



Vulnerability of families and households to natural hazards: A case study of storm surge flooding in Sarasota County, Florida



Li-San Hung, Chongming Wang, Brent Yarnal*

Department of Geography, The Pennsylvania State University, 302 Walker Building, University Park, PA 16802, USA

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ABSTRACT

The role that family and household structure, size, and ethnic/racial composition play in increasing or decreasing vulnerability to natural hazards, which has been missing from the literature, is investigated. The study first reviews the conceptual foundations of the relationships between families/households and natural hazards vulnerability and then employs a principal components analysis to uncover spatial variations in the vulnerability of families and households to hurricane storm surge hazards in Sarasota County, Florida. The analysis identifies and maps five principal components that explain approximately 83% of the variance in family/household population: nuclear families/households; Black families/households; nonfamily, young adult group households; Hispanic families/households; and Asian families/households. Comparison of storm surge risk maps with the locations of these families/households shows the relative vulnerability of each of these family/household categories, with elderly householders living alone on exposed barrier islands being the most vulnerable. The research suggests that family and household structures integrate several socio-demographic vulnerability indicators central to most social vulnerability assessments. Results indicate that future research and hazard mitigation policies should focus on families and households as core analytical units. Findings also suggest that recognizing the diversity of families and households is important to reducing vulnerability to natural hazards.

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1. Introduction

Vulnerability assessments of natural hazards include not only evaluations of a location's physical exposure to geophysical events, but also assessments of its socioeconomic and demographic vulnerabilities (Birkmann & Fernando, 2008; Cutter, 1996). Among demographic factors leading to natural hazard vulnerability, two theoretically important elements are households and families (Cutter, Boruff, & Shirley, 2003; Kuhlicke, Scolobig, Tapsell, Steinführer, & De Marchi, 2011). Among the many empirical studies that have examined vulnerability from the perspective of the household or family, including such topics as household demographics (e.g., Lindell & Perry, 2000), household income (e.g., Adger, 1999), household socio-economic status (e.g., Morrow, 1999), household hazard awareness (e.g., King, 2000), and household evacuation and emergency plans (e.g., Paton & Johnston, 2001), few have specifically examined vulnerability from the

point of view of household characteristics themselves. The goal of this paper, therefore, is to examine social vulnerability to natural hazards from the perspective of families and households.

Literature from sociology, family studies, and other related fields (Bandy & Ottoni-Wilhelm, 2012; McLanahan, 2004; McLanahan & Percheski, 2008) have suggested that the characteristics of families and households capture and display many of the social traits that are often identified as social vulnerability indicators, such as gender, race/ethnicity, disability, age, and class (Cutter et al. 2003; Wachtendorf, Nelan, & Blinn-Pike, 2013). Section 2 of this study reviews how families and households represent these social traits and considers the conceptual foundations of the vulnerability of families and households to natural hazards. Section 3 presents the research design, including an overview of the study area and presentation of the data and methods used. In section 4, it presents a practical example that shows spatial variations in the vulnerability of families and households to hurricane storm surge hazards in Sarasota County, Florida. Instead of presenting them separately as dictated by tradition, the results and discussion of those results are combined in this section to help the reader interpret and understand the study's findings. The paper's conclusions section draws inferences from the findings, identifies gaps in our understanding

* Corresponding author.

E-mail addresses: lxh239@psu.edu, cwx960@psu.edu, alibar@psu.edu (B. Yarnal).

of family and household vulnerability to natural hazards, points out an important caveat regarding this study, and briefly reviews policy implications. The paper concludes that family and household structures integrate many socio-demographic vulnerability indicators and are therefore central to most social vulnerability assessments.

2. Families and households in vulnerability studies

2.1. Conceptual background to families and households

The U.S. Census Bureau defines *family* as “a group of two people or more (one of whom is the householder) related by birth, marriage, or adoption and residing together” and *household* as “all the people who occup[y] a housing unit” (Lofquist, Lugaila, O’Connell, & Feliz, 2012: 4). Households include family households and nonfamily households. A *family household* is “a householder and one or more other people living in the same household who are related to the householder by birth, marriage, or adoption” (Lofquist et al. 2012: 4). A *nonfamily household* “consists of a householder living alone or with nonrelatives only” (Lofquist et al. 2012: 4). A *householder* is “the person (or one of the people) in whose name the housing unit is owned or rented” (Lofquist et al. 2012: 4).

While the number of households in the United States tripled between 1940 and 2010 (Jacobsen, Mather, & Dupuis, 2012), changes in the structure of both family and nonfamily households was even more dramatic (Cherlin, 2010; Kennedy & Fitch, 2012). The proportion of traditional two-parent families decreased radically, while other forms of family structures, which we will refer to as non-two-parent families, increased (McLanahan & Percheski, 2008). Some examples of non-two-parent families are step-families, single-parent families, and cohabiting families. Many Americans have experienced several family transitions during the course of their lives (Fomby & Cherlin, 2007; Osborne & McLanahan, 2007).

