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The importance of place in early disaster recovery: a case study of the 2013 Colorado floods

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Recovery is an important but understudied phase in the disaster management cycle. Researchers have identified numerous socio-demographic factors that help explain differences in recovery among households, but are less clear on the importance of place, which we define as a household's locality and local governance. In this paper, we examine the influence of place on disaster recovery through a study of the 2013 Colorado floods. Our findings are based on data collected from interviews, observation of recovery meetings, and a survey of 96 flood-affected households. We show that place shapes a household's disaster recovery by structuring: (1) physical exposure to hazards; (2) which local government has jurisdiction over recovery decisions; (3) local planning culture and its approach to citizen participation; and (4) the strength of social capital networks. Our findings expand the recovery literature and show that place-level variables should be taken into consideration when conceptualizing household recovery and resilience.

Keywords: disaster; recovery; local government; flood; Colorado

1. Introduction

Recovery after a disaster is an important but understudied phase in the disaster management cycle. Disaster recovery, or the ability of affected people and communities to 'return to normal function with minimal suffering and disruption of services', is a complex process and our understanding of the factors that influence its trajectories is relatively limited (FEMA 2011; see also Barton 1969; Smith and Wenger 2007; Olshansky 2005; Rubin 2009; Ahrens and Rudolph 2006). The research on disaster recovery is growing but many fundamental questions remain. Of particular concern is uneven recovery, or the tendency of some households and communities to recover more quickly or completely than others. This 'recovery divide' is often tied to pre-existing social, economic, and political inequalities and to unequal access to resources and decision-making authority (Johnson, Penning-Rowsell, and Parker 2007; Walker and Burningham 2012), but detailed studies of recovery at the household level are still relatively rare (but see Cutter *et al.* 2014, 3; Wisner, Gaillard, and Kelman 2012; Enarson and Fordham 2001). Understanding the factors before and after disaster events that underlie uneven recovery will help us to design better policies and planning approaches to encourage more efficient, sustainable, and equitable recovery (Kim and Olshansky 2015; Smith and Wenger 2007; Johnson, Penning-Rowsell, and Parker 2007).

Researchers have made significant progress in understanding how individual and household level characteristics influence disaster vulnerability. Numerous studies suggest

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that *who you are* – your socioeconomic status (SES), age, sex, demographic makeup, and other personal attributes – has a measurable impact on disasters and subsequent recoveries (Highfield, Peacock, and Van Zandt 2014; Peacock *et al.* 2015). When considered together, these personal variables are indicators of social vulnerability to hazards and explain a significant amount of variation in recovery outcomes across social groups, even with similar levels of exposure (e.g., Cutter, Boruff, and Shirley, 2003; Wisner *et al.* 2003; Thomas *et al.* 2013; Tierney 2014; Enarson and Fordham 2001).

Some studies also suggest that *where you live* is an important consideration for understanding recovery. For instance, Cutter *et al.* (2014) argue that community recovery is, in part, dependent on "preparedness and mitigation efforts taken pre-storm, and the capacity (economic, social, and institutional) of the community" (64). In their study of post-Katrina recovery of flood damaged neighborhoods in New Orleans, Green, Bates, and Smyth (2007) show that "structural and flood damage is not the only, or perhaps even the primary, impediment to recovery" (312). Instead, the neighborhood's limited resources, external assumptions about community non-viability, and the slow rebuilding of infrastructure all played a more "significant role in retarding repair and re-occupancy" (Green, Bates, and Smyth 2007, 312). Similarly, Ahrens and Rudolph (2006) theorize that institutional failure and bad governance could be the root cause for a vicious cycle connecting underdevelopment and disaster susceptibility to poor recovery, but they also note a lack of empirical evidence at each level of government. Thus, compared to research on social vulnerability, we are less clear on how place – more specifically, a household's locality and local governance – matters in household recovery and how place-related variables interact with demographic and socioeconomic characteristics to produce uneven recovery. This paper attempts to address this gap and seeks to better understand how place influences the early recovery period.

We base our findings in a mixed-methods case study of the 2013 floods in the state of Colorado, in the United States. The Colorado floods provide a unique opportunity to examine how place characteristics shape recovery since a diverse range of households and communities were affected but all operated under the same state and federal recovery regime. Our three-county study of the ongoing recovery includes data from a survey of 96 households that suffered significant loss or damage during the floods; semi-structured interviews with local, county, and state officials involved in the recovery process; participant-observation in more than 50 recovery meetings; and monitoring of communication between public officials and disaster-affected communities.

Our study focuses on the early recovery period that begins during the emergency response and can last for months or years depending on the scale and context of the disaster. In general, early recovery is a time when households and communities make key decisions about what to rebuild, where to rebuild it, and how they might pay for it (Schwab 2014, 31). Consequently, households also determine whether they can stay in their communities or are forced to relocate, at least for the foreseeable future. During this period, authorities also distribute the majority of public and private household recovery resources. Also, recovery plans are typically written or updated during this time, documents that establish recovery goals and priorities that can guide the distribution of limited recovery resources. Early recovery is also a time where recovery leadership tends to engage most intensely with the public.

