

**The Multiple Contexts of Food Insecurity:
Evaluating the Impact on Child Energy Balance**
Lori Kowaleski-Jones Ph.D., University of Utah

Food security is defined as “access to enough food for an active, healthy life” (USDA, 1997). Food insecurity for the entire population was measured directly for the first time with an 18-item measure included in the April 1995 Current Population Survey (CPS). In 2003, 11% of the United States population was food insecure and 4% of the population suffered from food insecurity with hunger. For households with children, the rates are higher – 17% and 3.8 respectively.

The impact of food insecurity on children is an increasingly important research issue. However, at this point research is only beginning to evaluate community-level determinants of food insecurity. Prior research has identified state-level contextual predictors of household food insecurity (Edwards & Weber, 2003; Bartfeld & Dunifon, 2005). This paper expands on this work by considering the impact of a food insecurity infrastructure on household food insecurity by measuring infrastructure at the county level and therefore capturing local environmental effects. Using data from the Early Childhood Longitudinal Survey-Kindergarten Cohort, I examine two research questions: 1) what is role of local food insecurity infrastructure on food insecurity? 2) What is the impact of food insecurity on the elementary school aged energy balance? Results will provide important insight into the role of community resources in alleviating or aggravating food insecurity and subsequent impact on child energy balance.

At this point, much of the available research on community determinants of food insecurity has centered on what promotes differences in food insecurity across states. State level variation represents meso level determinants of food insecurity. Currently, Southern and Western states show the highest rates. For example, Oregon has consistently high hunger rates that persist across a mix of family structure and employment configurations. One conclusion is that broader economic factors affecting the relative cost of living in this state may have an important role (Edwards and Weber, 2003).

Other researchers have used data from U.S. Department of Agriculture and the U.S. Census to probe the higher than expected rates of hunger in the pacific northwest (Tapogna et al, 2004), arguing that a definitive explanation has not emerged that links state prevalence of hunger to contextual characteristics. State level residential mobility, unemployment rates, poverty, share of renters spending more than 50 percent of income on rent, ethnic diversity, and youthful population were identified as potentially important predictors of food insecurity. Results indicated that residential mobility, poverty, higher housing costs, and youthful population were associated with higher likelihood that a state would experience elevated incidence of food insecurity with or without hunger. Previous research has identified some important contextual determinants of food insecurity that warrant an investigation with a smaller lens. I argue that the county level is an important level of community analysis as many local decisions affecting food security infrastructure are

potentially made at this level. For example, counties represent an important unit for decision making about school policy, investments in infrastructure and the delivery of services.

Food Insecurity and Child Development

The effects of food insecurity on the development of U.S. children remain an open research issue. Rates of food insecurity are twice as high in households with children than in those without (Bickel, Carlson, and Nord, 1999). Dunifon and Kowaleski-Jones (2003) have found that food insecurity is consistently associated with increases in children's behavior problems, but not decreased test scores, and that factors representing families' economic status are significantly associated with food insecurity. Jyoti and colleagues (2005) found that food insecurity was predictive of poor developmental trajectories in children. Their results also suggest an association between food insecurity and greater weight gain among boys. Boys in households that transitioned from food insecurity to food security gained less weight than boys remaining food insecure, boys remaining food secure, or boys becoming food insecure. Therefore, the association in boys seems to be with change in food security status, giving evidence for a relatively short lag between cause and effect. They conclude that food insecurity in the early elementary years has developmental consequences.

Data

I study these issues with data from the Early Childhood Longitudinal Survey Kindergarten Cohort (ECLS-K). The ECLS-K is based on a nationally representative sample of approximately 22,000 children who were enrolled in roughly 1,000 kindergarten programs during the 1998-1999 school years. The analyses focus on the sample of children surveyed in the spring of fifth grade.

Dependent Variables

Food Insecurity. At this point, the food in 18 questions about self-reported behaviors and attitudes that has been developed by the USDA represents the concept that is widely used by government agencies and advocacy groups. In the proposed research, I employ the USDA measurement of food insecurity. Food insecurity is measured using the 18-item measure developed by the USDA and is coded using the USDA-defined categories of secure, insecure without hunger, insecure with moderate hunger, and insecure with severe hunger (USDA, 1997).

Children's Energy Balance. Children's energy balance will be measured by child body mass index (BMI), which is viewed as the composite of energy intake and output. BMI is calculated by dividing the weight of the child by the height squared of the child. Based on the Centers for Disease Control-recommended definition a child is considered overweight if they are in the 95th percentile of the expected BMI

for their height and weight.

Independent Variables

County Level Food Infrastructure. To measure county level food infrastructure, data have been gathered from a variety of sources and appended to the ECLS data via county identifiers available from the restricted use data that is available from the National Center for Educational Statistics. This operationalization has greatly benefited from the previous work in state level variation in food assistance done by Tapogna et al (2004) and Bartfeld and Dunifon (2005).

