



CHILDHOOD OBESITY

• The Causes & What We Can Do to Fight It •

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MEASURING OVERWEIGHT & OBESITY

Body Mass Index (BMI) Percentile for sex-and-age



Most commonly used indicator of obesity based on height & weight of children & adolescents (2-19 years of age)

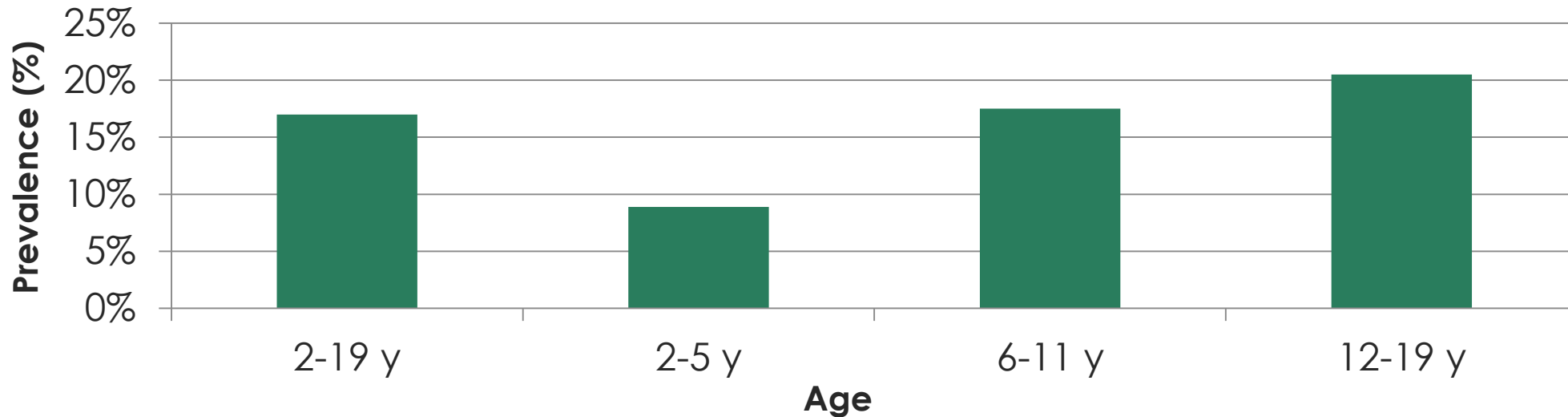
- Underweight: Less than the 5th percentile
- Normal or Healthy Weight: 5th percentile to less than 85th percentile
- Overweight: 85th to less than 95th percentile
- Obese: Equal to or greater than the 95th percentile

http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html



CHILDHOOD OBESITY IN THE UNITED STATES

PREVALENCE OF OBESITY IN U.S. CHILDREN & ADOLESCENTS AGED 2-19 YEARS: 2011-2014



Florida # 27 in Nation:

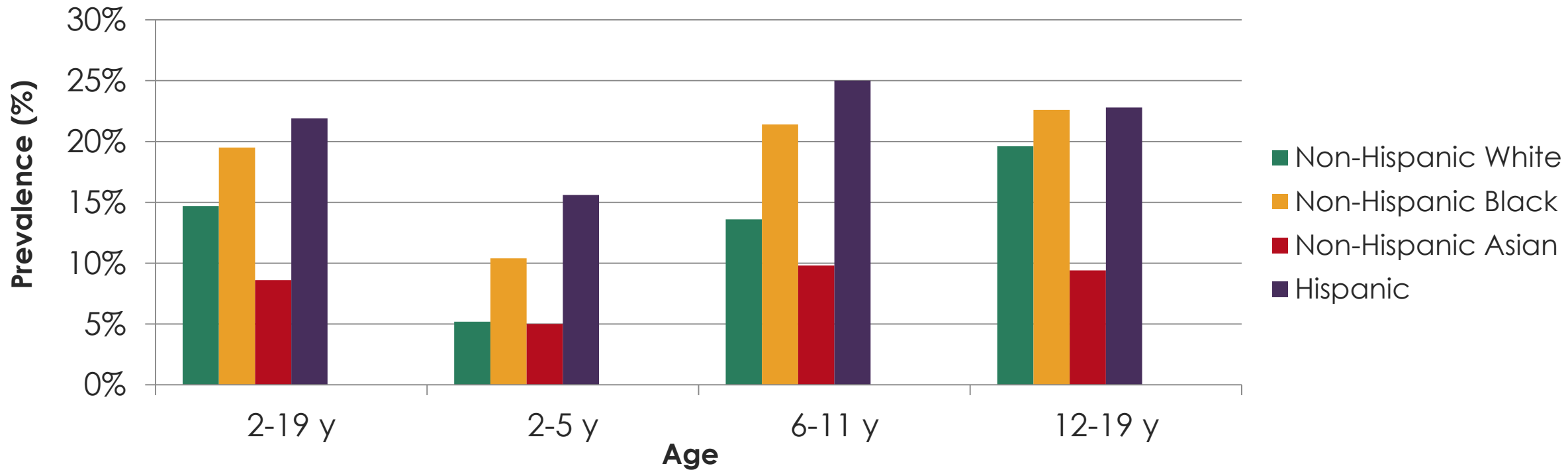
A little more than half of the states are doing better than Florida regarding childhood obesity

Cynthia L. Ogden, Margaret D. Carroll, Hannah G. Lawman, Cheryl D. Fryar, Deanna Kruszon-Moran, Brian K. Kit, Katherine M. Flegal. **Trends in Obesity Prevalence Among Children and Adolescents in the United States, 1988-1994 Through 2013-2014.** *JAMA*, 2016; 315 (21): 2292.



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OBESITY CAN AFFECT...



**PHYSICAL
HEALTH**

Type 2 Diabetes

Cardiovascular Disease

Some Types of Cancer



**SOCIAL
HEALTH**

Stigmatization

Discrimination



**EMOTIONAL
HEALTH**

Low Self-Esteem

Negative Body Image

Depression

IMMEDIATE HEALTH RISKS

High blood pressure/High cholesterol



- 70% w/ >1 Cardiovascular risk factor
- 39% w/ >2 Cardiovascular risk factors

Increased risk of impaired glucose tolerance



- Insulin resistance
- Type 2 diabetes

Breathing problems



- Sleep apnea
- Asthma

Barlow SE, & Dietz WH. Obesity evaluation and treatment: Expert Committee recommendations. *Pediatrics*, 1998; 102(3); Freedman, D.S., et al., *Cardiovascular Risk Factors and Excess Adiposity Among Overweight Children and Adolescents: The Bogalusa Heart Study*. *The Journal of Pediatrics*, 2007. **150**(1): p. 12-17. e2. <https://www.cdc.gov/obesity/childhood/causes.html>



IMMEDIATE HEALTH RISKS

Joint problems & musculoskeletal discomfort



Impact on internal organs



- Fatty Liver Disease
- Gallstones
- Gastro-esophageal reflux

Barlow SE, & Dietz WH. Obesity evaluation and treatment: Expert Committee recommendations. Pediatrics, 1998; 102(3).



FUTURE HEALTH RISKS

Obese children are more likely to become obese adults.



Obesity in adulthood is likely to become more severe.



<https://www.cdc.gov/healthyschools/obesity/facts.htm>; <http://www.obesity.org/obesity/resources/facts-about-obesity/childhood-overweight>



THE COST OF OBESITY



The medical care costs of obesity in the United States are high. In 2008 dollars, these costs were estimated to be \$147 billion.

Finkelstein EA1, Trogon JG, Cohen JW, Dietz W. Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Aff (Millwood)*. 2009 Sep-Oct;28(5):w822-31. doi: 10.1377/hlthaff.28.5.w822



WHAT ARE THE FACTORS THAT INFLUENCE OBESITY?

