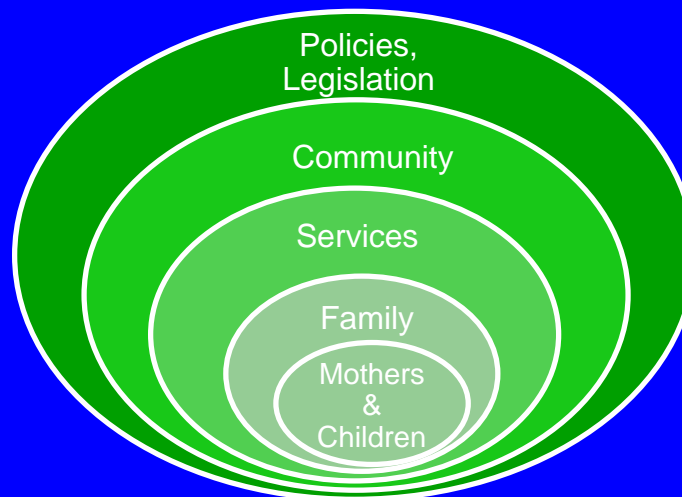# Embedded in socio-ecological model

Local, State, and National Policies

Individual Agents of Change

Physical Environment Support
- Design of Childcare Centers & Schools
- Food Access
- Regional & Urban Planning

Social Environment Support
- Peer & Family Networks
- Institutional Norms
- Culture

Primary Care Advocacy

Family Practices

Individual Behavior

Health Care System
Prevention & Treatment

Nader et al. childhood Obesity. June 2012 | Volume 8, Number 3

Figure 1. Maternal-child life-course obesity framework

↑ Prepregnancy BMI

↑ Early childhood obesity risk   MATERNAL CYCLE   ↑ Gestational weight gain

↑ Infancy weight gain rate   ↑ Post-partum weight retention

Suboptimal infant feeding   NEWBORN CYCLE

↑ Neonatal predisposition

----- Increased risk of continuing the cycle

Note: From "Early life nutrition disparities: Where the problem begins?" by R. Pérez-Escamilla and O. Bermudez, 2012, *Adv Nutr, 3*, p. 72.[13] Reprinted with permission from author.

Policies, Legislation

Community

Services

Family

Mothers & Children

Community energy balance: A framework for contextualizing cultural influences on high risk of obesity in ethnic minority populations

Kumanyika et al, Prev Med (2011)
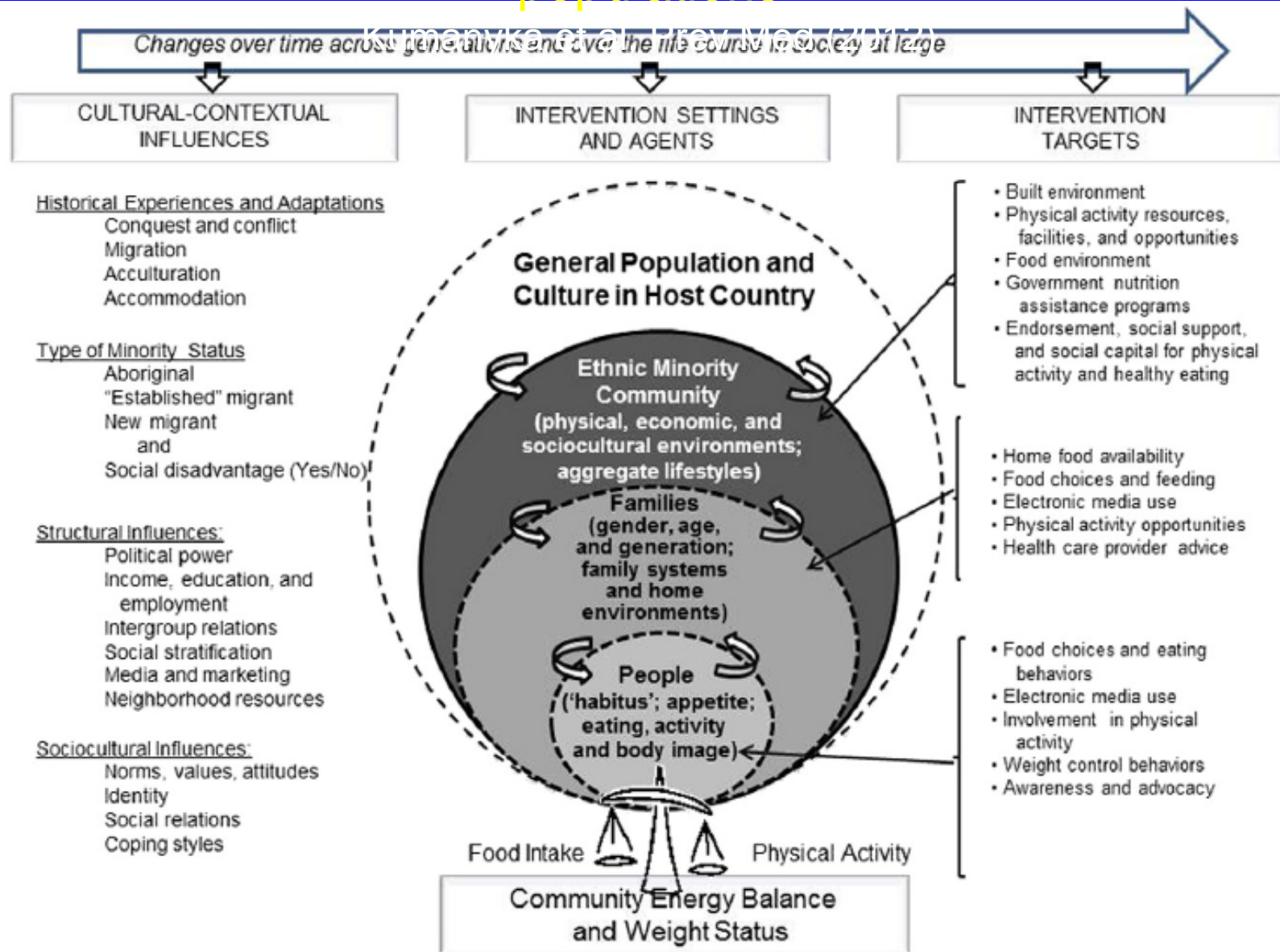
Example 1: Breastfeeding

