Food Insecurity and the Double Burden of Malnutrition

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Food Security exists when…

“…people, at all times, have physical, social and economic access to **sufficient**, **safe** and **nutritious** food which meets their dietary needs and **food preferences** for an active and healthy life”

1996 Rome World Food Summit

Prevalence of food-insecure and severely food-insecure individuals across 20 LICs, 35 LMICs, 36 UMICs, and 43 HICs. * Adapted from Smith et al. World Dev (2017)

*Measured with FAO’s Food Insecurity Experience Scale.
• FI inversely associated with household income, shelter and housing, and employment.

• FI associated with poor physical health and lower subjective well-being* adjusting for other living conditions.
  • FI was associated with subjective well-being in low-, middle- and high-income countries.

*Physical health was measured by asking whether the respondents “have any health problems that prevent them from doing any of the things people their age normally can do.”

Well-being measured by respondent’s self-report of whether or not they felt well-rested, were treated with respect, smiled or laughed a lot, learned or did something interesting, felt enjoyment, felt physical pain, felt worried, felt sad, felt stress, or felt anger on the day before the survey.
HFI is Associated with Stunting, Obesity & NCDs
HFI & Stunting: Mexican Children < 5 Years - ENSANUT 2012

Shamah-Levy et al. 2013

- FS: 11.7%
- Mild HFI: 13.1%
- Moderate HFI: 14.5%
- Severe HFI: 19%
Double Burden of Malnutrition: Simultaneous presence of stunted children under five and overweight mother in same household

Data set: 2006 Brazilian PNDS

DBM associated with severe HFI:
AOR: 2.65 (CI: 1.17–8.53)
“...severe HFI was associated with obesity risk among adult women (PR: 1.49; 95%CI: 1.17-1.90), moderate HFI was associated with excess weight among female adolescents (PR: 1.96; 95%CI: 1.18-3.27).”
<table>
<thead>
<tr>
<th>Food Security</th>
<th>BMI &lt; 18.50 kg/m², OR (95% CI)</th>
<th>BMI 25.00–29.99 kg/m², OR (95% CI)</th>
<th>BMI ≥ 30.00 kg/m², OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure (Ref)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Marginally insecure</td>
<td>0.96 (0.51, 1.81)</td>
<td>1.03 (0.83, 1.28)</td>
<td>1.33* (1.05, 1.69)</td>
</tr>
<tr>
<td>Highly insecure</td>
<td>1.74* (1.02, 2.96)</td>
<td>0.96 (0.80, 1.16)</td>
<td>1.18 (0.99, 1.41)</td>
</tr>
</tbody>
</table>

*Note. BMI = body mass index; CI = confidence interval; OR = odds ratio. OR (95% CI) controls for race, income, health insurance, and tobacco exposure.

Reference category is the normal BMI range (18.50–24.99 kg/m²).

*P ≤ .05.
Food insecurity among low-income families is associated with a significantly higher percentage of diabetes in community samples and studies with representative samples in the United States and Canada, especially among women.
Food Insecurity and Chronic Diseases Among American Indians in Rural Oklahoma: The THRIVE Study

Valarie Blue Bird Jernigan et al. AJPH 2017;107:441–446

• cross-sectional sample of 513 American Indian adults
• 2 questions from the six-Item Short Form of the USA Household Food Security Scale
• prevalence of obesity (60.7% vs 45.8%), diabetes (27.3% vs 18.8%), and hypertension (52.5% vs 42.5%) was higher among those with inadequate food quality than among those with adequate food quality
  • even after adjustment for age, gender, study site, education, and income
National Health Interview Survey data 2011-2015. Adjusted for: survey year indicators, age, gender, employment, marital status, race/ethnicity, insurance status, highest education of any adult in household, number of children, family size, and household income-to-poverty ratio. Working-age adults in households at or below 200 percent of the Federal poverty line.
• N=32,320 adults

