Articulation of Personal Network Structure with Gendered Well-Being in Disaster and Relocation Settings

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Abstract:

Women are frequently considered more vulnerable and generally experience higher levels of stress than do men in disaster environments. This is due in minor part to biological differences between men and women (e.g., pregnancy, nursing, physical strength, various hormone levels, differences in daily caloric intake strategies/metabolism), but is due in major part to culturally derived gender roles involving responsibilities of maintaining networks and caring for others during crises when fewer familiar resources are available. This study delves into how personal networks figure in the relationship between gender and well-being. We employed a social network framework in seven disaster-affected and resettled communities in Ecuador and Mexico to understand better how gender and personal networks interact to produce variations in personal well-being. More than 400 people affected by the volcanic activity around Mt. Tungurahua (Ecuador) and Mt. Popocatépetl (Mexico) and landslides in the Caribbean coastal mountains (Mexico) participated in in-depth structured interviews. Data were collected on demographics, health, mental health, and personal networks. Resettled women in both Ecuador and Mexico reported the overall lowest well-being for any network type, although there was considerable variation associated with network type. Subgroups were promising as a protective factor for resettled women in both Ecuador and Mexico, which further points to the role of personal networks. Non-resettled men, on the other hand, reported the highest well-being, followed by non-resettled women and resettled men.

Keywords: Social support | Mental health | PTSD | Depression | Social networks | Resettlement | Volcano | Landslide | Disaster | Gender

Article:

Introduction

Social scientists have documented the role of women in natural disasters as active change agents and advocates for restoring their communities (Akçar 2001; Enarson and Chakrabarti 2009; Enarson and Morrow 1997; Hoffman 1999). Through the establishment of social networks , women and men negotiate their environments during the disaster recovery process in order to adapt. From social networks, however, women often take on additional roles as decision makers, change agents, and proactive responders to natural disaster in order to assist their families, and to restore their neighborhoods and the biophysical environment.

In adapting to disaster impacts , communities are forced to adjust preexisting social structures and cultural practices to the newly imposed circumstances, if only in novel forms of resistance to the disaster-induced changes (Oliver-Smith 1999). A gendered division of labor makes women both frontline responders in moments of extreme crisis and long-term caregivers to disaster-impacted family members (Dufka 1988). Disasters, like economic crises, can increase solidarity and thus women frequently act collectively when they are provided with assets like collective physical spaces (Akçar 2001).

Women can play a major role in restoring their communities through the acts of replanting crops, rebuilding houses, political organizing, and intra-community collaboration as well as participating in research-based workshops on gender, development, and disaster (Enarson and Morrow 1997). During disasters, women's caregiving roles usually expand dramatically at all stages of disaster response and, though often invisible to disaster responders, women's formal and informal networks can be central to both household and community recovery (Enarson and Morrow 1998).

Women often comprise the majority of all neighborhood associations, before and after the disaster, but the disaster often creates further socially acceptable and legitimate reasons for women to operate in the public arena. Disasters, then, can operationalize the mobilization of women and increase the visibility of the way in which women and communities cope with challenges (Akçar 2001). Women's domestic space is affected, including their house, furnitures, and articles of everyday use and hence their life, their normality, can be significantly altered. In this regard, it is argued that women participate in community activities more than men because they are generally responsible for the family well-being, and when there is a disruption in the family, they struggle to reconstitute it (Vinas 1998).

In one of our study sites, Teziutlán, Puebla, women adapted to their surroundings by using resources of the sociocultural system to create support groups and social networks , involved decision making, social change, and empowerment. This led us to explore how such informal networks and personal relationships can span social contexts and generate a variety of potential mechanisms for recovery, adaptation, and social and individual agency. Disasters increase women's collective bargaining power (rather than individual bargaining power). Ironically, disasters provide the impetus for women to influence the local agenda through their group involvement (Akçar 2001). The question is "When do these groups form effectively?" This study, therefore, looks at relationships between well-being and the structure of women's and men's personal networks and compares the differences between relocated communities and non-relocated communities.