Ultimately, disaster recovery can take years or even decades, and at this point, we cannot write a complete account of the Colorado floods. Nevertheless, the early recovery

phase sets the stage for long-term recovery and allows us to observe the various ways in which place shapes the character and direction of recovery pathways and processes.

We find that place shapes recovery in at least four ways. First, where you live determines your exposure to environmental hazards. Although exposure alone does not determine disaster outcomes, it is an important component of disaster risk and a significant predictor of physical damage, which is a major barrier to recovery. Second, place is associated with level and approach to governance, including which local government has jurisdiction over a household, its capacity and relationship with its constituents, and its relationship with other levels of government. A third way that place influences household recovery is through planning cultures, and in particular how planning institutions approach citizen participation and transparency of decision-making. Finally, place is important for understanding social networks and social capital, both of which are important drivers of recovery in disaster-affected communities (Nakagawa and Shaw 2004; Aldrich 2012; Walker and Burningham 2012).

Although there is an emerging consensus that 'place matters' in disaster recovery, our study moves this argument forward in several ways. Very few studies use empirical evidence in general, and household-level data in particular, to determine whether where one lives matters for recovery and, if so, why. Also, examining disaster recovery processes operating in the same region and under the same state- and federal-level recovery regime allows us to control for some of the variation introduced when comparing across different disasters and less proximal jurisdictions. Finally, our categorization of findings helps researchers and practitioners better address how place-level variables might affect early and long-term recovery, as well as disaster preparedness (Johnson, Penning-Rowsell, and Parker 2007; Ahrens and Rudolph 2006).

The paper proceeds in four parts. First, we conceptualize the importance of place in disaster recovery based on a review of the disaster recovery, environmental justice, and community planning literatures. Second, we introduce the Colorado floods as the context of our study. Third, we outline our methods and review and analyze the empirical data from our survey of flood-affected households, supported by data from interviews, public meetings, and other qualitative sources. We conclude with a brief discussion of our findings and some suggestions for future research.

2. Locating place in household disaster recovery

Epidemiologists, sociologists, political scientists, and geographers have long shown how place is a powerful explanatory variable for life outcomes, even when controlling for self-selection bias (Jencks and Mayer 1990; Castells 1992; Ellen and Turner 1997; Levelthal and Brooks-Gunn 2000). Although an influential critique of the 'power of place' contends that globalization renders location irrelevant (O'Brien 1992; Friedman 2006), much empirical work demonstrates the strength and resilience of neighborhood effects (Christopherson, Garretsen, and Martin 2008; Sampson 2012). Dreier, Mollenkopf, and Swanstrom (2001) argue that "place affects our access to jobs and public services, our access to shopping and culture, our level of personal security…and even the air we breathe" (4). The environmental justice literature confirms that places are separate and unequal due to the social, economic, and political contexts that create the distribution of exposures and a community's ability to influence or respond to them (Huang and London 2012). Where one lives plays a critical role in affecting, among other indicators, economic opportunity, social capital, quality of governance, and physical well-being, as well as the interactions between these key variables.

First, place shapes *economic* opportunity. Where one lives distributes life chances differentially through, for one, the location of jobs and development (Hayward and Swanstrom 2011; Raphael and Stoll 2002). Experts often present evidence of place impacts when justifying, for example, voucher-based housing policies intended to move lower-income households into more economically-viable neighborhoods. Along these lines, Bratt, Stone, and Hartman (2006) find that place impacts on economic opportunity are very durable and play a critical role in "fixing a person's place in society and in the local community" (2; see also Chetty *et al*., 2014). Others have noted the weakness of these studies' findings (Goetz and Chapple, 2010), agreeing that place does matter, but not necessarily in predictable patterns of outcomes, and that social ties also matter for shaping household well-being.

Place impacts *social capital* and social networks in complex ways, although evidence as to the direction of this link varies (Putnam 2007; Anguelovski 2012). What is clear, following Sampson (2012) and others, is that altruism, sense of worth, sense of community and belonging, and collective efficacy – or the feeling that one's opinion matters and is 'counted' – differs significantly depending on where one lives. Crime, incarceration rates, and even voting behavior are influenced significantly by one's neighbors, even when controlling for historical behavior or other key personal characteristics (Enos 2015).

Where one lives also dictates local *governance* structures. Attitudes of local officials about political accountability, the role of government and civil society, the primacy of property rights, and planning capacity and power all interact to shape the structure and nature of political engagement. Dreier, Mollenkopf, and Swanstrom (2001) show that 'organization-based resources' – including health clinics, community centers, block associations, crime prevention initiatives, after school programs, local NGOs, and other social services – all play an important and multivalent role in shaping quality of life. The level and quality of public services and infrastructure such as schools and transit systems also differ greatly by neighborhood (Hayward and Swanstrom 2011; Sanchez, Stolz, and Ma 2004). Specific to disaster management, local governance over disasters and disaster recovery varies widely in terms of capacity, coordination between agencies and organizations, and views on the appropriate role of local government (Olshanksy, Johnson, and Topping 2006; Dewan 2013).