Availability of federal assistance. *Availability and amount of Food stamps.* Following from prior research (Bartfeld and Dunifon, 2005), I use the availability of food stamps among eligible people as a marker for accessibility of food assistance in a local area. *Federal spending on agriculture and natural resources, community resources, human resources.* Federal spending on agriculture and natural resources is seen as an important macro level determinant of food insecurity. This data is drawn from the 2000 Consolidated Federal Funds Reports data from the U.S. Department of Commerce, Census Bureau. Recent research (Reeder, Calhoun, and Bagi, 2001) has demonstrated regional differences in federal spending and the effects for the local areas. This research has also identified this category as representing federal spending that is likely to result in developing local infrastructure.

Economic Attributes of Communities *County Economic Type* I draw data from the 2000 Economic Research service county typology (Cook and Mizer, 1994) to identify farming-dependent communities. I expect that farming dependent communities would have more support for food related needs and therefore would be associated with lower levels of household food insecurity. *County unemployment rate* is coded to county to measure local area ability to find work. *County Poverty rate* is included from the 2000 census to measure overall economic well being in the county. *Median rent* is coded from the 2000 census to counties and is used as a marker of household costs. *Average wages per job* is coded from the Bureau of Economic Analysis to capture job quality in 2000.

Local Food context *Availability of food.* Data is drawn from County Business Pattern Data from the U.S. census and will use North American Industry Classification System. These data are used to construct data on the ratio of grocery stores, convenience stores, full service and limited service restaurants, and the ration of grocery to convenience stores and of full-service to limited service restaurants in a child's home county, and have been linked to children's weight gain (Sturm and Datar, 2005).

Social Context. *Percentage of Households that Moved in the Last Five Years.* This variable uses census data from the 2000. Prior work has linked residential stability with food security (Topogna et al, 2004; Bartfeld and Dunifon, 2005). *Population share under age 18.* Tapogna et al (2004) has identified this

characteristic as potentially leading to household food insecurity because larger households with children will more prone to problems with food availability.

Hierarchical linear modeling (Raudenbush & Bryk, 2002) is used to model the clustering of cases (i.e., children) within larger units (in this case, counties). HLM analytic techniques are used to model the effects of community food infrastructure on food insecurity and on child energy balance. In all analyses, I also control for an extensive set of background characteristics of the child's family, including: average family income; family size; number of siblings; home ownership; parents' education; child gender, age, and race; maternal employment; welfare receipt over the study period; receipt of food stamps; maternal age at the birth of the child; and family structure.

Summary

Prior research in the general area of context and food insecurity has focused on state level variation. This research will break new ground in identifying more proximal indicators of food insecurity. Results will enhance local community efforts at developing the sort of community food security profiles envisioned by recent USDA reports (Cohen, 2002). Overall, the research on food insecurity has evolved and grown since the 1997 when the USDA instrument was first measured. However, important gaps in our understanding of the determinants and consequences of food insecurity remain. We must better understand the local area determinants of food insecurity. These analyses will provide important insight about the multiple contexts of food insecurity in the United States and the impact for child energy balance outcomes.

References

- Bartfeld, Judith and Rachel Dunifon. (2005). "State and Household Level Predictors of Food Insecurity". United States Department of Agriculture Working paper.
- Bickel, G., Carlson, S., and Nord, M. (1999). "Household food security in the U.S. 1995-1998 (Advance report)". Food and Nutrition Service, U.S. Department of Agriculture.
- Cohen, B. 2002. Community Food Security Assessment Tool Kit. United States Department of Agriculture, Economic Research Service, EFAN E-FAN-02-013.
- Cook, P. J. and Karen L. Mizer, *The Revised ERS County Typology: An Overview*, RDRR-89, U.S. Department of Agriculture, Economic Research Service, Dec. 1994.
- Dunifon, Rachel, and Kowaleski-Jones, Lori. 2003. The Influence of Participation in the National School Lunch Program and Food Insecurity on Child Well-Being *Social Service Review* 76(4): 72-92.
- Edwards, Mark. And Weber, Bruce. 2003. Food Insecurity and Hunger in Oregon: A New Look. Working Papers in agricultural and resource economics AREC 03-104.
- Jyoti, D.F. E. A. Frongillo, and S. J. Jones 2005 Food Insecurity Affects School Children's Academic Performance, Weight Gain, and Social Skills *J. Nutr.*, 135(12): 2831 - 2839.
- Raudenbush, S. & Bryk, A. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods*. 2nd edition. Thousand Oaks: Sage Publications.
- Sturm, R. and A. Datar, *Body mass index in elementary school children, metropolitan area food prices and*

food outlet density. Public Health, 2005. 119(12): p. 1059-1068.

Tapogna, J., Suter, A., Nord, M., Leachman, M. 2004. Explaining variations in state hunger rates. Family Economics and Nutrition Review 16(2): 12-22.

USDA (2002). National Level Annual Summary Tables: Fiscal Years 1969-2001. Available:
<http://www.fns.usda.gov/pd/cnpmain.htm> .

USDA Guide. (2001). Guide to measuring household food security [On-line]. Available:
<http://www.ers.usda.gov/briefing/foodsecurity/surveytools/index.htm>. Accessed November.