Table 1. Crude Breastfeeding Rates Among 167 842 Children Born From 2009 to 2015[a]

Variable	Year of Birth, % (SE)							Slope[b]	P Value for Trend[b]
	2009	2010	2011	2012	2013	2014	2015		
Ever breastfeeding									
Total	76.1 (0.50)	77.0 (0.51)	78.8 (0.50)	80.5 (0.48)	81.1 (0.44)	82.2 (0.44)	83.2 (0.53)	1.22	<.001
Exclusive breastfeeding through 6 mo									
Total	15.7 (0.45)	17.4 (0.48)	19.0 (0.49)	22.3 (0.53)	23.3 (0.49)	25.7 (0.53)	24.9 (0.60)	1.74	<.001
Breastfeeding continuation at 12 mo									
Total	24.6 (0.51)	25.3 (0.55)	26.8 (0.55)	29.5 (0.56)	31.3 (0.52)	34.1 (0.55)	35.9 (0.67)	2.00	<.001

Li et al. JAMA (2019)
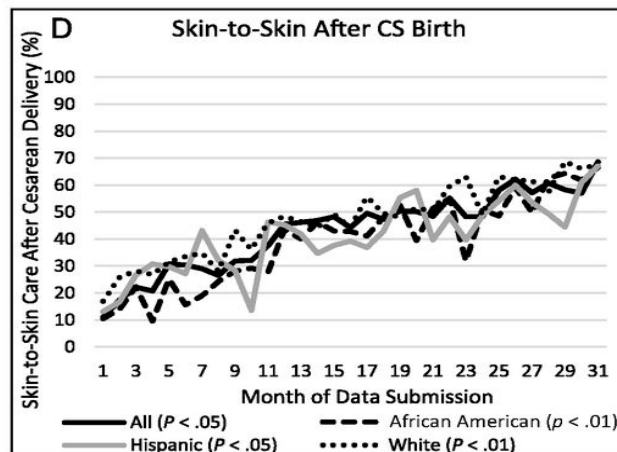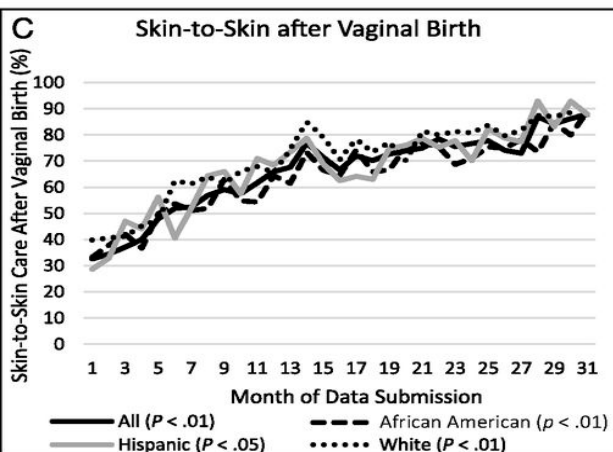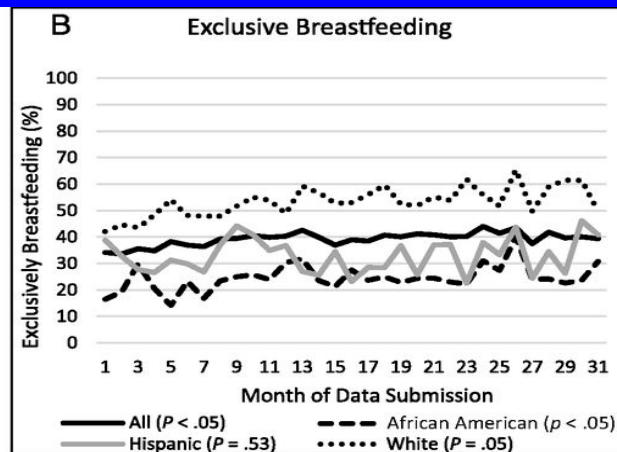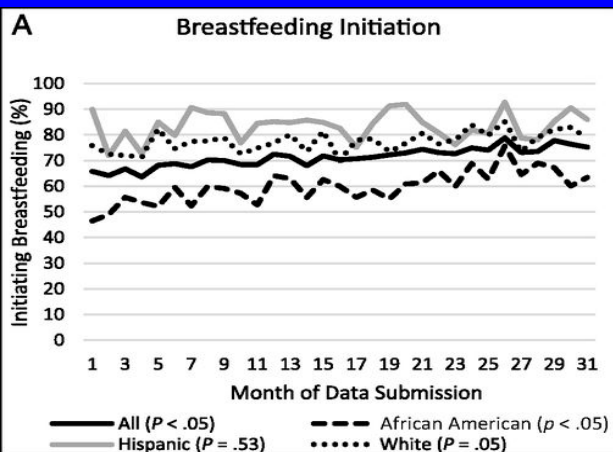