Finally, in terms of *physical* well-being, public health advocates and environmental epidemiologists show the impact of neighborhood wealth and urban form on factors such as disease prevalence, general child and adult health, and infant and adult mortality (Diez Roux 2001; Veenstra *et al.* 2005). More recent studies have begun to tie health outcomes to food access and cost, with access to healthy food varying significantly across neighborhood types (see Moore and Diez Roux 2006).

These sets of well-being-related variables work together in complex ways. We know, for example, that neighborhood-level social capital varies directly with the amount of green space in a neighborhood, and indirectly with crime, violence, health, antisocial behavior, and even mortality, all while controlling for personal characteristics such as SES and demographics (Sampson 2012). Dreier, Mollenkopf, and Swanstrom (2001) argue that solutions to metropolitan inequality must be multi-pronged and multi-scalar and include municipal, regional, and federal level policy prescriptions. Those working from an environmental and social justice approach seek to understand the causes of underdevelopment and distributional inequality and whether they relate to government policy and practice (Walker and Burningham 2012), specifically whether the government is accountable, transparent, participatory and predictable (Ahrens and Rudolph 2006). In sum, place matters in powerful ways, whether through attachment to place and social networks,

location in an area with more services and amenities, better access to job opportunities, fewer health and safety risks, or the quality of local governance (Chapple and Goetz 2011).

With the relatively recent emergence of a research literature on disaster recovery, scholars have begun to emphasize the power of place in determining disaster outcomes, particularly at the community-scale (Rubin 1985; Olshanky 2005; Rubin 2009). Smith and Wenger (2007) define disaster recovery as the "differential process of restoring, rebuilding, and reshaping the physical, social, economic and natural environment through pre-event planning and post-event actions" (237). While early studies (e.g., Haas *et al.* 1977; Kates and Pijawka 1977) theorized disaster recovery as 'ordered, knowable, and predictable', more recent studies highlight how the terrain of recovery is actually quite varied (Olshansky, Johnson, and Toppings 2006; Smith 2012; Cutter *et al.* 2014).

Much of the current research on household disaster recovery focuses on social vulnerability, or those characteristics that make a person or group susceptible to the damage effects of a hazard. This research shows that disasters are largely social in origin and are deeply rooted in the everyday inequalities present in political, economic, and social systems rooted in place (e.g., Wisner *et al.* 2003; Cutter, Boruff, and Shirley 2003; Fothergill and Peek 2004; Peacock *et al.* 2015; Tierney 2014). We also know that social vulnerability plays a significant role in producing uneven recovery processes and outcomes. Wisner, Gaillard, and Kelman (2012) conceptualize vulnerability as a lack of access to various types of resources, including natural, political, and economic resources. A vulnerable individual's lack of access to resources continues after the disaster, leaving her marginalized in different ways. Quarantelli (1999) shows that disaster recovery varies due to the social characteristics of victims such as SES, age, knowledge, and social positioning (5−7). Enarson and Fordham (2001) show similar findings by race, ethnicity and gender. Olshansky, Johnson and Topping (2006) describe "considerable consensus" in the disaster recovery literature that the "higher the socioeconomic level, the more likely households and businesses are to recover to pre-disaster levels" (356). Numerous studies on household and community recovery after Hurricane Katrina center on questions of race and class and how they influence patterns of uneven recovery (e.g., Comfort 2006; Squires and Hartman 2006; Elliot and Pais 2006). In their study of recovery after Hurricanes Andrew (1992) and Ike (2008), Peacock *et al.* (2015) found that social vulnerability factors played an important role in shaping the inequities in housing recovery.

Compared to the relationship between social vulnerability and recovery, the connection between place and household recovery is less well documented. Some of the leading conceptual models of disaster resilience do discuss the importance of place to the vulnerability or resilience of people and communities to natural hazards. Cutter *et al.*'s (2008, 5) disaster resilience of place (DROP) model, for instance, begins with antecedent conditions that are a set of "place-specific multi-scalar processes that occur within and between social, natural, and built environment systems", but what these processes are and how they influence recovery post-disaster is not specified. In later work Cutter, Burton and Emrich (2010) propose a set of quantifiable place-level variables, but compared to research on indicators of social vulnerability, these variables remain underdeveloped. Recent research on community recovery post-disaster, especially after Hurricanes Katrina and Rita, present powerful evidence that recovery is often a function of community input, power, and capacity, but the impact on individual households is less clear (e.g., Haas *et al.* 1977; Rubin 1985; Kweit and Kweit 2004; Olshansky and Johnson 2010; Smith 2012; Kim and Olshansky 2015). Our goal in this research is to fill this gap and better understand empirically how specific place-related factors impact household-level recovery processes.

Table 1. Demographics in three study counties.

County	2014 Population estimate	Median household income 2009–2013	% White alone	% Living below poverty line, 2009–2013	Average unemployment 2014
Boulder County	313,333	$67,956	91.0%	14.2%	4.1%
Larimer County	324,122	$58,626	93.4%	14.1%	4.3%
Weld County	277,670	$57,180	93.4%	14.7%	4.5%

Source: US Census, Bureau of Labor Statistics 2014.