Disaster and Relocation: Disruption in Social Structure

A disaster places demands upon the traditional structure of a society (Wenger 1978) frequently disrupting gendered divisions of labor, traditional sources of prestige, intergenerational responsibilities, and proximity to affinal, consanguineal, and fictive kin. These are the structures that help sustain worldviews and systems of meaning. At the community level, disasters refer to a condition in which a precipitating geophysical event renders the customary social structure no longer collectively defined as an appropriate guide for social behavior. In an event such as a tornado, flood, or earthquake, new daily routines and relations emerge as attempts are made to fulfill the newly imposed demands.

Relocation usually exacerbates the challenges facing society following disasters. Oliver-Smith (1991), for instance, found that siting issues are one of the most frequently mentioned causes of resettlement failure, particularly the physical layout or design of the settlement, and the distance from kin or from the old village. Relocation may also produce more stressful household conditions, including social stressors such as crowding, isolation, and disruption of relationships. Some aspects of this disruption include an inability to sufficiently maintain social relations, loss of family and friends, or ruptures in social networks .

Relocation can thus negatively impact perceived support, received support, social embeddedness, and hope for the future leading to stressful psychological situations which may result in negative mental health effects as "strangers" may find it difficult to create new support networks (Quarantelli 1985). As such, the resettlement itself may be more harmful to the survivors than is the impact of the disaster . Involuntary resettlement often involves removal from an environment in which the society has evolved traditions of behavior over decades or centuries.

Post-disaster settings, whether in a relocated community or not, generate different challenges for survival. In this regard, women often face new responsibilities, sacrifices, and opportunities. While both male and female adults are expected to find work to feed their families, women are also expected to immediately adapt and perform all of their previous tasks in the same efficient manner, which means still bearing, raising, and caring for their children, as well as dealing with the effects of the resettlement.

Since gender in many societies often reflect multiple social inequalities, women—whether single or married, and with children or not—may not be provided with the same benefits and resources as men, and may be left out of disaster relief programs that generally seek to support heads of the households—that is, men (Morrow and Enarson 1998). Similarly, post-disaster relief efforts and resources are often designed to honor wage labor over domestic labor, thus privileging those who earn salaries over stay-at-home caretakers (Bolin et al. 1998, p. 42). Another factor that helps to determine the outcome of a woman's life during and after a disaster is whether or not she has a cohabitating mate. Notwithstanding the increase in domestic violence that occurs post disaster (James et al., Chap. 6), a domestic arrangement with a male "breadwinner" offers the most security for women in this setting (Morrow and Enarson 1998).

Hazard victims experience increased anxiety levels and prolonged depression, and sometimes posttraumatic stress disorder (PTSD; e.g., Ollenburger and Tobin 2008). The calming of fears of

her children , feeding, nourishment of others (Bhatt 1995), and the overall performance of her traditional roles during disaster situations are an extreme extension of women's normal expected caregiving roles in many societies (Morrow and Enarson 1998). The fact that they must keep up with their caregiving responsibilities makes it increasingly more difficult for women who are suffering from PTSD and other anxiety or stress disorders to adjust following a disaster, although it is still not clear whether men or women achieve better levels of functioning post disaster.

Although the women in our relocation study site in Ecuador did not move extensive distances, they still had to deal with mothering, educating, caring for, and raising their children in a new location, while also handling the stresses of their immediate surroundings, such as new employment. Often, men were already laborers, while women relocated from a farm community—as in our Ecuadorian sites—were obliged to make career changes by finding wage labor work or by starting a new business. Moon (2003) found that many women cope with the less than favorable conditions of paid labor by labeling it as an extension of their mothering roles. Also, instead of using daycare services or supportive friends, many mothers prefer still to carry the bulk of the responsibilities on their own shoulders, even while working full time and relying on parents or siblings for help in raising the children.

Methodology

We interviewed 413 people in Ecuador and Mexico face to face in a variety of settings, though typically in their home, with a structured questionnaire. In Mexico, 137 were resettled following the landslides in 1999, and 59 were evacuated but not resettled in a volcanic risk zone after eruptions in 1994 and 2000. In Ecuador, 78 respondents in three communities were evacuated but not relocated although they continue to experience ashfall, and 139 from several different villages were relocated to two resettlements after the 2006 eruptions, although initial dislocations for some people had occurred since activity had begun with a strong eruption in 1999. Initially, a well-being survey composed of 16 metrics was conducted to establish current health conditions in the various communities. To measure well-being, we employed the World Health Organization's Comprehensive Diagnostic Inventory to capture posttraumatic stress as well as functioning due to posttraumatic stress. The Center for Epidemiologic Studies Depression Scale-20 (CESD-20) was used to determine potential depression symptoms and an ecological stress scale (i.e., household conditions; Norris and Raid 1996).

