

# The relationship of maternal BMI, child body size, home environment, and food

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# Primary and secondary prevention of childhood obesity

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- Primary Prevention
  - Normal birth weight
  - Appropriate feeding during first year
    - Breastfeeding
    - Avoidance of early solids (before 4-6 months)
    - No foods of low nutritional quality
- Secondary Prevention
  - Early recognition of overweight
  - Appropriate feeding
  - Physical activity
- Focused on public health level interventions

# settings for studies

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- Special Supplemental Nutrition Programs for Women, Infants and Children (WIC) in Galveston and Harris Counties, Texas
- Research developed through CBPR with WIC staff, health department staff, community partners (grassroots organizations)
- Intervention delivered through clinic and home visits

# Significance of the Problem

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- 300,000 U.S. deaths/year are associated with obesity, 400,000 with smoking.
- Dramatic increase in prevalence of overweight/obesity in 40 years.
- According to the Centers for Disease Control and Prevention, in 2008, **18.5** percent of Hispanic children were obese compared to **12.6** percent of white children and **11.8** percent of African American children.

# Growth Problems

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- Obesity is increasing in epidemic proportions among children, especially low-income and among African Americans and Hispanics.
- Obese children tend to become obese adults.
- During their preschool years, minority children eat more fast food, drink more sugar-sweetened beverages and are more likely to have televisions in their rooms than Caucasian children (Taveras, 2010).

# Nationwide

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- 1999: 13% of children aged 6 to 11 years and 14% of adolescents aged 12 to 19 years in the United States were obese.
- 2012, 18% of children aged 6 to 11 years and 21% of adolescents aged 12 to 19 years in the United States were obese.
- Nearly one-third of children/adolescents are overweight or obese (CDC 2012).
- Type 2 diabetes, previously considered an adult disease, has increased dramatically in children and adolescents. Overweight and obesity are closely linked to type 2 diabetes (Surgeon General, 2004).

# Definition of Acculturation

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“Values, ideologies, beliefs, and attitude appear to be important components of acculturation as are cognitive and behavioral characteristics such as language, cultural customs, and practices”.\*

**Maternal Acculturation**-adaptation of the mother to U.S. lifestyle choices such as selection, purchase and consumption of food items and/or engagement in physical activities.

\*Source: Cuellar et al (*Hispanic J Behav Sci.* 1980; 2; 199-217)

# Attributes of Acculturation

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- Identify Cultural Constructs i.e. familism, health beliefs, gender role stereotypes.
- Exposure to a different culture i.e. years in the US, amount of exposure.
- Change in the following domains:

**Behavior**

**Cognitive**

**Affective**

Robin, P. Acculturation in Mexican Immigrants: A Concept Analysis. *Journal of Holistic Nursing*. 2006; 24(4); 270-278.

Walker I.O., & Avant K.C. *Strategies for theory construction in Nursing*. (4<sup>th</sup> ed) 2004. Upper Saddle River, NJ: Prentice Hall.



- Secondary Prevention
  - Reducing Overweight among Galveston WIC Participants (R21), 2008-2011
  - Focused on 2-4 year olds who were overweight/obese
- Primary Prevention
  - Preventing Childhood Obesity through Early Feeding and Parenting Guidance (R01), 2012-2017
  - Focused on infants, will follow for 3 years

# intervention content

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- Appropriate Feeding
  - Exclusive breastfeeding for first 6 months, but continue for 1 year
  - Appropriate amount of formula, not propping bottle, no other foods until 4-6 months old and no foods of limited nutritional value
- Parenting
  - Talking and reading to child (parental engagement)
  - Playing together for physical activity

# ecological model of growth

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- Blend of Bronfenbrenner's Human Ecology and classic epidemiology (agent, host, environment)
- Agent is food (too much, too little, inappropriate)
- Host is child
- Environment is the microsystem (mother-child) and mesosystem (family and neighborhood)
- The EMG reflects a social-ecological framework



# instruments (R21)

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- Agent (food eaten/available)
  - 24 hour diet recall, analyzed with NDSR
  - Household Food Inventory (HFI)
  - Child Feeding Questionnaire (CFQ)
- Mesosystem
  - Home Screening Questionnaire (HSQ)
  - TV hours
- Microsystem
  - Child and mother body size
  - Maternal Physical Activity Recall (PAR)
  - Nativity measures
  - Sleep (PSQI, Child Sleep Instrument)