• Multiple logistic regression (adjusted for complex sampling design)
  • Adjusted for education, age, urban/rural, socio-economic class, health insurance, BMI

• HFI is a risk factor for self-reported T2D (women)
  • Food secure; AOR: 1.00 (ref. category)
  • Mild HFI; AOR (95%CI): 1.31 (1.06-1.62)
  • Moderate HFI; AOR (95%CI): 1.67 (1.31-2.13)
  • Severe HFI; AOR (95%CI): 1.48 (1.14-1.93)
## HFI & Fasting Blood Glucose (mg/dl) among U.S. Hispanics

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Secure (n=24)</td>
<td>145.5</td>
<td>17.4</td>
</tr>
<tr>
<td>Mild-FI (n=18)</td>
<td>170.7</td>
<td>21.3</td>
</tr>
<tr>
<td>Moderate-FI (n=21)</td>
<td>184.0</td>
<td>19.6</td>
</tr>
<tr>
<td>Severe-FI (n=17)</td>
<td>204.4</td>
<td>21.7</td>
</tr>
</tbody>
</table>

Multivariate linear regression, N=97, p=0.007; Adjusted for 6 SES and demographic confounders; model $R^2=0.23$

Perez-Escamilla et al. (2014)
Possible mechanisms

- Poor dietary quality
  - high consumption of cheap energy dense and sugary foods and beverages
- Stress
- Poor sleep
- Other
  - Health care access issues

Pérez-Escamilla. Curr Dev Nutr 2017;1:e000513
• The 2010 Dietary Guidelines Advisory Committee concluded that strong and consistent evidence in adults indicates that dietary patterns relatively low in energy density improve weight loss and weight maintenance.

• The committee also concluded that there was moderately strong evidence from longitudinal cohort studies in children and adolescents suggesting an association between dietary energy density and increased adiposity.
Association of Household Food Insecurity with the Mental and Physical Health of Low-Income Urban Ecuadorian Women with Children

M. Margaret Weigel,1,2,3,4 Rodrigo X. Armijos,1,2,3,4 Marcia Racines,4 William Cevallos,4 and Nancy P. Castro5 Journal of Environmental and Public Health (2016)

- 794 women with children living in low income Quito, Ecuador, neighborhoods
- HFI was associated with poorer self-rated health, low MHI-5 scores, mental health complaints including stress, depression, and tightness/discomfort/pain
Standardized Path Diagram of Parallel Multiple Mediation Model between Food Insecurity and Insulin Resistance

HOMA = homeostatic model assessment of insulin resistance; WHR=waist-to-hip ratio; hsCRP=high sensitivity c-reactive protein

Bermúdez-Millán et al. (under review)
• Experiencing HFI was associated with
greater psychological distress and worse sleep quality (p< 0.05)

• Depressive symptoms, anxiety symptoms, and diabetes mellitus
distress mediated the relation between HFI and worse sleep quality
  • adjusting for age, education, income, marital status, and employment status.
• After adjusting for potential confounders, a significant association was found between severe household food insecurity and getting **less than the recommended 7–8 h of sleep** [adjusted odds ratio (AOR) =1.83, 95% CI=1.37–2.43].

• Compared with food secure households, odds of **poor sleep quality** increased with level of HFI severity
  - AOR = 1.27 for mild; 1.71 for moderate; and 1.89, 95 for severe household food insecurity.
Conclusions & Recommendations

- HFI is a risk factor for the DBM
- Multiple pathways may explain this relationship
  - Easy access to ultraprocessed foods
  - Stress coping
  - Poor sleep
- Global food systems need to be improved
  - Sugar taxes
  - Unhealthy foods and beverages marketing protection
  - Accurate and consumer-friendly front of package food labels
  - Ciclovías recreativas

Pérez-Escamilla. Curr Dev Nutr 2017;1:e000513
Food Security & Prevention of DBM is Central to the SDGs

Curr Dev Nutr 2017;1:e000513