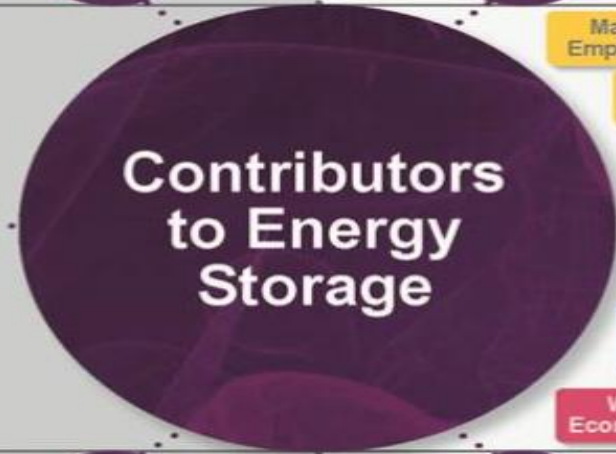


POTENTIAL CONTRIBUTORS TO OBESITY

2015

Inside the Person

Outside the Person



Increased Intake

Increased Intake

Decreased Expenditure

Decreased Expenditure

Intake & Expenditure (Or Unknown)

Intake & Expenditure (Or Unknown)

- Disordered Eating (night eating syndrome, binge eating, "food addiction")
- Emotional Coping
- Hyper-reactivity to Environmental Food Cues
- Heightened Hunger Response
- Delayed Satiety

- Environmental/Chemical Toxins
- Increased Availability of Energy Dense, Nutrient Poor Foods & Beverages
- Larger Portion Sizes
- Eating as Recreation, Snacking, Special Occasions
- Lack of Nutritional Education
- Skipping Meals
- Food Insecurity
- Diet Patterns
- Eating Away From Home
- Lack of Family Meals
- Market Economy
- Food Surplus
- Pervasive Food Advertising

- Age Related Changes (i.e. menopause, mobility decline, hormones)
- Chronic Inflammation (i.e. altered insulin signaling and glucose homeostasis)
- Pathological Sources of Endocrine Dysregulation (i.e. thyroid dysfunction, PCOS, Cushing's Syndrome)
- Genetic & Epigenetic Factors
- Central & Peripheral Regulators of Appetite & Adipose Tissue
- Gestational Diabetes
- Self-regulatory & Coping Deficits
- Mood Disturbance (i.e. depression, anxiety, bipolar etc.)
- Trauma History
- Mental Disabilities

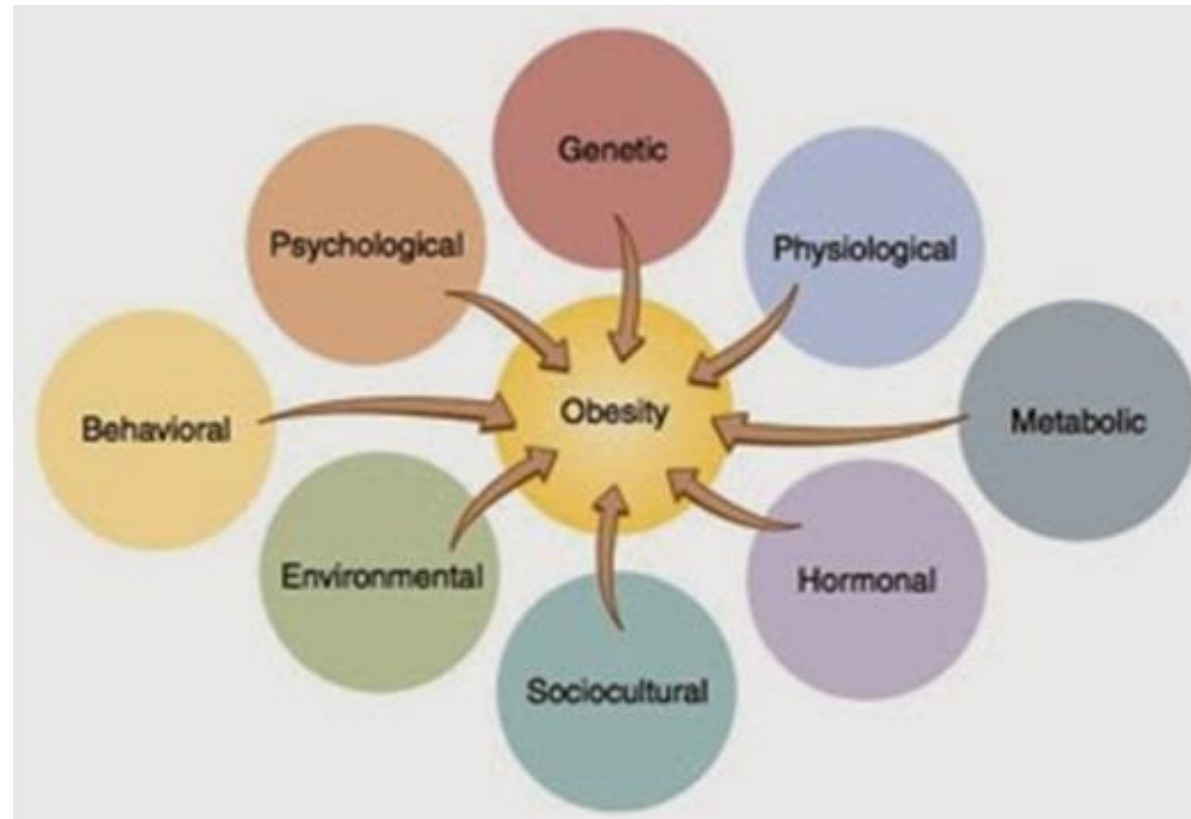
- Maternal Employment
- Breast Feeding and/or Related Factors
- Maternal Stress
- Maternal Smoking
- Maternal Obesity
- Delayed Prenatal Care
- Birth Order (first-born in family)
- Having Children (for women)
- Non-parental Childcare
- Maternal Over-nutrition During Pregnancy
- Birth by C-section
- Infection (i.e. human adenovirus 36)
- Weight Gain Inducing Drugs
- Smoking Cessation
- Sleep Deficits
- Family Conflict
- Weight Bias & Stigma (i.e. avoidance of medical care, self esteem, teasing history)
- Social Networks
- Entering into a Romantic Relationship
- Lack of Employer Preparedness to Assist with Obesity
- Lack of Health Care Provider Support/Knowledge & Inadequate Access to Care
- Stress
- Child Maltreatment
- Weight Cycling (yo-yo dieting)
- Westernization & Economic Development
- Low SES & Nutrition Support
- Living in Crime-prone Areas

- Thermogenesis
- Gut Microbiota
- Pain Sensitivity
- Physical Disabilities (i.e. functional impairments and regulatory dysfunction)
- Social Anxiety (i.e. exercise avoidance)

- Consistent Temperature (i.e. air conditioning/heating, thermoregulation)
- Increased Sedentary Time (i.e. inactive leisure "screen" time, inactive job requirements)
- Built Environment (i.e. stairwell design/access, building design, absence of or poor sidewalks)
- Decreased Opportunity for Non-exercised Based Physical Activity (i.e. driving vs. walking to work and school, sedentary jobs)
- Labor Saving Devices
- Pre-natal Air Pollution