Baby-Friendly Facilities in the US
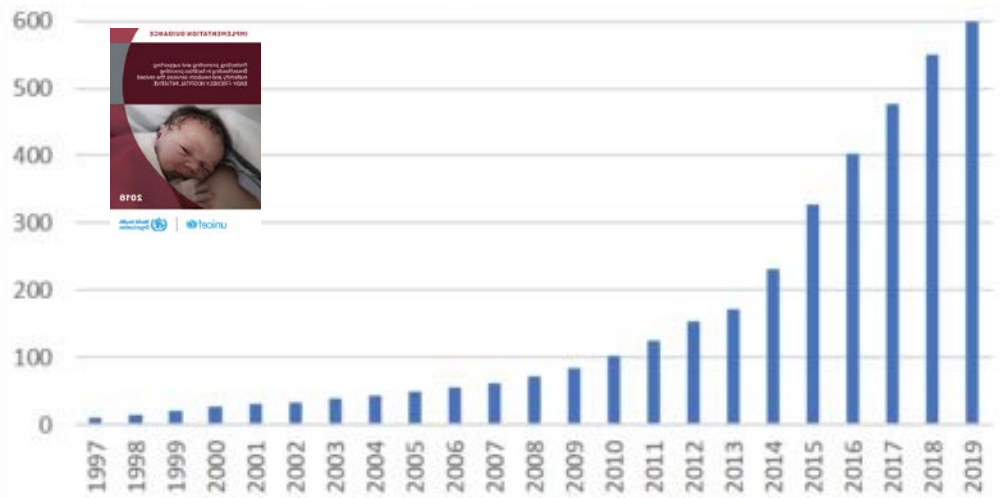
The Baby-Friendly Hospital Initiative (BFHI) has reached another important milestone: over 600 birthing facilities are now Baby-Friendly designated in the US, representing more than 28% of the nation's births, (Baby Friendly USA, 2020)
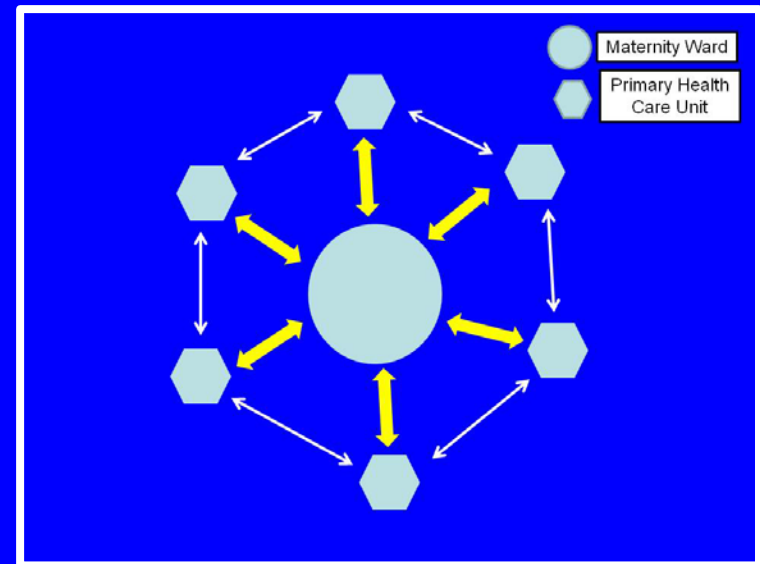
Health care systems approaches involving CDC, WIC, others