3. Study context: the 2013 Colorado floods

From 9–15 September 2013, heavy rainfall triggered massive flooding along the Colorado Front Range. The flood killed 10 people, destroyed more than 1,850 homes, and caused widespread damage to roadways and other critical infrastructures. The total economic costs of the flood will likely exceed $3 billion, making it one of the costliest disasters in state history (Colorado Recovery Office 2014).

The Colorado floods are a unique opportunity to study place-related impacts in recovery processes because of the geographic breadth of the disaster and the diversity of communities impacted. Eighteen counties were included in the major disaster declaration, with the heaviest impacts in a three-county region in the north-central part of the state, an area that contains medium and large sized cities, small towns, unincorporated communities, and rural agricultural areas. The terrain of the area ranges from high mountain and canyons to arid plains.

We chose to focus on these three hardest-hit counties for our study: Boulder, Larimer and Weld. These counties border one another but are politically and socially diverse. Boulder County is a Democratic stronghold and one of the most liberal counties in Colorado. Larimer County leans conservative – the County Commissioners are all currently Republican, and registered Republicans outnumber Democrats by a significant margin.[1] Weld County is one of the most conservative counties in northern Colorado.[2] Demographically, the three counties are quite similar in terms of total population, race, and socioeconomics. Although household income is higher in Boulder County, the poverty rate and unemployment are relatively similar among the three (Table 1).

4. Methodology

To better understand how place shapes disaster recovery, we designed a mixed methods study of recovery in Boulder, Larimer and Weld counties and collected qualitative and quantitative data from multiple sources. First, we conducted semi-structured interviews with 32 local and state officials active in the recovery, including town and city staff, elected officials, agency representatives, and leaders of civil society organizations. Second, we monitored public communication about recovery in the three counties through direct observation of over 50 recovery meetings and public events, as well as emails, public notices, social media postings, and newspaper stories. Finally, we surveyed 96 households from Boulder, Larimer and Weld Counties whose homes or property were significantly damaged by the floods.

Our research team conducted surveys between May and October 2014, recruiting participants with fliers, direct mail, emails, tabling at flood recovery events, and through snowball sampling. We administered our surveys in person in either English or Spanish. The survey instrument contained a total of 70 closed and open-ended questions and produced a rich set of quantitative and qualitative data. The 96 households surveyed contained 286 individuals, with a median household size of three. Because of the political similarities between Larimer and Weld Counties, and because damage was highest in Boulder County, we compare household recovery between Boulder County and a grouping of Larimer and Weld counties. Of the households surveyed, 48 were living in Boulder County at the time of the flood, 40 in Weld County, and 8 in Larimer County. The respondents lived in a diversity of places within these counties, but were primarily from towns, small cities (less than 30,000 population), and rural (unincorporated) communities. Sixty-six of our surveys (69% of our sample) were conducted in English and 30 (31%) in Spanish. The floods disproportionately impacted low-income households, which was reflected in our survey sample. Of the 96 households surveyed, 74.2% earned less than $60,000 per year, the approximate median household income for the state of Colorado, with an average income of $46,296.[3] Approximately 45% of households in our sample earned less than $30,000 per year, whereas 14 (15%) earned $100,000 per year or more. Our survey population included a mix of household types: married/partnered with children (31), married/partnered without children (21), single without children (17), single with children (8), and other (19).[4]

To analyze the surveys, we tested for differences between the answers of Boulder respondents and a grouping of Larimer and Weld respondents. Depending on the type of response variables we tested for significance, with an alpha level of .05, using Likelihood Ratio (Pearson's chi-square) and *t*-tests (Fischer's exact). The two groupings allowed for two nearly equal independent samples; 47 respondents from Boulder and 49 from Larimer/Weld.

5. Four ways that place shapes household recovery

Our findings confirm that the Colorado floods, like most disasters, had a disproportionate impact on households who are socioeconomically vulnerable, particularly low-income and/or elderly households (Cutter, Boruff, and Shirley 2003; Thomas *et al.* 2013). Beyond socioeconomic factors, however, we find that place-level variables also contribute significantly to household recovery. In the remainder of the paper we organize these place-level effects into four major categories: physical exposure, local governance, planning and policy making, and social networks. Within each category, we discuss existing thinking from the disaster recovery literature then illustrate how our own findings support, refute, or extend these arguments.

5.1. Physical exposure

The most direct way that place can shape recovery processes is through exposure, or the location of a household and its physical assets relative to natural hazards. Hazard exposure is strongly tied to the level of physical damage a household or community experiences during a disaster. Generally speaking, the higher the damage, the longer and more difficult the recovery process will be. Although foundational disaster studies equate physical reconstruction with recovery (Haas *et al.* 1977), and some researchers continue to use it as a convenient metric (Kikitsu and Sarkar 2015), most scholars now recognize

that exposure and damage alone do not determine recovery (e.g., Berke, Kartez, and Wenger 1993; Olshansky 2005; Smith and Wenger 2007; Rubin 2009; Iuchi, Johnson, and Olshansky 2013). Nevertheless, physical exposure and damage are important factors affecting the speed and quality of recovery.