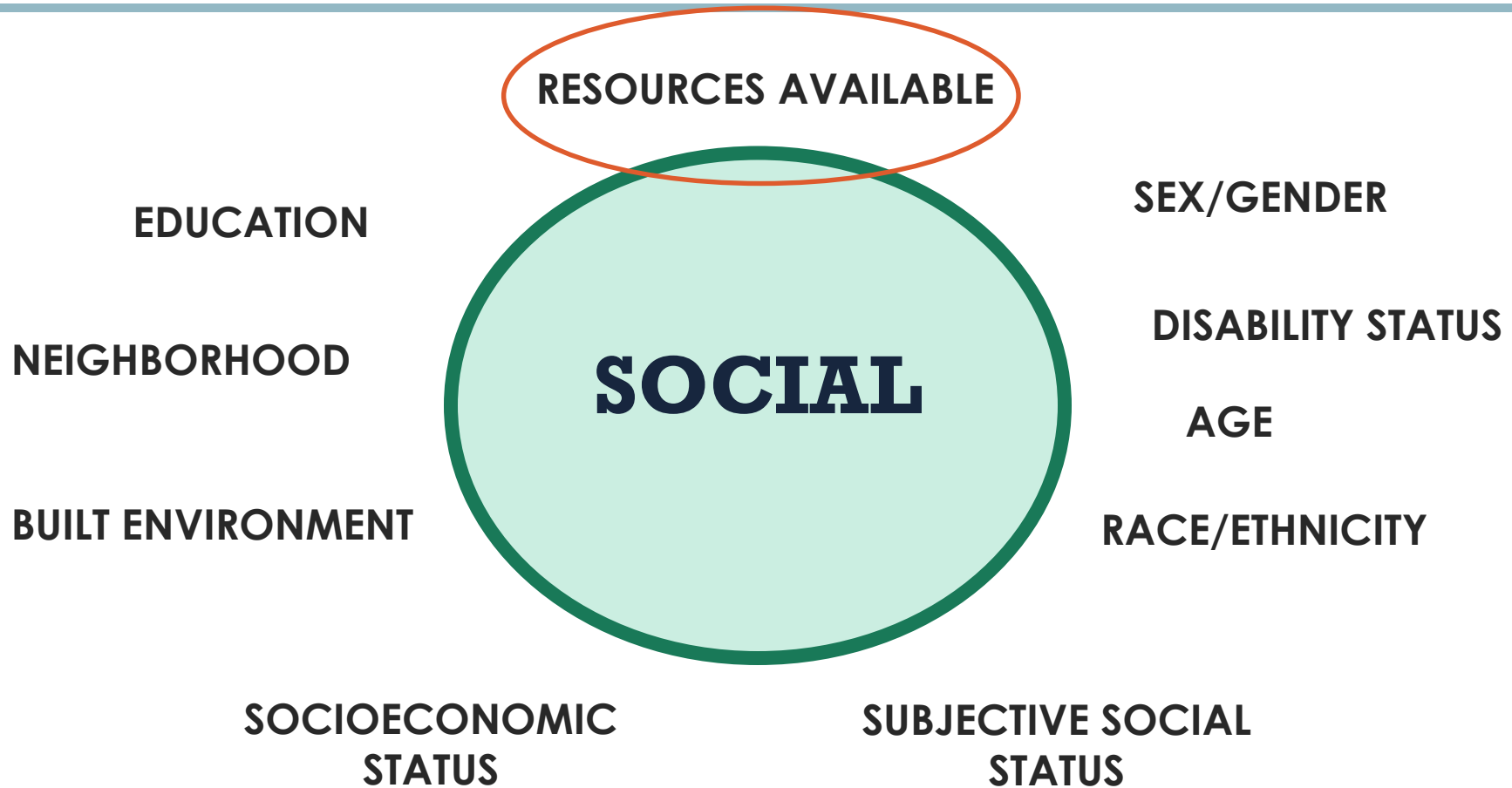
* Potential contributors indicate anything that has been put forth in the research literature as a question of investigation and is not intended to be a verification of whether or not, or the extent to which, each may or may not contribute.

OBESITY: A MULTIFACTOR DISEASE



Chalk, M. B. (2004). Obesity: addressing a multifactorial disease. *The Case Manager*, 15(6), 47-49.

SOCIAL DETERMINANTS OF OBESITY



ACCURACY OF WEIGHT LOSS INFORMATION IN SPANISH SEARCH ENGINE RESULTS ON THE INTERNET

Michelle I. Cardel, Sarah Chavez, Jiang Bian, Eribeth Peñaranda, Darci R. Miller, Tianyao Huo, François Modave

Objective

Assess quality of weight loss information Spanish speakers in the U.S. access on the Internet.

Methods

Evaluated quality of information for websites in Spanish in 5 dimensions: **Nutrition, Physical Activity, Behavior, Pharmacotherapy, & Surgical Recommendations.**

Results

- ~1.5% of sites scored greater than 8 (out of 12) on nutrition, physical activity, & behavior content.
- Unsubstantiated claims were made on 94% of the websites.
- **All content quality scores were lower for Spanish websites relative to English websites.**

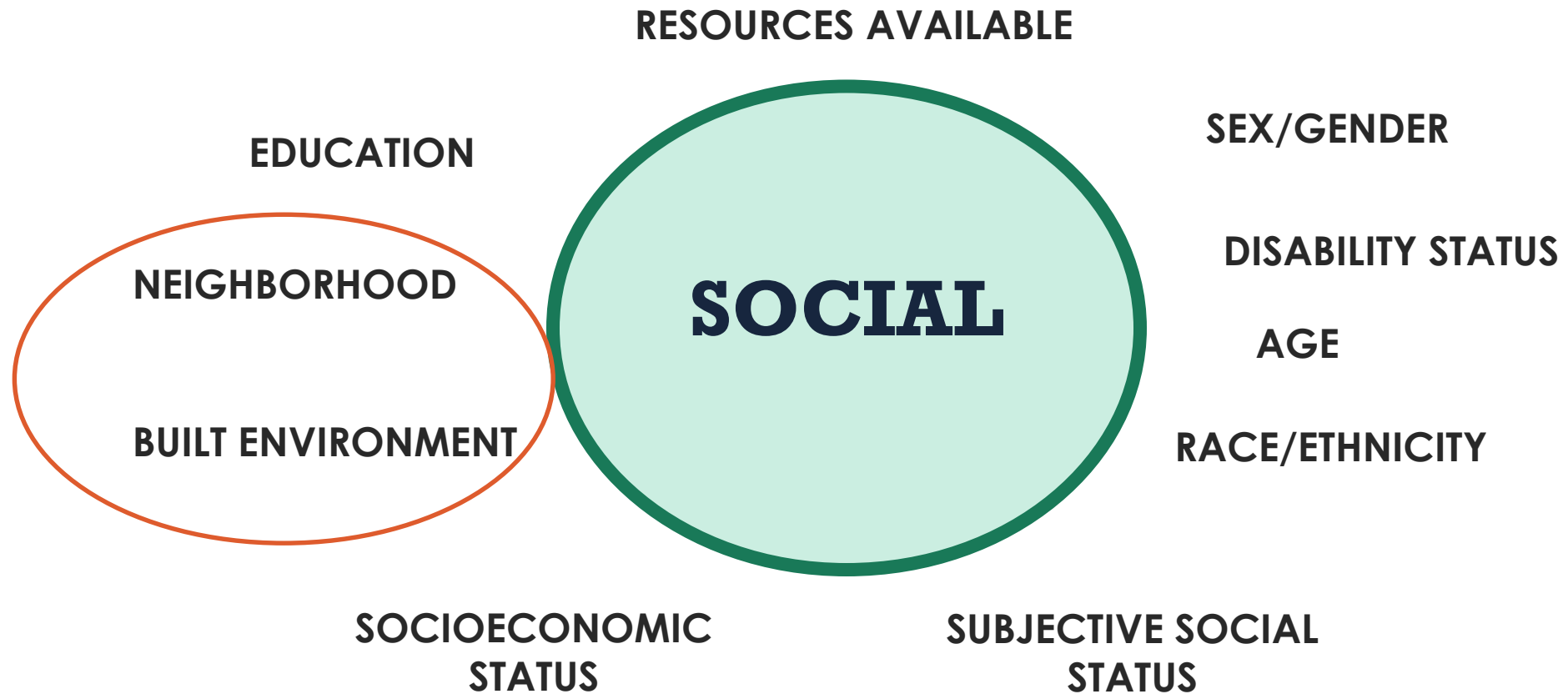
Conclusions

- Weight loss information accessed in Spanish Web searches is **poor and relatively worse** than information accessed in English.
- U.S. Spanish speakers accessing weight loss information online may be provided with **incomplete & inaccurate** information.

Cardel, M. I., Chavez, S., Bian, J., Peñaranda, E., Miller, D. R., Huo, T., & Modave, F. (2016). Accuracy of weight loss information in Spanish search engine results on the internet. *Obesity*.



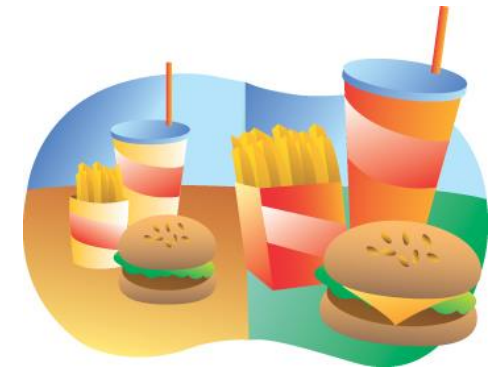
SOCIAL DETERMINANTS OF OBESITY



ACCESSIBILITY

High prevalence of fast-food restaurants

- Low-income neighborhoods have higher concentration of fast food restaurants
- Less access to healthy, affordable foods for rural, minority, & lower-income neighborhoods



Accessibility to grocery stores is associated with reduced obesity risk.