The change of family household structures has had many consequences on families and American society. Although results are sometimes mixed, most demographers and family sociologists agree that compared to two-parent families, non-two-parent families are often linked to negative outcomes, such as poverty, criminal behavior, and health and mental problems both for parents and children (Bandy & Ottoni-Wilhelm, 2012; McLanahan, 2004; McLanahan & Percheski, 2008). For example, many studies have shown that children in non-two-parent families have generally lower academic performance (Sun & Li, 2011; Thomson, Hanson, & McLanahan, 1994). Among the many theories proposed to explain the disadvantages of non-two-parent families, economic deprivation has considerable support among many researchers (e.g., Downey, 1995; Eggebeen & Lichter, 1991; McLanahan, 1985).

Evidence suggests that other family household structures, such as stepfamilies and cohabiting families, also perform less well than two-parent families (see Smock, 2000; Thomson et al. 1994), with single-parent families, especially single-mother families, being the most disadvantaged. McLanahan (1985) and McLanahan and Percheski (2008) show that in the United States, single mothers are often minorities with low educational attainment and low income, with their limited economic and social resources and sometimes poorer mental health often leading to worse parenting, which significantly decreases their children’s wellbeing and reproduces inequalities in subsequent generations.

Nonfamily households are also important, accounting for 24.6% of all household types in 1990, 25.8% in 2000, and 26.7% in 2010. There was an increase in the number of elderly individuals and

couples living alone in the 20th century United States (Kramarow, 1995) so that one third of nonfamily households in 2010 were elderly (Lofquist et al. 2012). No single factor can explain the rising percentage of the elderly living alone, but value change and rising income were two important factors (Kramarow, 1995). The rise in elderly nonfamily households is a social concern because as people enter their last decades of life, they face health, economic security, needs-assistance, and other issues (Neugarten, 1974).

Demographers, family sociologists, and other social scientists interested in family structures have tended to focus their attention on such topics as: the impact of family structure on children’s educational outcome, crime, poverty, health, and fertility (e.g., Astone & McLanahan, 1991; Dawson, 1991; Eggebeen & Lichter, 1991; Hogan & Kitagawa, 1985; Voorhis, van, Cullen, Mathers, & Garner, 1988); the relationship between nonfamily households and poverty (e.g., Bauman, 1999); the changing traditional attitudes, values, plans, and expectations for the young who cohabitate (Waite, Goldscheider, & Witsberger, 1986); and the association between household structures and racial segregation (Iceland, Goyette, Nelson, & Chan, 2010; Marsh & Iceland, 2010). As noted in the introduction, work relating family and household characteristics to vulnerability to natural hazards and resulting disasters – which is the focus of this paper and is expanded below – is limited (e.g., Morrow, 1997; Wachtendorf et al. 2013).

2.2. Families, households, and vulnerability to natural hazards

The concept of vulnerability is used in various disciplines, such as economics, anthropology, psychology, and engineering, and in various interdisciplinary fields, such as global environmental change and natural hazards; each discipline or field has its own definition and understanding of the term (e.g., Adger, 2006; Birkmann et al. 2013). Even researchers working in the same discipline or field can use somewhat different definitions of vulnerability (Füssel, 2007). Nonetheless, all disciplines, fields, and researchers agree that *vulnerability* is the potential of people or entities to be harmed (e.g., Cutter, 1996). In the closely related fields of global environmental change and natural hazards, researchers also often agree that vulnerability consists of three dimensions: exposure, sensitivity, and adaptive capacity (Adger, 2006; Polsky, Neff, & Yarnal, 2007). Yarnal (2007) summarized that exposure is the degree to which people (human systems), places (physical systems), or things people value are open to a potentially harmful event; sensitivity is the degree to which people, places, or things people value can be harmed by an exposure; and adaptive capacity means the degree to which people can mitigate the potential harm by taking action to reduce exposure or sensitivity both before and after the event.

Among the many perspectives and frameworks used by scholars to examine and assess vulnerability to natural hazards (e.g., Birkmann et al. 2013; Frazier, Thompson, & Dezzani, 2014; Kienberger, Blaschke, & Zaidi, 2013; Wolf, 2012),¹ one view point employs two sub-concepts (Cutter, 1996): physical vulnerability and social vulnerability. Physical vulnerability, similar to the idea of exposure, deals with potential loss to natural hazards caused by physical processes and concentrates on physical science; social vulnerability refers to a social group’s potential loss to natural

¹ The aim of this literature review is not to provide a comprehensive review of the social vulnerability literature but instead to emphasize the dearth of literature on the vulnerability of families and households to natural hazards. The literature on social vulnerability in natural hazards and its cognate fields is vast, with many excellent reviews available. For relatively recent reviews of the vulnerability literature, see, for example, Hufschmidt (2011) or Fuller and Pincetl (2015).

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