Network data were captured through interviews based on the approach of McCarty (2002) in which respondents each named 45 people with whom they were associated. A random sample of 25 individuals was taken from these 45, and the respondent was then asked a series of questions about each, including whether each of the 25 people interacted with one another a lot, a little, or not at all. This produced a network for each respondent that could have as many as 300 ties or as few as zero when the respondent is excluded from the matrix of ties. To generate graphics or network visualizations for each interviewee, we utilized EgoNet (socioworks.com and sourceforge.net). These network patterns were then coded as tight (very dense; similar to cohesive networks), extending (dense core with some peripheral nodes; similar to core–periphery networks), subgroups (notable clusters of groups of nodes that have some connections between them; similar to clear hierarchical clustering, or similar to multiple components if disconnected subgroups), or sparse (relatively few ties in the graph plus a number of isolated or disconnected

nodes; similar to highly disconnected graphs). Figure 1 shows typical visualizations for each network type, although individual visualizations will vary. We used two coders and discussed conflicting codes when necessary in order to achieve agreement about coding for each of the four types.
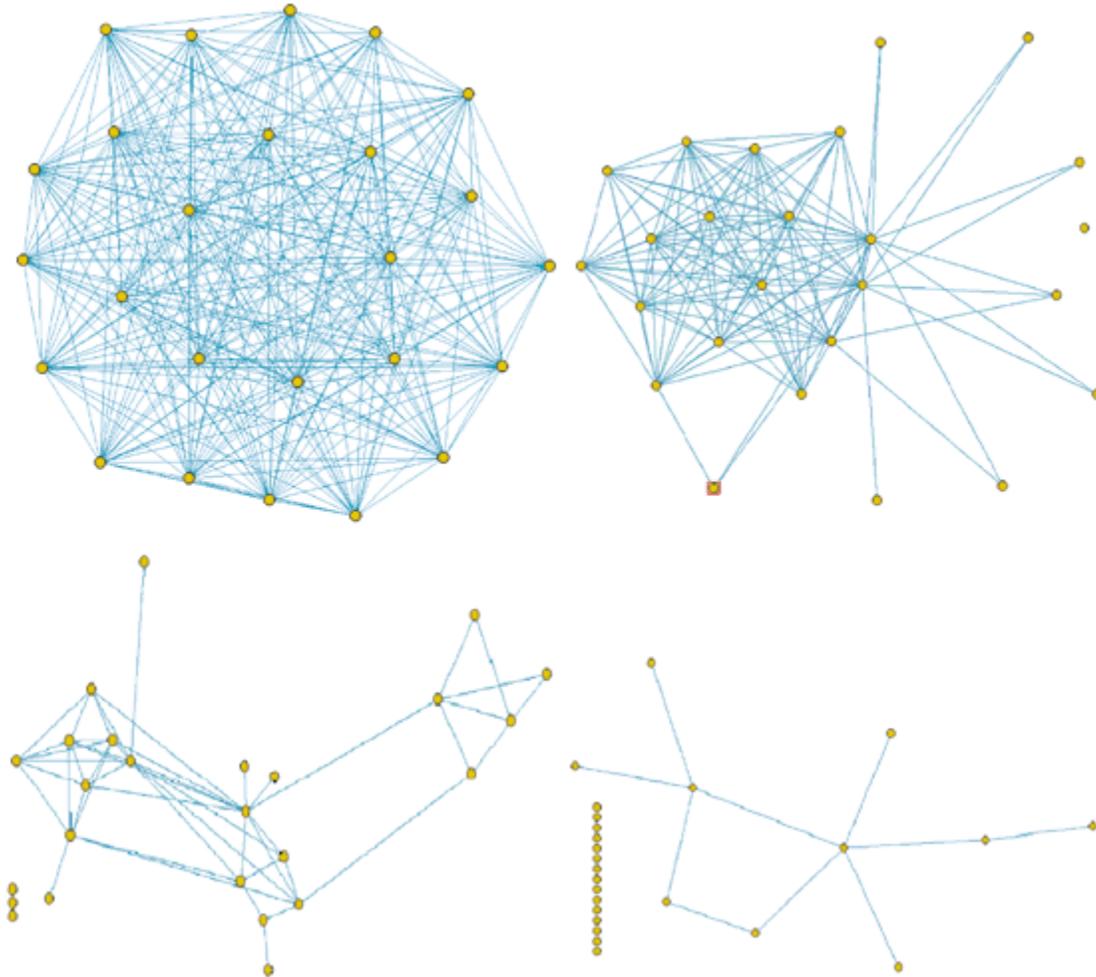
Fig. 1. From upper left, clockwise, are four examples of idealized graphical network types taken from our data: dense (high closure), extending (like core-periphery), subgroups (like subgroup cohesion), and sparse (low closure).