# sample (R21)

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- Aimed for 100 mother/child dyads, only able to recruit 56 and have data on 53
- Mean age of child: 3.3 years
- Mean BMI% of child: 98%
- Mean maternal BMI: 35
- Aim was for roughly equal racial/ethnic distribution, result was heavily skewed to Hispanic due to post-Hurricane changes

# results for agent (diet intake)

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- Food macronutrients all highly correlated
  - Protein, calories, carbohydrates, fiber, total fat, saturated fat, all showed relationships of  $p < .0001$
- Food micronutrients had variable correlations
  - Vitamin D highly correlated with iron and zinc
  - Vitamin C highly correlated with fiber and carbohydrates
  - Vitamin A highly correlated with folate, calcium, iron, zinc and vitamin D

# agent/host results (food items)

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- Foods in the home positively associated ( $p < .05$ ) with maternal BMI:
  - Chips; Sweet cereal; Chicharrones, Salad
- Number of times per week eaten is negatively related ( $p < .05$ ) to child BMI% for:
  - Chips, Cake, Salad, Soda
- Data from the Household Food Inventory



# agent/host results (relationship among food items)

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- Chips in the home are positively associated with:
  - Maternal BMI
  - Chiccarones in the home
  - Cake in the home
  - Sweet cereal in the home
  - Salad????
  - Sodas in the home

# Examples of indicated foods

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# agent/host results (relationship among food items)

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- Number of times chips are eaten per week is positively associated with:
  - How often cake is eaten
  - How often sweet cereal is eaten
  - How often salad is eaten???
  - How often soda is drunk

# agent (anthropometric) relationships

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- Contrary to expectations, no relationship between maternal BMI and child BMI% or child z score
- Maternal BMI was related to child gender, with heavier moms having more boys. Girls were ( $p < .051$ ) more likely to have a lower BMI than boys
- Maternal BMI was associated with high calorie foods in the home

# microsystem (nativity) results

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- Mother's Years in the US is negatively related ( $p < .02$ ) to child BMI% and child z score, but positively related ( $p < .08$ ) to mother's BMI
- Mother's birth country is negatively related ( $p < .08$ ) to child z score
- Child's birth county positively related ( $p < .05$ ) to child's protein intake
- Scoring: Latin American countries 1-3, US 4

# agent/micro results

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- Mother's physical activity (hard/very hard activity) negatively related ( $p < .05$ ) to the CFQ
- Interpretation: mothers who are physically active also are non-directive in feeding
- Stimulating home environment (HSQ) positively related ( $p < .03$ ) to the HFI and years in US
- Interpretation: stimulating homes have more food available

# microsystem (nativity) and agent (diets)

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- Child's place of birth (US=4, Latin America=1-3) is positively related ( $p < .05$ ) to:
  - Folate intake
  - Calcium
  - Iron intake
  - Zinc intake
  - Vitamin A ( $p < .06$ )

# micro/mesosystem interactions

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- Child calcium intake negatively ( $p < .05$ ) related to mother's total sleep hours and mother's time in US
- Child hours sleep hours, HFI, HSQ, mother's time in US, all positively ( $p < .05$ ) related
- HSQ negatively related ( $p < .05$ ) related to mother's total sleep hours



# discussion

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- Children showed better outcomes when their parents had been in the US for a longer period of time. They had better diets, lower BMI, better home environments, and more sleep
- Child BMI is higher when they eat fewer chips, soda, cake and salad???
- Maternal BMI is higher when there are more chips, sweet cereal, chicharrones, salad and sodas in the home

# discussion

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- All dietary macronutrients (protein, Kcal, fat, carbohydrates and fiber) and most micronutrients (Vits A, D, calcium, folate, zinc) highly ( $p < .05$ ) related
- When a child has a high protein intake, very likely also have sufficient dietary intake for all other nutrients.
- No relationship between specific dietary intake markers and BMI of mother or child

# conclusion

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- BMI of child did not differ by groups at end of study and little difference apparent by dietary intake or home environment
- Differences apparent by home environment, with children of newer immigrants having less healthy environments than children of parents who have been US residents for a longer time
- Ecological model of growth helps to explain child outcomes in home environments and dietary intakes