Brantley, P. J., Myers, V. H., & Roy, H. J. (2005). Environmental and lifestyle influences on obesity. *The Journal of the Louisiana State Medical Society: official organ of the Louisiana State Medical Society*, 157, S19-27.

COMMUNITIES IN LOW-INCOME NEIGHBORHOODS

Access to Healthy Food

- **6.5 million children**, live in low-income areas at least one mile from a supermarket
- Convenience stores – Poor options



Walkability

- Overweight & obesity found to be lowest in the most walkable neighborhoods
- Lack of sidewalks-higher prevalence of obesity

Powell, L. M., et al. (2007). Food store availability and neighborhood characteristics in the United States. *Preventive medicine*, 44(3), 189-195.; Ver Ploeg, M. (Ed.). (2010). *Access to affordable and nutritious food: measuring and understanding food deserts and their consequences: report to Congress*. DIANE Publishing.; Moore, L. V., & Diez Roux, A. V. (2006). Associations of neighborhood characteristics with the location and type of food stores. *American journal of public health*, 96(2), 325-331.; Booth, K. M., Pinkston, M. M., & Poston, W. S. C. (2005). Obesity and the built environment. *Journal of the American Dietetic Association*, 105(5), 110-117.



COMMUNITIES IN LOW-INCOME NEIGHBORHOODS

Built Environment

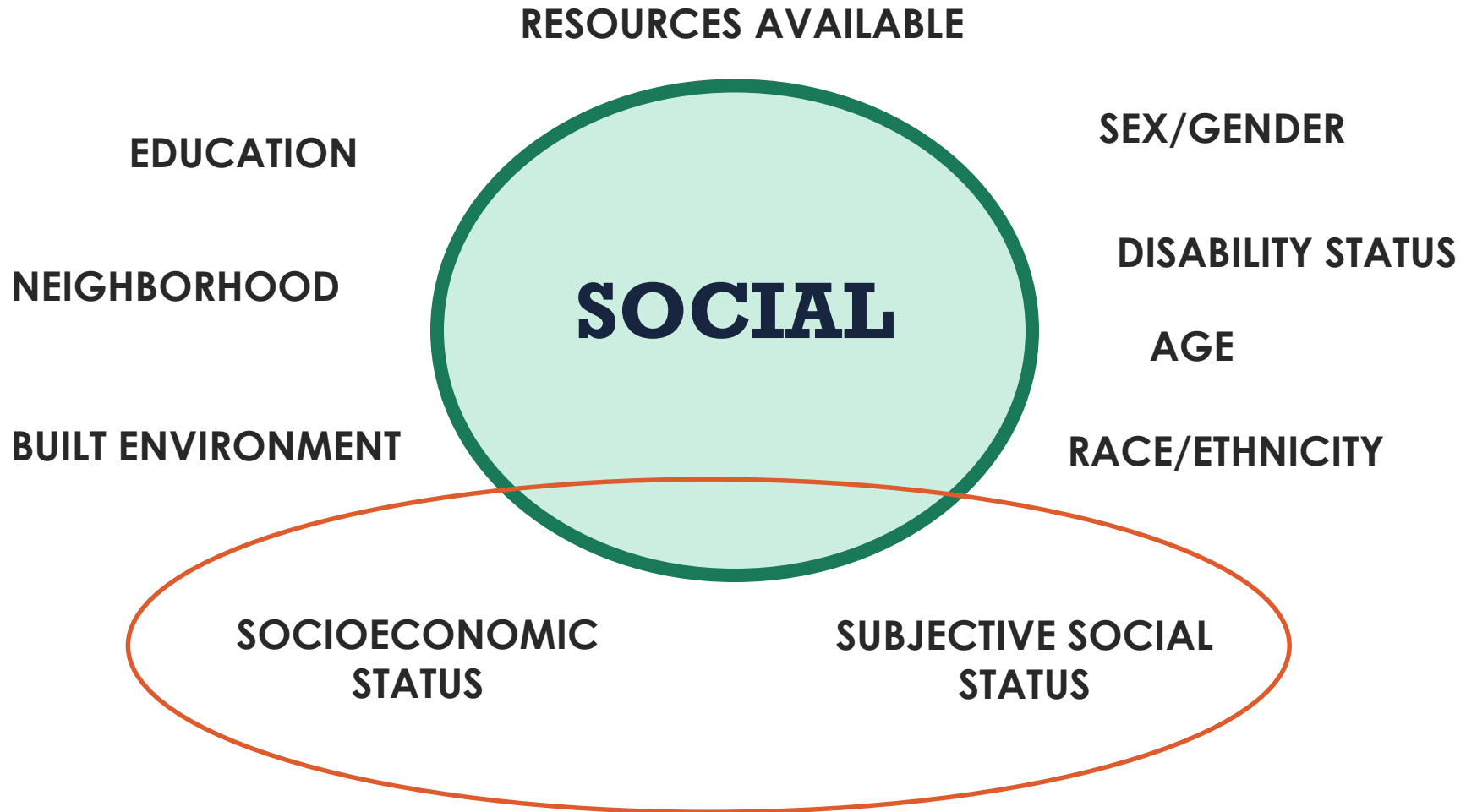
- Safety
- Parks/recreation centers
- Public transit may not be an option



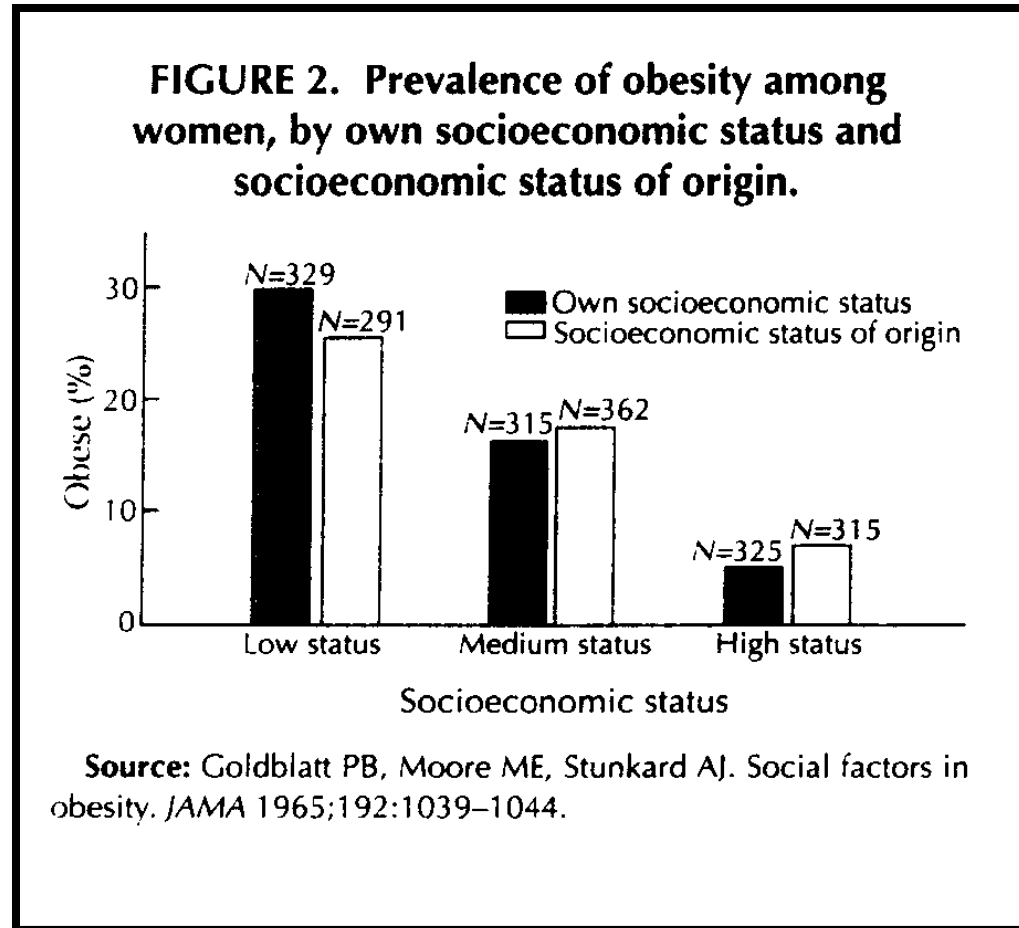
Half of US children do not have access to neighborhood parks, community centers, or sidewalks (CDC, 2010).