There is a well-documented connection between social vulnerability and physical exposure, as low-income and marginalized communities tend to be disproportionately located in hazardous areas (e.g., Adger *et al.* 2005; Dewan 2013; Peacock *et al.* 2015; Sherly *et al.* 2015). The Colorado floods are further evidence of this relationship; a significant number of disaster-affected households lived in affordable housing located in the floodplain or floodway, including more than 250 households across the three counties displaced from manufactured-housing communities sited on hazard-prone land.

Beyond the direct physical damage to a respondent's home or assets, the overall level of damage to the surrounding community also had an important bearing on the household recovery process. In several towns, most notably Jamestown and Lyons (both in Boulder County), and several unincorporated communities, the flood destroyed roadways, water systems, and other critical infrastructure, necessitating a community-wide evacuation and temporary dislocation. Displacement from their homes and communities slowed the recovery process for many affected households. Another aspect of physical location unique to these mountain communities was the importance of the 'construction season', a period lasting from late spring to early autumn. In high-elevation communities, winter-time construction is impractical and prohibitively expensive, so households have a narrower window of time to rebuild than households at lower elevations. This narrow window also increased the competition for contractors between flood-affected and non-flood-affected households in the region, which put further cost and time pressures on recovering households.

5.2. Local governance

Place also shapes household recovery through the capacity, actions, and leadership of local government, elected officials, and staff who have administrative authority over a particular geography. Disaster recovery is, in many respects, a function of local governance, and how a local government represents its constituents and the decisions it makes play a central role in the recovery trajectory of individual households. For example, in communities where a disaster destroys a significant amount of affordable housing, the local government can help to determine whether, and where, housing will be rebuilt through such actions as applying (or not applying) for federal recovery dollars or through changes in land-use to allow the development of replacement housing in less vulnerable areas. Consistent with other studies of community recovery, Olshansky, Johnson, and Topping (2006) find that local leadership is critical to successful recovery since effective leaders can provide vision, work with community organizations, and act as a bridge between citizens and other government agencies, among other roles (see also Rubin 1985; Prater *et al.* 2006; Smith 2012).

The Colorado flood is an opportunity to observe and compare the recovery of households living in close geographical proximity but under the authorities of a diverse group of local governments. As noted above, Boulder is one of the most politically liberal counties in Colorado. Larimer and Weld counties, by contrast, both lean conservative and subscribe to a small-government ethos common to much of Colorado outside of the Denver-Boulder metro region. The political differences among the counties, and the philosophy of government they embody, are reflected in the size of their annual operating budgets. In 2012, the last full year before the floods and associated increase in

government spending, Boulder's operating budget was $321.7 million, or $1,054 per resident. In comparison, Larimer County's operating budget was $230.8 million, or $743 per resident, and Weld County's was $203.6 million, or $773 per resident.[5]

The size of the local government and the services it offers can be important indicators of its capacity to manage the complex task of recovery. Although local and county governments can add capacity after a disaster, there is a steep learning curve that may limit the government's ability to act definitively in early stages of recovery. Local governments with pre-existing expertise in key recovery areas such as community planning, social services, or housing development are able to act more quickly and with less reliance on outside resources than those without this background or experience. The capacity of local government can also be an indicator of the degree of regular contact between citizens and officials, with 'limited government' advocates often calling for less government intrusion in the everyday lives of citizens. In Boulder County, particularly in its communities hardest hit by the flood, there is a strong culture of citizen participation in a wide variety of local government decisions. In Weld County, by contrast, local governments see their role as more narrowly defined, largely confined to health, safety, and economic development, and citizen participation in planning is less common.

As expected, survey results show that Boulder County households had a closer relationship with their local government both before and after the disaster (for a summary of survey results, see Table 2).[6] Survey results also showed that households in Boulder County were more likely to have visited a disaster recovery center, one of the primary support mechanisms for households making complex recovery decisions, especially those living in rural or unincorporated areas. In the three counties, FEMA-operated disaster recovery centers began closing seven weeks after the flood. Boulder County alone decided to locally fund and staff a flood rebuilding information center, which remains open two years after the disaster. The degree of contact between flood-affected households and their local governments likely had a strong effect on their evaluation of the performance of public officials after the disaster, with Boulder County respondents more apt to give high marks to their public officials for their handling of the recovery compared to those in Larimer/Weld Counties.[7]

Boulder County residents were also more trusting of their public officials for information about recovery, possibly the result of their closer relationship prior to the disaster. Although there was no significant difference between households in the two comparison groups with regard to the number of sources of recovery information they relied upon, or whether they used major media outlets such as newspaper or radio as a source for recovery information, Boulder County residents rely more heavily on government sources of information (public meetings, information from public officials, and town/city websites), whereas we found the opposite from Larimer and Weld County residents. Respondents from Larimer and Weld Counties were also more likely to reveal that they relied on *no* government sources for recovery information.