A — Breastfeeding Initiation
Initiating Breastfeeding (%) vs Month of Data Submission
All (P < .05); African American (p < .05); Hispanic (P = .53); White (P = .05)

B — Exclusive Breastfeeding
Exclusively Breastfeeding (%) vs Month of Data Submission
All (P < .05); African American (p < .05); Hispanic (P = .53); White (P = .05)

C — Skin-to-Skin after Vaginal Birth
Skin-to-Skin Care After Vaginal Birth (%) vs Month of Data Submission
All (P < .01); African American (p < .01); Hispanic (P < .05); White (P < .01)

D — Skin-to-Skin After CS Birth
Skin-to-Skin Care After Cesarean Delivery (%) vs Month of Data Submission
All (P < .05); African American (p < .01); Hispanic (P < .05); White (P < .01)

E — Rooming-In
Rooming In (%) vs Month of Data Submission
All (P < .01); African American (p < .01); Hispanic (P < .01); White (P < .01)

Merewood et al. Pediatrics (2019).

BFHI reduces BF inequities

-Hospitals in Mississippi, Louisiana, Tennessee, and Texas

⬆compliance with the Ten Steps. Parallel support from community organizations

⬆ BF initiation from 66% to 75% for all races combined

⬆ BF initiation among AA infants from 46% to 63%

⬆ EBF from 34% to 39%

⬇**Disparity in BF initiation between African American and white infants by 9.6%**

Breastfeeding Gear Model

IBFAN
WABA

Advocacy

Research & Evaluation

World BF Week

Political Will

Promotion

Coordination Goals & Monitoring

Maternity Leave
Work Day Breaks
WHO Code

Training & Delivery

Legislation & Policies

Baby Friendly Hospital
Community BF support

Resources

Pérez-Escamilla R, Curry L, Minhas D, et al. *Adv Nutr* 2012 Nov 1;3(6):790–800

Example 2: Specific Policies

- Sugar sweetened beverages taxes
- SNAP incentives
- Front of package legislation
- Food product reformulation (removal of trans-fatty acids form food supply)
- Open Streets
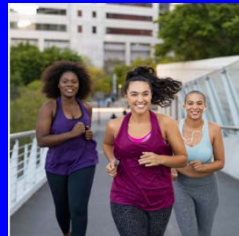
We do not know what specific impact they have on dietary and physical activity patterns of P/L women

Lee et al. AJPH (2019); Pérez-Escamilla et al. Obesity Reviews (2017); Rummo et al. Health Aff (Millwood). (2019)

Example 3: Modelling wide food system improvement

An Agent-Based Model of Income Inequalities in Diet in the Context of Residential Segregation Auchincloss et al. AJPM (2011)

- A simple agent-based model was used to identify segregation patterns that generate income disparities in diet

- The capacity for household food preferences and relative pricing of healthy foods to overcome or exacerbate the differential was explored

- Income differentials in diet resulted from the segregation of high-income households and healthy food stores from low-income households and unhealthy food stores

- When both income groups shared a preference for healthy foods, low-income diets improved but a disparity remained

- <u>Both favorable preferences and relatively cheap healthy foods</u> were necessary to overcome the differential generated by segregation

'Simulation modeling can be a useful tool for proposing and testing policies or interventions that will ultimately be implemented in a complex system where the consequences of multidimensional interactions are difficult to predict.'

Research Recommendations

- What are the optimal dietary and physical activity patterns for P/L women?
  - Nutrient requirements, cultural preferences, dietary guidelines
- How can food and physical activity systems be improved to facilitate optimal nutrition for P/L women
  - Community Based Participatory Research *(Allender et al. Obes Rev (2018))*
  - Implementation research *(Tumilowicz et al. Curr. Dev. Nutr. (2017)*
- What are the impacts of policies on dietary quality and physical activity of pregnant and lactating women across ethnic/racial and socio-economic groups?
  - SNAP incentives, WIC benefits changes
  - SSBs taxes, FOP legislation, open streets
- Improve modelling approaches to optimize systems level solutions to improve nutrition among P/L women taking inequities into account! *(Morshed et al. Obes Rev (2018); Tracy et al. Ann Rev. Publ. Health (2018))*
  - Predictions are as good as the data upon which they are based

Thank you!