Booth, K. M., Pinkston, M. M., & Poston, W. S. C. (2005). Obesity and the built environment. *Journal of the American Dietetic Association*, 105(5), 110-117.; http://www.cdc.gov/healthyweight/calories/other_factors.html; Centers for Disease Control and Prevention. State Indicator Report on Physical Activity, 2010. Available at http://www.cdc.gov/physicalactivity/downloads/PA_State_Indicator_Report_2010.pdf

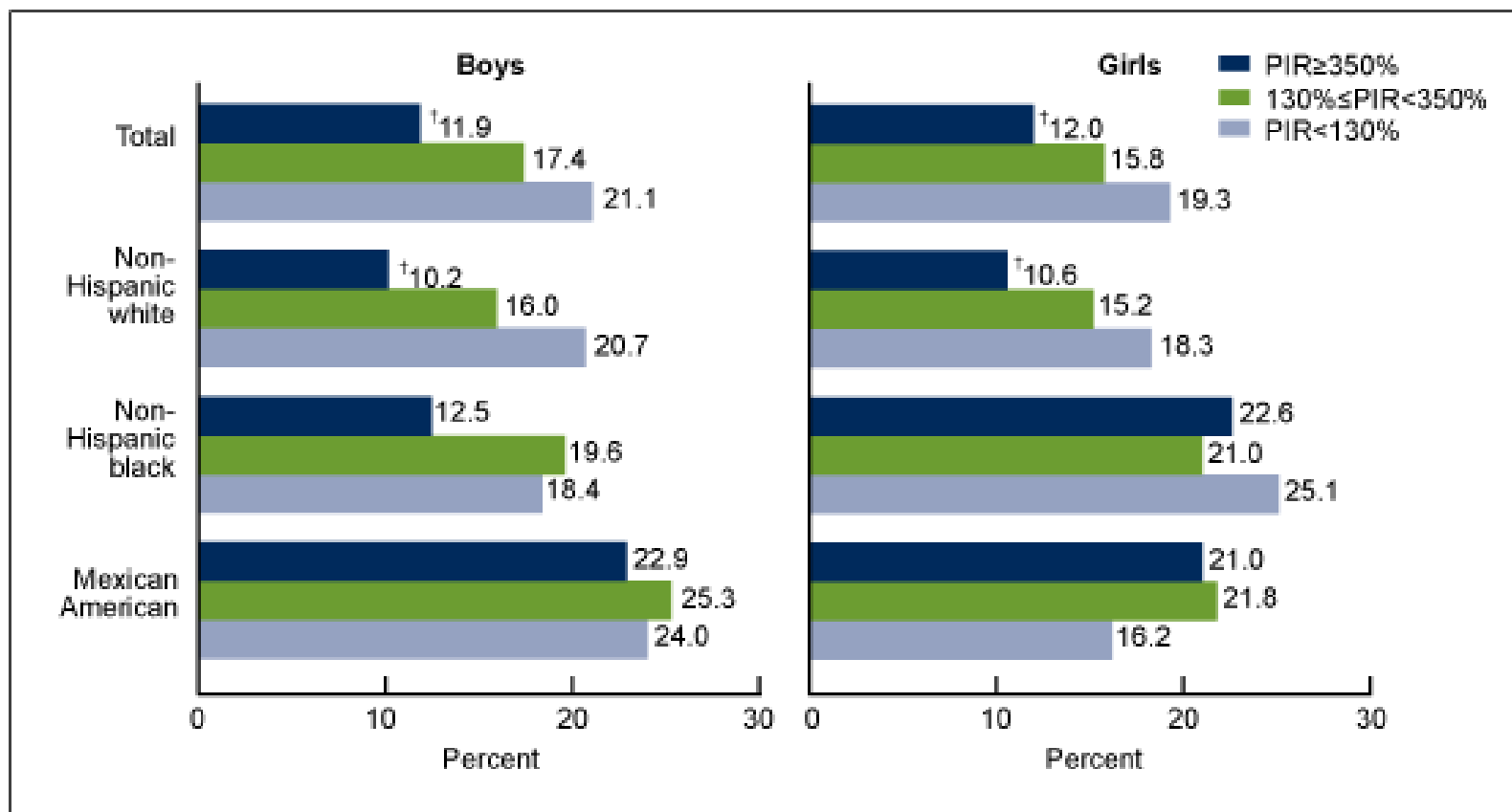
SOCIAL DETERMINANTS OF OBESITY



THE MIDTOWN MANHATTAN STUDY



PREVALENCE OF OBESITY AMONG CHILDREN & ADOLESCENTS AGED 2-19 YEARS BY POVERTY INCOME RATIO, SEX, & RACE/ETHNICITY



[†]Significant trend.

NOTES: PIR is poverty income ratio. Persons of other race and ethnicity included in total.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2005–2008.

Ogden CL, Lamb MM, Carroll MD, Flegal, KM. Obesity and socioeconomic status in children: United States 1988-1994 and 2005-2008. NCHS data brief no 51. Hyattsville, MD: National Center for Health Statistics. 2010.



SOCIOECONOMIC STATUS VERSUS SUBJECTIVE SOCIAL STATUS

- Define Socioeconomic Status (SES)
- Define Subjective Social Status (SSS)
- SES may not be a good measure in youth
 - Lack youth specific indicators
- SSS can more fully capture the cumulative influences of social hierarchy on health by taking into account:
 - Earlier life circumstances
 - Family history
 - Perceived future trajectories and opportunities
- SSS may be a more sensitive and relevant measure of social position in youth

Adler et. al 2000; Goodman et. al 2001



MAYBE IT'S THE SOCIO-RATHER THAN THE ECONOMIC

In adolescents, one study characterized the associations between SES, SSS, and adolescent obesity

- Cross-sectional study of 1,491 black and white youth

Table 2. Spearman rank correlation coefficients among social status indicators

	School SSS	Parent education	Household income
Societal SSS	0.39*	0.25*	0.27*
School SSS		0.17*	0.15*
Parent education			0.60*

* $p < 0.001$.

- Objective indicators of SES were highly correlated
 - Modestly correlated with societal SSS
 - Weaker correlation with school SSS
 - Suggesting that students differentiated the two ladders appropriately

All analysis adjust for age, sex, race, and school sit
Goodman et. al 2003

MAYBE IT'S THE SOCIO-RATHER THAN THE ECONOMIC

Table 3. ANOVA: association between social status indicators and weight status

	Total		Normal weight (BMI < 85%)			At risk for overweight (85% ≤ BMI < 95%)			Overweight (BMI ≥ 95%)	
	Mean	SD	Mean	SD	<i>p</i> [‡]	Mean	SD	<i>p</i> [‡]	Mean	SD
Societal SSS	6.62	1.42	6.64	1.39		6.67	1.37		6.50	1.54
School SSS	7.29	1.62	7.44	1.54	†	7.30	1.59	‡	6.85	1.77
Education	3.41	1.14	3.52	1.19	†	3.32	1.05		3.17	1.02
Income	3.53	1.70	3.72	1.69	†§	3.40	1.65		3.07	1.68

† $p < 0.001$, ‡ $0.05 > p > 0.01$.

* p value for comparison to overweight group only.

§ Normal weight group also significantly different from at risk for overweight, $p = 0.03$.

- Though Parental Education, Income, and School SSS were each independently associated with obesity, SSS was the strongest predictor
- Suggests that SSS is a better predictor of obesity in youth than SES

All analysis adjust for age, sex, race, and school sit
Goodman et. al 2003



SIGNIFICANT RESEARCH GAPS IN ANALYSIS OF SOCIAL STATUS AND OBESITY

- Cross-sectional and observational
- Limited research has investigated mechanisms underlying the relationship between social status and obesity-related outcomes.
- Experimental studies are needed to help identify causal mechanisms underlying low social status as a pathway for obesity.

No experimental studies had been conducted.