5.3. Planning and policy-making

A third and related way that place shapes recovery is through local planning culture. For example, Olshansky, Johnson and Topping (2006) find that previously-existing plans can "help to improve both the speed and quality of post-disaster decisions" (357). Pre-existing plans are indicative that a community has "an active planning process, including well-established community organizations, lines of communication, a variety of planning documents and tools, and some degree of community consensus" (Olshansky, Johnson, and Topping 2006, 357).

Table 2. Survey test results.

Survey question	Direction	Test results ($p < 0.05$)
Prior to the flood, how often did you communicate with local officials?	Boulder residents had more frequent contact	$X^2 = 117, 0.000^{**}$
At any time since the flood, have you spoken with a public official about the disaster or disaster assistance?	Boulder residents spoke to officials more than expected	$X^2 = 106, 0.000^{**}$
In your opinion, how well have your town officials responded to the flood?	Boulder more likely to choose Very Well, Well, or Adequate and less likely to select Poorly or Very Poorly	$X^2 = 113, 0.000^{**}$
At any time since the flood, did you visit a disaster recovery center?	Boulder residents more likely to have visited a recovery center than residents of the Larimer/Weld group	$X^2 = 29, 0.000^{**}$
What are your primary source(s) for information about disaster recovery? (check all that apply)	Boulder residents were more likely to report: • Government resources (Public Officials, Public Meetings, and Town Website. • Word of Mouth • Email • News media sources were not significantly different between groups	$X^2 = 105, 0.000^{*}$ $X^2 = 8, 0.007^{**}$ $X^2 = 16, 0.000^{**}$
In the 12 months prior to the flood, did anyone in your household have a regular volunteer position?	Boulder residents reported Yes more than expected and No less than expected	$X^2 = 102, 0.000^{**}$
What types of volunteer services have you used?	Boulder residents were more likely to use two or more sources.	$X^2 = 104, 0.000^{**}$
Since the flood, have you volunteered your time to help with the recovery?	Boulder residents were less likely to report No than Larimer/Weld residents.	$X^2 = 33, 0.020^{*}$
At this point in time, do you want to return or stay in [community at time of flood]	Boulder residents were more likely to state Yes.	$X^2 = 42, 0.012^{*}$

Note: **indicates $p < 0.01$; *indicates $p < 0.05$

And of particular importance for disaster recovery is the role of public participation in recovery decision-making (Rubin 1985; Berke, Kartez and Wenger 1993; Olshanksy 2005; Vallance 2014). In general, public participation in planning and policymaking helps to improve governance by communicating local preferences to decision-makers, building trust in planning processes, improving the quality and implementation of plans, and increasing accountability of organizations and public officials to their constituents (Booher and Innes 2010; Burby 2003; Sirianni and Girourd 2012). Studies of post-disaster recovery have shown that participation in recovery decision-making has multiple benefits for disaster-affected households and improves recovery overall (Ganapati and Ganapati 2009; Olshansky and Johnson 2010). At stake is equity in the recovery process, a fundamental consideration for sustainable disaster recovery (Bolin 1985; Berke, Kartez, and Wenger 1993; Smith and Wenger 2007; Olshansky 2009; Smith 2012). For a

recovery to be equitable, it should establish a framework that allows full, effective participation in plans and decision-making, and households should have fair and sufficient access to recovery information, resources, and processes (Young 1990). Equity is a central concern after a disaster because many people make competing demands on finite resources and an inequitable recovery can work to "cut deeper the grooves of social oppression and exploitation", producing a community that is ultimately less resilient to future disasters (Smith 2006).

The counties in our study had widely varying planning cultures prior to the flood, particularly comparing communities in Boulder and Weld Counties. In Lyons, one of the hardest-hit towns in Boulder County, the 2010 comprehensive plan includes goals and objectives related to land use, housing, the environment, economic development, history and culture, historic preservation, and other topics. The plan describes the formation of a citizen's commission to guide the planning process, as well as the inclusion of multiple community organizations and civic groups in a robust public process that included multiple public meetings and workshops. The city of Evans, the most-impacted community in Weld County, also updated their comprehensive plan in 2010 (City of Evans 2010). Compared to Lyons, however, the Evans plan is narrower in scope, focusing primarily on infrastructure, land-use, public facilities, transportation, and recreational amenities. Evans did not use public participation as a tool in the planning process, instead relying on the "observations of city officials and staff about pressing issues" (1−3). The contrast between Lyons and Evans is illustrative of the difference in planning cultures between the counties generally.

These differences carried over into the early recovery period, where flood-affected households had very different opportunities to participate in flood-recovery plans and decision-making processes. In Boulder County, Lyons and Jamestown (the two most heavily-affected communities) carried out robust recovery planning efforts despite significant displacement of citizens. Both plans were grounded in a public participation model that encouraged broad and inclusive engagement with residents. Resident-led committees and working groups established the community vision, articulated goals and priorities, and developed ideas for projects and policies that would further recovery. In Lyons, more than 800 persons participated in the recovery planning process, fully 40% of the town's population. In Weld County, by contrast, our interviews revealed that local governments relied on town staff or closed-group committees to determine the direction of recovery efforts. In Evans, for instance, the city established a 'recovery and redevelopment task force', but the meetings were closed to the public. The city's main form of engagement was a set of public hearings on recovery grant applications and public comment periods, legally required methods of participation found to be less effective than other forms of engagement (Innes and Booher, 2004). In Milliken, post-disaster recovery plans were also created largely without public input. According to our interviews with local planners and officials, they did selectively invite some citizens to participate in focus group interviews, but their numbers were in the single digits.