Results

The results focus on personal networks and the relationship between these networks and gendered well-being. Average levels of reported posttraumatic stress symptoms, reported functioning problems due to posttraumatic stress, depression symptoms , and potentially stressful household conditions are examined through a comparison of the four network types. We make these comparisons in each context—resettled women, resettled men, non-resettled women, and non-resettled men. Then we present the distribution of these types of networks among the different context combinations in order to understand what kinds of networks predominate.

Table 1. Gendered well-being in Mexico by resettlement status and network type

			Mean # of PTSD symptoms	Mean # of functioning symptoms	Mean recent depression (CES-D)	Mean household conditions
Women	Not resettled	Tight	6.2	0.6	*16.6*	*10.6*
		Extending	2.4	0.2	16.2	*4.2*
		Subgroups	*1.4*	*0.1*	13.3	*2.7*
		Sparse	n/a	n/a	*12.0*	8.0
	Resettled	Tight	*9.3*	*1.0*	*16.6*	*10.6*
		Extending	*7.1*	*0.5*	*20.0*	*6.6*
		Subgroups	*6.1*	*0.4*	*16.8*	8.4
		Sparse	*9.3*	*0.6*	*18.2*	*11.6*
Men	Not resettled	Tight	*3.1*	*0.4*	*13.8*	6.3
		Extending	*2.2*	*0.2*	*12.5*	6.7
		Subgroups	*0.8*	*0.3*	*12.8*	*2.3*
		Sparse	*3.8*	*0.3*	*13.8*	*2.3*
	Resettled	Tight	7.0	0.5	*15.7*	*5.8*
		Extending	5.8	*0.7*	15.2	7.5
		Subgroups	3.3	*0.4*	14.6	5.0
		Sparse	5.2	*0.1*	14.3	5.3

Italicized numbers indicate the lowest score (best well-being) and bolded numbers indicate the highest score (worst well-being) for a single network type (e.g., tight) for a single measure (e.g., PTSD symptoms). When two numbers are the same or similar, more than one number might be bolded or italicized for a given network type
PTSD posttraumatic stress disorder, *CESD-20* Center for Epidemiologic Studies Depression Scale-20

Table 2. Gendered well-being in Ecuador by resettlement status and network type

			Mean # of PTSD symptoms	Mean # of functioning symptoms	Mean recent depression	Mean ecological well-being
Women	Not resettled	Tight	8.3	*1.3*	11.5	10.3
		Extending	8.1	1.7	*11.2*	11.0
		Subgroups	*6.3*	*0.9*	*7.6*	*9.7*
		Sparse	*8.0*	*0.5*	10.5	7.0
	Resettled	Tight	*9.0*	*1.4*	12.3	*11.2*
		Extending	8.7	*1.4*	17.0	11.9
		Subgroups	8.6	1.4	*15.9*	9.5
		Sparse	*12.0*	2.6	15.6	8.4
Men	Not resettled	Tight	*6.5*	1.5	*7.1*	*7.6*
		Extending	6.5	1.5	12.4	*7.1*
		Subgroups	7.5	1.7	11.3	9.5
		Sparse	*8.0*	1.5	*7.0*	*14.5*
	Resettled	Tight	7.7	*2.1*	8.3	8.1
		Extending	*9.4*	2.5	13.9	11.0
		Subgroups	7.9	*1.5*	11.6	*8.4*
		Sparse	9.5	*2.3*	9.8	*4.8*