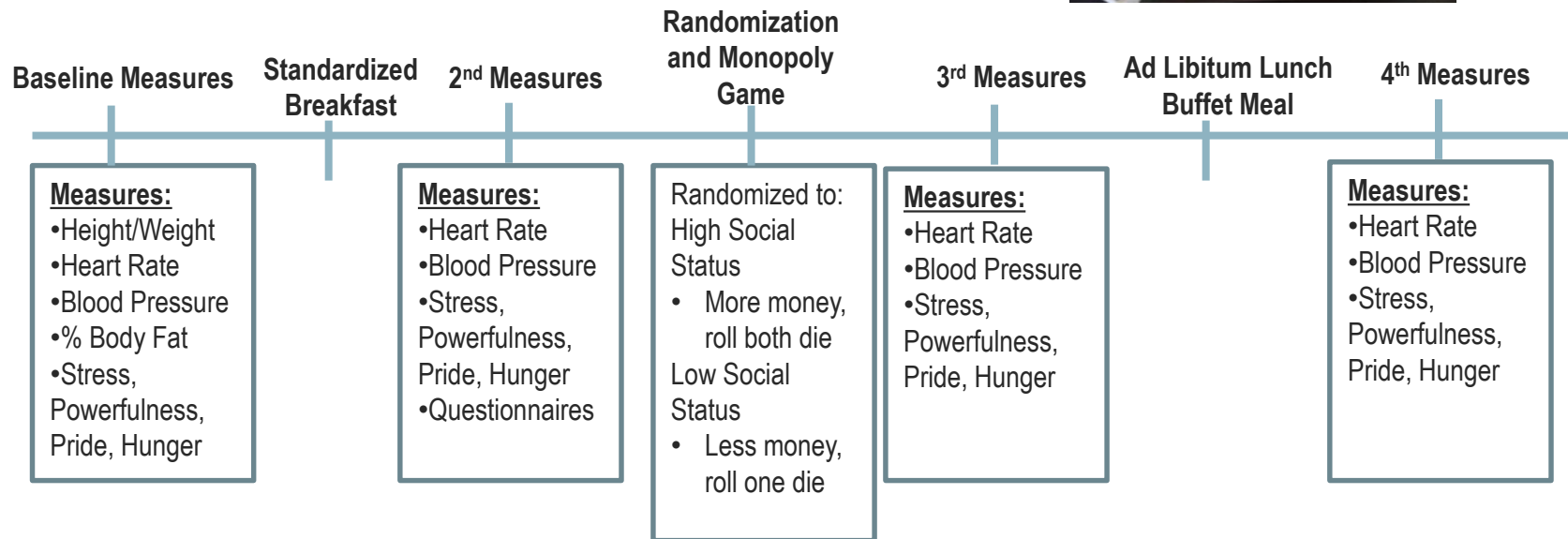


FEASIBILITY STUDY: MANIPULATED GAME OF MONOPOLY

- Investigated eating behavior following experimental manipulation of social status using a game of Monopoly
- Objective: To investigate the effect of experimentally manipulated social status on *ad libitum* acute energy intakes and eating behavior
 - **Used a randomized crossover design to place participants in experimental high and low social status conditions**
- Hypothesis: In the low social status condition, individuals would consume a greater number of calories, fat, sodium, and sugar when compared to the high social status condition.

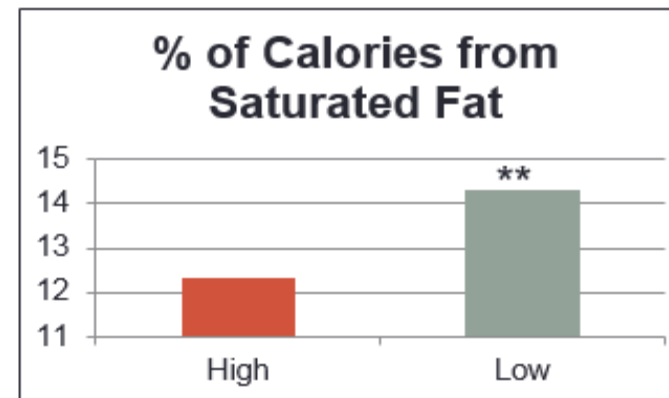
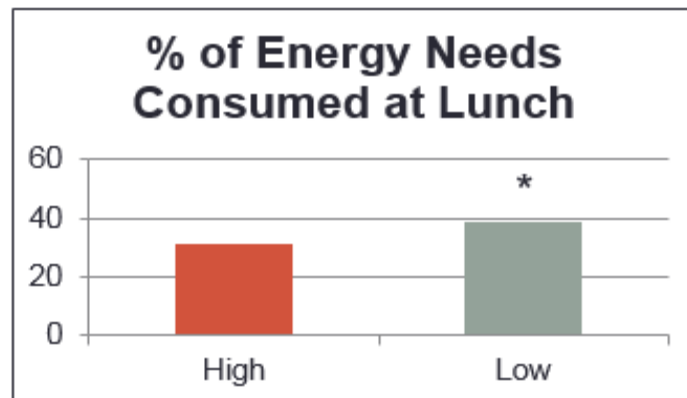
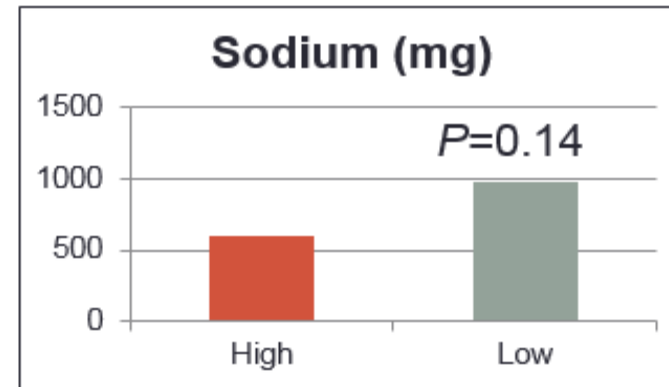
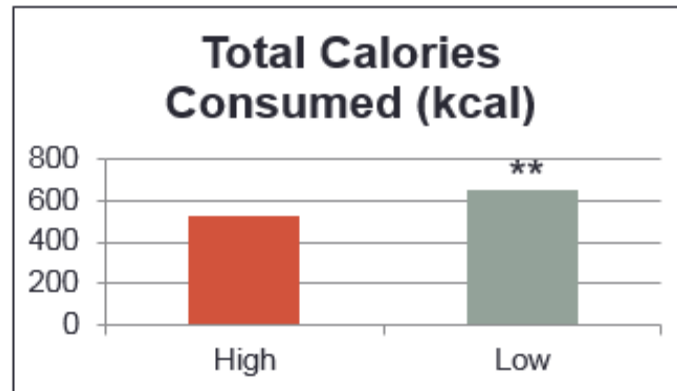


THE EFFECTS OF EXPERIMENTALLY MANIPULATED SOCIAL STATUS ON ACUTE EATING BEHAVIOR



When participants returned for their second study visit, the protocol was identical, but they were placed in the opposite social status condition.

RESULTS



*Different from HIGH, $P < 0.05$; **Different from HIGH, $P < 0.10$

Cardel MI et al. (2016). The effects of experimentally manipulated social status on acute eating behavior: A randomized, crossover pilot study. *Physiology & Behavior*, 162; 93-101.

SUMMARY & FUTURE DIRECTIONS

First studying evaluating experimental manipulation of social status on dietary intakes and risk for obesity



- Experimentally manipulated low social status resulted:
 - Increased consumption of calories, % of calorie needs, saturated fat, and sodium
- Corroborated by recent publication demonstrating that when individuals are randomized and primed to a “rich” or “poor” condition, they ate significantly more calories

Currently confirming findings in a randomized controlled trial (n = 150)



- Future Directions: To explore how social factors can be incorporated into effective obesity prevention and intervention efforts

Cardel MI et al. (2016). The effects of experimentally manipulated social status on acute eating behavior: A randomized, crossover pilot study. *Physiology & Behavior*, 162; 93-101.



WHAT ARE THE CURRENT APPROACHES TO OBESITY PREVENTION?



HIGHER DIET QUALITY IN ADOLESCENCE & DIETARY IMPROVEMENTS ARE RELATED TO LESS WEIGHT GAIN DURING THE TRANSITION FROM ADOLESCENCE TO ADULTHOOD

Examination of weight change among adolescents transitioning into young adulthood (n=2656)

- Middle/high school participants followed for 10 year
- Reported diet & weight at mean ages of 15, 20, & 25 years
- Higher diet quality in adolescence was associated with less weight gain over 10 years.

“Food preferences & attitudes may be established as early as age 15.”