5.4. Social capital and local social networks

A final way that place influences household recovery is through social capital, what Lin (2001) describes as "resources embedded in one's social networks…that can be accessed or mobilized through ties in the networks" (quoted in Aldrich and Meyer 2015, 256). Disaster researchers have appreciated the importance of social capital and social networks for disaster response and recovery for decades, but the topic has seen a recent

surge in interest and attention (Erikson 1978; Klinenberg 2002; Nakagawa and Shaw 2004; Aldrich 2012; Rahill *et al.* 2014; Tierney 2014). Social capital has been shown to have multiple positive effects on household resilience to disasters and on household and community recovery. During times of crisis, neighbors with strong ties look out for one another and share emotional, material, and logistical support (Klinenberg 2002; Rumbach and Foley 2014). Civil society institutions and organizations often mobilize after disasters to take on roles and responsibilities important for response and recovery and help to ensure that aid delivery fits local needs. 'Linking' social capital, which describes the external relationships that extend to higher levels of government or to those in positions of relative power, helps communities and individuals to access and navigate the complex landscape of post-disaster recovery policies and programs, and to access different types of resources, monetary or otherwise (Hawkins and Maurer 2010, 1779-1780; Tierney 2014; Aldrich and Meyer 2015, 259). 'Bonding' social capital refers to the relationships amongst members of a network who are similar to one another (Hawkins and Maurer 2010). Tierney (2014) notes that social capital can help compensate for disadvantages associated with social vulnerability (222).

Our survey gauged both attitudes and behaviors indicative of the strength of local social networks (Aldrich and Meyer 2015). Attitudinally, households in Larimer and Weld counties perceived their communities as tighter-knit prior to the flood than respondents in Boulder County, and were more likely to report that their neighbors got along with one another. Behaviorally, while Larimer and Weld County respondents received help and support from their neighbors at a similar rate as their Boulder County counterparts, Boulder County respondents – who were more likely to have volunteered on a regular basis before the flood – were more likely to receive more than one source of volunteer help after the flood than were residents in Larimer/Weld Counties. Boulder residents were also more likely to use word-of-mouth and email to access recovery information, such as access to volunteer assistance and sources of aid. Combined with our findings about the stronger relationship between Boulder County respondents and their local governments, our survey results show Boulder County respondents having higher levels of linking social capital, whereas respondents in all counties had similarly strong internal (bonding) social networks.

These differences did not appear to affect the amount of monetary aid, public or private, that households received post-disaster, although Boulder residents applied for a significantly higher number of sources. This finding held up when comparing just low-income households, indicating that availability of and access to various sources of recovery aid was relatively consistent across counties and households. Respondents in Boulder County, however, accessed more sources of non-profit monetary aid in addition to non-monetary volunteer services after the flood than those in Larimer/Weld. These results indicate that the ability of a community to access external organizations and aid networks was more important in influencing the amount of non-monetary aid they received than the strength of their internal community ties.

6. Conclusion

Our study shows that where a household lives has a significant effect on the early recovery period. Although long-term recovery in Colorado has yet to play out completely, the process has been significantly different for households living in relatively close proximity to each other and recovering under the same national-, state-, and regional-level recovery rules and programs. Compared to Weld and Larimer County households, though, Boulder

County households had closer relationships with their public officials, were engaged more robustly in the recovery planning process, were more satisfied with the performance of their local officials in recovery, and were able to leverage their social capital more effectively to receive non-monetary sources of aid and assistance. In comparison, Weld and Larimer County households have smaller local governments (with fewer taxes), weaker relationships with their public officials, were less engaged in recovery plans and decision-making processes, and had fewer sources of volunteer and non-monetary support. These findings suggest Boulder County communities and residents may recover more fully and be better prepared for future disasters.

Two years after the flood, recovery in Colorado is an ongoing and dynamic process, and the final outcomes from the disaster are still uncertain. Nonetheless, our interviews with households and local leaders provide preliminary evidence of the importance of these four categories of place-level variables on the current state of recovery. In terms of *physical exposure*, households who lived on the most hazard-prone land have also faced the most challenges in terms of rebuilding, regardless of their home county. Specifically, households that were located in a floodplain or floodway are now required to rebuild or rehabilitate their properties following newly-stringent regulatory requirements, which can come with a particularly onerous financial burden. In communities such as Lyons (Boulder County) and Evans (Weld County), updated floodplain rules and regulations have forced the closure of large manufactured housing communities, permanently displacing several hundred households who were already considered socially vulnerable.

The capacity of *local governance* institutions has also played an important role in the speed of recovery, particularly for households living in small towns or rural (unincorporated) areas. In Weld County, the county government does not have the capacity to provide technical assistance or staff support to communities struggling with the complexity and bureaucratic requirements of the federal and state recovery programs. Boulder County, on the other hand, provided – and continues to provide – ongoing assistance to several small communities (e.g., Jamestown and Lyons), enabling them to pursue recovery resources and programs that were otherwise unobtainable. These resources are helping to drive several aspects of local recovery, such as the restoration of parks or the rebuilding of public facilities.

We continue to see wide differences with regards to the *culture of planning* between counties. In Weld County, local officials formulated recovery plans in consultation with their staff and community leaders, whereas in Boulder County, community-based planning with broad participation from the public is the norm. Although it is still unclear what the long-range impact of these different planning cultures will be, communities who engaged in citizen-based recovery planning process are tackling a broader range of recovery issues and projects than those who did not. We sense that community-based recovery plans will be a boon to communities in Boulder County in terms of their competitiveness for certain external grants and resources.

Finally, the impact of *social capital and local social networks* on long-term recovery is still unclear. Although our survey effort captured the strength of social networks before and soon after the flood, many of the residents from the most flood-impacted communities are now permanently displaced and have relocated as far away as California, New Jersey, and Mexico. Our conversations with displaced residents suggest that the power of their pre-flood social networks is declining, as displaced households begin to build new networks in their new communities. One potential wrinkle in this story is the active use of Facebook and other social media for organizing. In Lyons, many

displaced residents use Facebook as a way to stay connected to their former community, gather information about recovery programs and decisions, and lend their voice to debates and discussions. This presents an exciting avenue for future research.

Consistent with numerous studies of community recovery, many of the opportunities and constraints on household recovery described above are established well before the disaster and are grounded in relationships between households and their surrounding environment, decisions and actions of local government, local planning cultures and participation in decision-making, and in the ability of social capital networks to access resources. These four categories are clearly related and are neither mutually exclusive nor exhaustive. Instead, they point to the need for further consideration of place when conceptualizing the complex drivers of household risk and resilience. The results also present an argument for an expanded consideration of place as a category of variables that influences uneven disaster recovery, alongside more frequently cited socio-demographic variables such as income, race, and age. This is not to diminish the importance of socioeconomic and demographic factors in determining disaster outcomes or shaping recovery processes, but to introduce further complexity into our understanding of how these household-level characteristics are influenced by the places in which we live. At the very least, national governments should consider the differences in the local implementation of recovery programs when designing funding programs and policies to prepare for and respond to disasters (Johnson, Penning-Rowsell, and Parker 2007).

Our findings are also important for planners working outside of disaster recovery. Recovery is a unique and revelatory moment in the life of a community, when large numbers of citizens interact with, and place demands upon, the state (Kruks-Wisner 2011). It is an opportunity, therefore, to develop a more robust understanding about how place matters in the lives of citizens and how local government understands its roles, responsibilities, and limitations in the face of sudden change. Our study suggests that the resilience of a household can be supported through local governance activities like promoting cultures of volunteerism, creating more robust and inclusive planning cultures, developing pre-disaster plans and policies, and improving the relationships between vulnerable populations and their local governments. These actions are likely to have multiple positive benefits for a community beyond recovery.

Our study also highlights a significant need for additional research on the relationships between place and household recovery. We will continue to track household recovery in Colorado to observe how place differences further influence long-term outcomes. For example, several communities in our study area lost affordable housing to the flood, and whether that housing gets replaced, for whom, and when, are important decisions that will inform the long-term household impacts of the disaster. It will also be important to compare the influence of place variables on household recovery in other disaster-affected communities. Do the place variables identified in this paper have similar influence in different contexts? These lines of research inquiry will help improve our understanding of disaster recovery and the actions and policies that planners and policy makers might take at each level of government to promote more resilient places and communities.

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Notes

1. In Larimer County, 33.6% of active voters are registered Republican while 26.6% are Democrats (Colorado Secretary of State).
2. In 2012, for instance, Weld County's commissioners led an ultimately unsuccessful effort to secede from Colorado and form a new, more conservative state of Northern Colorado (Rochat 2013).
3. Two households declined to provide income data, and two households were not sure of their yearly income. The median household income for Colorado from 2008-2012 was $58,244 (see US Census QuickFacts Colorado, online at http://quickfacts.census.gov/qfd/states/08000.html.
4. The Other category includes extended families, grandparents as caregivers, parents with adult children, and households with family and non-family members.
5. County budgets for 2011 are available on the Boulder, Larimer, and Weld County websites. Geographically, Boulder is one-third and one-fifth the physical size of Larimer and Weld Counties, respectively.
6. For a summary of survey questions and the results of significance tests, see Table 2.
7. In Larimer County, respondents were predominantly from unincorporated communities and rural areas, whereas Boulder and Weld County respondents were mostly from incorporated towns and cities. Larimer County respondents were primarily evaluating the performance of county officials, who they described as less active in their recovery than respondents with municipal governments. In several cases, they compared the level of services they were receiving against the experiences of friends and neighbors in nearby incorporated towns.

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