“The choices adolescents make during that stage establish a lifetime diet pattern, which could influence weight gain over time.”

Hu, T., Jacobs, D. R., Larson, N. I., Cutler, G. J., Laska, M. N., & Neumark-Sztainer, D. (2016). Higher Diet Quality in Adolescence and Dietary Improvements Are Related to Less Weight Gain During the Transition From Adolescence to Adulthood. *The Journal of Pediatrics*.



INTERVENTIONS FOR PREVENTING OBESITY IN CHILDREN

Interventions often used include educational, promotional, & psychological strategies in community, school, & home settings (n=55 studies).



Types of interventions often include programs that focus on diet/nutrition, exercise/physical activity, lifestyle and/or social support.



Studies reported one or more of the following primary outcomes:



- Weight/Height
- Percent body fat
- BMI
- Data Collection
- Interventions
- Skin-fold thickness
- Prevalence of overweight/obesity



WHAT TYPES OF INTERVENTIONS SHOW PROMISE FOR THE FUTURE?

- 1 School curriculums that include healthy eating, physical activity, & body image
- 2 Increased sessions for physical activity & the development of fundamental movement skills throughout the school week
- 3 Improvements in nutritional quality of the food supply in schools

Summerbell, C. D., Waters, E., Edmunds, L. D., Kelly, S., Brown, T., & Campbell, K. J. (2005). Interventions for preventing obesity in children. *Cochrane Database Syst Rev*, 3(3); Sim, L. A., Lebow, J., Wang, Z., Koball, A., & Murad, M. H. (2016). Brief primary care obesity interventions: a meta-analysis. *Pediatrics*, e20160149; Loveman, E., Al-Khudairy, L., Johnson, R. E., Robertson, W., Colquitt, J. L., Mead, E. L., ... & Rees, K. (2015). Parent-only interventions for childhood overweight or obesity in children aged 5 to 11 years. *The Cochrane Library*.



WHAT TYPES OF INTERVENTIONS SHOW PROMISE FOR THE FUTURE?

- 4 Environments & cultural practices that support children eating healthier foods & being active throughout each day
- 5 Support for teachers & other staff to implement health promotion strategies & activities (e.g., professional development, capacity building activities)
- 6 Parent support & home activities that encourage children to be more active, eat more nutritious foods, & spend less time in screen-based activities

Summerbell, C. D., Waters, E., Edmunds, L. D., Kelly, S., Brown, T., & Campbell, K. J. (2005). Interventions for preventing obesity in children. *Cochrane Database Syst Rev*, 3(3); Sim, L. A., Lebow, J., Wang, Z., Koball, A., & Murad, M. H. (2016). Brief primary care obesity interventions: a meta-analysis. *Pediatrics*, e20160149; Loveman, E., Al-Khudairy, L., Johnson, R. E., Robertson, W., Colquitt, J. L., Mead, E. L., ... & Rees, K. (2015). Parent-only interventions for childhood overweight or obesity in children aged 5 to 11 years. *The Cochrane Library*.



WHAT WORKS IN TREATING OBESITY?



CURRENT APPROACHES TO OBESITY MANAGEMENT

Primary Care Interventions in Children 2-18 Years



- Clinically meaningful outcomes were demonstrated w/ intensive behavioral counseling
- Approaches including patient-centered communication, patient education, regular visits & phone calls show marginal effects in reduction of overweight/obesity
- Comparable BMI reduction effectiveness to results in family-based behavioral weight management treatments

Sim, L. A., Lebow, J., Wang, Z., Koball, A., & Murad, M. H. (2016). Brief primary care obesity interventions: a meta-analysis. *Pediatrics*, e20160149



CURRENT APPROACHES TO OBESITY MANAGEMENT

School-Based Interventions in Elementary Students



- Target moderators for BMI improvement: increased physical activity, lowered sugar-sweetened beverage intake, increased fruit intake, reduction in sedentary activity
- Teacher-led interventions were effective for improvement of BMI

Brown, E. C., Buchan, D. S., Baker, J. S., Wyatt, F. B., Bocalini, D. S., & Kilgore, L. (2016). A Systematised Review of Primary School Whole Class Child Obesity Interventions: Effectiveness, Characteristics, and Strategies. *BioMed Research International*, 2016.



CURRENT APPROACHES TO OBESITY MANAGEMENT

Family-based Behavioral Treatment Programs



- Targets diet, physical activity, behavioral interventions, & parenting skills to support child weight loss
- Treatment targets both parent & child behavioral changes

Strong predictors of child weight loss include active parent engagement & weight loss (Wrotniak, 2004).

Hayes, J. F., et al. (2016). Decreasing food fussiness in children with obesity leads to greater weight loss in family-based treatment. *Obesity*, 24(10), 2158-2163.



CURRENT APPROACHES TO OBESITY MANAGEMENT

Family-based Behavioral Treatment Programs



- Parents asked to model healthy eating behaviors
- Parents asked to modify parenting techniques during mealtimes
- Includes parental praise & positive reinforcement from parents to children
- Includes structured goals/rewards for calories & quality of food consumed

Hayes, J. F., et al. (2016). Decreasing food fussiness in children with obesity leads to greater weight loss in family-based treatment. *Obesity*, 24(10), 2158-2163.



TRAFFIC LIGHT DIET

GO

Eat as much as you like.
Low energy, High Nutrients



- Fruits/Vegetables

SLOW

Eat some every day.
High energy, High nutrients



- Foods w/ protein or starch: meat, eggs, cheese, milk, bread, nuts, beans

STOP

Eat very occasionally.
High energy, Low nutrients



- High sugar foods: sweetened fruit juice, fizzy drinks, sweets



ACCEPTANCE-BASED BEHAVIORAL TREATMENT (ABT)

Characterized by free choice, recognition of discomfort & reduction of pleasure, mindfulness, & cue awareness



Acceptance-Based vs. Standard Behavioral Treatment for Obesity: Results from the Mind your Health RCT

- 190 participants ages 18-70 with overweight/obesity
- Randomized to 25 sessions of ABT or SBT over 1 year w/ measures taken at baseline, 6 months, &/or 12 months & weight measured each session
- ABT group attained significantly greater 12-month weight loss than SBT group (**13.3% vs. 9.8%**)
- Clinically significant **36%** increase in weight lost for ABT group

Forman, E. M., Butryn, M. L., Manasse, S. M., Crosby, R. D., Goldstein, S. P., Wyckoff, E. P. and Thomas, J. G. (2016), Acceptance-based versus standard behavioral treatment for obesity: Results from the mind your health randomized controlled trial. *Obesity*, 24: 2050–2056.



WHAT COULD WORK ON A POLICY LEVEL?



EFFECTS OF SUBSIDIES & PROHIBITIONS ON NUTRITION IN A FOOD BENEFIT PROGRAM

What strategies are effective for improving nutritional status of SNAP participants?

Does incentivizing the purchase of fruits/vegetables &/or prohibiting purchase of less nutritious foods in a food benefit program improve participants' diet/nutritional quality of foods consumed?

Harnack, L., Oakes, J. M., Elbel, B., Beatty, T., Rydell, S., & French, S. (2016). Effects of Subsidies and Prohibitions on Nutrition in a Food Benefit Program: A Randomized Clinical Trial. *JAMA internal medicine*.



RANDOMIZATION CONDITIONS

INCENTIVE

30% financial incentive for fruits/vegetables purchased using food benefits



RESTRICTION

Not allowed to buy sugar-sweetened beverages, sweet baked goods, or candies w/ food benefits



INCENTIVE + RESTRICTION

30% financial incentive on fruits/vegetables & restriction of purchase of sugar-sweetened beverages, sweet baked goods, or candy w/ food benefits



CONTROL

No incentive or restrictions on foods purchased w/ food benefits



Harnack, L., Oakes, J. M., Elbel, B., Beatty, T., Rydell, S., & French, S. (2016). Effects of Subsidies and Prohibitions on Nutrition in a Food Benefit Program: A Randomized Clinical Trial. *JAMA internal medicine*.



EFFECTS OF SUBSIDIES & PROHIBITIONS ON NUTRITION IN A FOOD BENEFIT PROGRAM

INCENTIVE + RESTRICTION



Reduced intake of discretionary or “empty” calories

Reduced intake of sugar sweetened beverages, sweet baked goods, & candies

Increased intake of solid fruit

Improved Healthy Eating Index score

- More improvements were seen in this group than in the incentive only & restriction only groups
- **Pairing incentives w/ restrictions may improve diet & nutritional quality of foods consumed**

Harnack, L., Oakes, J. M., Elbel, B., Beatty, T., Rydell, S., & French, S. (2016). Effects of Subsidies and Prohibitions on Nutrition in a Food Benefit Program: A Randomized Clinical Trial. *JAMA internal medicine*.



COMBATING OBESITY ON A POLICY LEVEL

Soda Taxation



	US	Florida
Adolescents who drank soda daily	27.0%	22.1%

ARGUMENT FOR TAXATION

- Childhood & adolescent obesity is associated w/ serious adverse lifetime health consequences & its prevalence has increased rapidly. Soft drink consumption has also expanded rapidly, so much so that soft drinks are currently the largest single contributors to energy intake.
- Want soda to be a “sin tax” & comparisons between soft drink taxation & cigarette taxation have been made

Nutrition, Physical Activity and Obesity Data, Trends and Maps web site. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition, Physical Activity and Obesity, Atlanta, GA, 2015. Available at <http://www.cdc.gov/nccdphp/DNPAO/index.html>.



CONSUMPTION OF SUGAR-SWEETENED BEVERAGES (SSBs)

- Higher rates of SSB consumption associated w/ higher overall BMI in children
- SSBs are largest “empty calorie” contributor in children ages 2-18
- Soft drinks account for 13% of a teen’s caloric intake

Research in parent-child dyads demonstrates a familial relationship with regards to beverage consumption patterns (Pinard, 2011).

DeBoer, Mark D., Rebecca J. Scharf, and Ryan T. Demmer. "Sugar-sweetened beverages and weight gain in 2-to 5-year-old children." *Pediatrics* 132.3 (2013): 413-420.
Han, Euna, and Lisa M. Powell. "Consumption patterns of sugar-sweetened beverages in the United States." *Journal of the Academy of Nutrition and Dietetics* 113.1 (2013): 43-53; Reedy, J., & Krebs-Smith, S. M. (2010). Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. *Journal of the American Dietetic Association*, 110(10), 1477-1484.; Pinard, C. A., Davy, B. M., & Estabrooks, P. A. (2011). Beverage intake in low-income parent-child dyads. *Eating behaviors*, 12(4), 313-316.

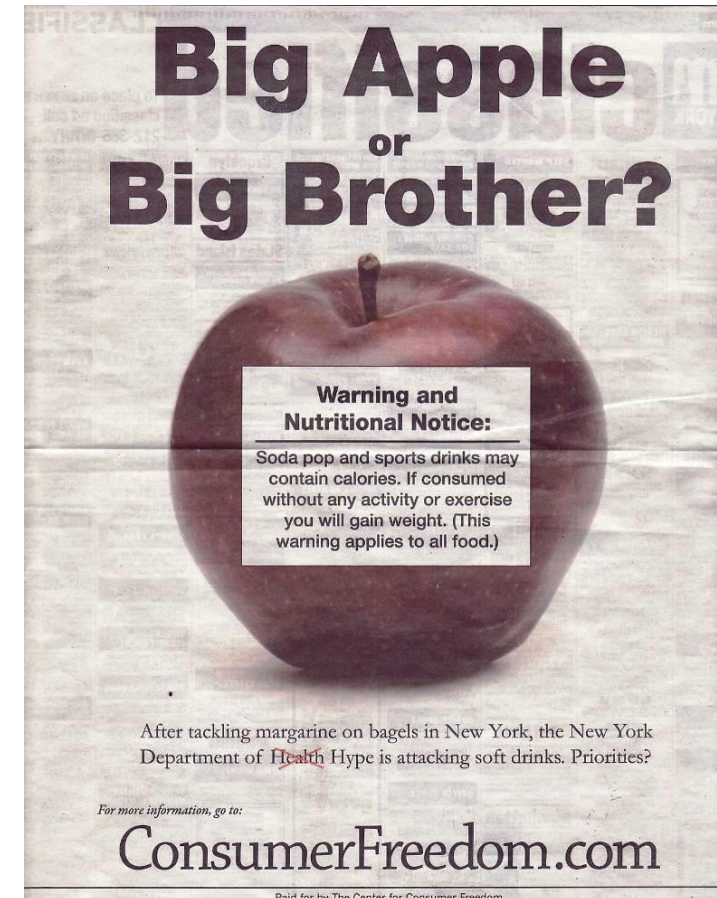


COMBATING OBESITY ON A POLICY LEVEL

Soda Taxation



ARGUMENT AGAINST TAXATION



WHAT DOES THE RESEARCH SAY?

- In 2013, Mexico's congress passed a one-peso-per-liter tax on sugary beverages
- Raised prices by 10%
- 8% sales tax on junk foods including chips, cookies, candy, & ice cream
- Both taxes went into effect in January 2014
 - During the first year of the tax, the average volume of taxed beverages purchased monthly was 6% lower in 2014 than would have been expected without the tax.
 - The reduction was the greatest among the households of the lowest socioeconomic status.

M Arantxa Colchero, Barry M Popkin, Juan A Rivera, Shu Wen Ng. Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study. *BMJ* 2016;352:h6704



WHAT DOES THE RESEARCH SAY?

- In November of 2014, Berkeley, California became the first US jurisdiction to pass an SSB
- \$0.01-per-ounce tax on SSBs, including soda; energy, sports, & fruit-flavored drinks; sweetened water, coffee, & tea; & syrups used to make SSBs (non-SSBs such as diet soda are not taxed).
- Used neighboring San Francisco & Oakland as comparison cities to account for secular trends locally (different from what was done in Mexico)

Jennifer Falbe, Hannah R. Thompson, Christina M. Becker, Nadia Rojas, Charles E. McCulloch, and Kristine A. Madsen. Impact of the Berkeley Excise Tax on Sugar-Sweetened Beverage Consumption. Published online ahead of print August 23, 2016 AJPH



WHAT DOES THE RESEARCH SAY?

- Focused on low-income & minority populations, who are more likely to consume SSBs & suffer related health consequences.
- Selected 2 large, low-income neighborhoods that yielded the highest combined proportion of African American & Hispanic residents according to 2010 census tract data.

Jennifer Falbe, Hannah R. Thompson, Christina M. Becker, Nadia Rojas, Charles E. McCulloch, and Kristine A. Madsen. Impact of the Berkeley Excise Tax on Sugar-Sweetened Beverage Consumption. Published online ahead of print August 23, 2016 AJPH



WHAT DOES THE RESEARCH SAY?

- Consumption of SSBs decreased 21% in Berkeley & increased 4% in comparison cities ($P = 0.046$)
- Water consumption increased more in Berkeley (+63%) than in comparison cities (+19%; $P < 0.01$)
- Suggests that Berkeley's excise tax reduced SSB consumption in low-income neighborhoods

Jennifer Falbe, Hannah R. Thompson, Christina M. Becker, Nadia Rojas, Charles E. McCulloch, and Kristine A. Madsen. Impact of the Berkeley Excise Tax on Sugar-Sweetened Beverage Consumption. Published online ahead of print August 23, 2016 AJPH



RESEARCH NEEDED

- Evaluating SSB taxes in other cities will improve understanding of their public health benefit & their generalizability (high SES, more health-conscious).
- Assessing changes in social norms
- What beverages, beyond water were they replacing SSB with?
- Is this enough to have an effect on obesity? **TBD**

Jennifer Falbe, Hannah R. Thompson, Christina M. Becker, Nadia Rojas, Charles E. McCulloch, and Kristine A. Madsen. Impact of the Berkeley Excise Tax on Sugar-Sweetened Beverage Consumption. Published online ahead of print August 23, 2016 AJPH



PUBLIC HEALTH

WHO Calls for Sugar Tax to Fight Obesity and Diabetes

Obesity more than doubled worldwide between 1980 and 2014

October 11, 2016

WHAT'S NEXT?



FUTURE DIRECTIONS

- Determine if acceptance-based behavioral treatment (ABT) works in children
- Determine if changes in SNAP & soda taxation actually result in improved obesity rates/BMI

MOVING FORWARD:

- Studies of longer duration in children & adolescents
- Additional RCTs & family-based interventions



THANK YOU!

Please feel free to contact me with any comments or questions:

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