Italicized numbers indicate the lowest score (best well-being) and bolded numbers indicate the highest score (worst well-being) when considering resettled women, resettled men, non-resettled women, and non-resettled men for a single network type (e.g., tight) for a single measure (e.g., PTSD symptoms). When two numbers are the same or similar, more than one might be bolded or italicized for a given network type

Well-Being by Network Type

Table 1 summarizes the difference between settled and non-settled men and women for each of the four network types across four different scales for the Mexico sample, while Table 2 does the same for the Ecuador sample. For each of the four scales in the columns, higher numbers indicate

worse conditions. In Mexico, interviews took place 7–8 years after the onset of the most recent large eruption and the landslides , while in Ecuador interviews took place about 4 years after the largest two recent eruptions, and 1 year after the people moved into the resettlement housing. In each table, numbers that are italicized indicate the lowest score for the column and the particular scale item, while bolded numbers indicate the highest. For example, the number 16.6 is bolded in the first row because it is the highest mean depression score for networks labeled "tight." The number 4.2 in the second row is italicized because it is the lowest score among networks coded as "extending."

A large number of bolded numbers are associated with resettled women of all network types. In contrast, a large number of italicized scores are associated with non-resettled men. Different network types did not seem to be associated with much variation in well-being except that subgroups and sparse networks showed much greater well-being for non-resettled men than did the denser networks (i.e., tight and extending networks are typically denser). Otherwise, resettled men fared somewhat worse than did non-resettled women. For men in resettled sites, sparse networks generally were associated with the better well-being scores perhaps suggesting that these men are branching out into new networks in order to access resources and support (and thus people within a person's network do not tend to know one another).

In general, there are several major patterns related to gender and resettlement status in Mexico:

1. Networks comprised of subgroups are associated with the best or next to best mental health and household conditions scores in all four groups.

2. Networks comprised of subgroups in non-resettlement settings for both men and women are associated with relatively good mental health and household conditions compared to women and women in resettlement settings.

3. Tight networks are associated with the poorest mental health and household conditions scores—or next to poorest scores in a few cases—for both genders in both resettled and non-resettled settings.

In Ecuador, resettled women also reported lower well-being than did non-resettled men and women and resettled men, and depression symptoms in particular were much higher for them than for other men and women (Table 2). Nonetheless, resettled women with non-sparse networks generally reported the lowest problems regarding the ability to function with day-to-day responsibilities. Otherwise, resettled men experienced relatively poor well-being primarily related to how well they thought they were functioning in light of the posttraumatic stress symptoms they were experiencing. Thus, although their posttraumatic stress was not particularly high compared to non-resettled men and women, their ability to function was more of an issue for them. Non-resettled men and women generally experienced intermediate or better well-being scores, with little overall difference between them, as seen in Table 2.

Again in Ecuador, several broad findings associated with gender and resettlement status are apparent:

1. Tight networks are associated with relatively good well-being scores for non-resettled men compared to other men and women.

2. Extending networks tend to be associated with worse well-being scores for both resettled men and resettled women.

For women in resettled sites in Ecuador, mental health was worse in sparse networks. However, sparse networks were associated with better household conditions for these women. For women in non-resettled sites, subgroups appear to be the most psychologically protective network type, although sparse networks are not far behind—especially for household conditions. For men in resettled sites, extending networks are consistently associated with poorer well-being scores. For men in both non-resettled sites and resettled sites, tight networks generally have better well-being scores. However, resettled men in sparse networks reported the best household conditions compared to other men and women.

Distribution of Network Types

The distribution of social network types in Ecuador and Mexico by gender and by whether people were resettled or not is shown in Tables 3 through 6. After presenting the distribution of network types, the association of network types with social support and well-being is explored. The four network types were tight, extending, subgroups, and sparse.

As shown in Table 3, sparse networks are the least common and tight networks are the most common, although the Mexico sample does have a higher number of sparse networks. This is partially an artifact of the sample as the Ecuadorian villages are much smaller than the Mexican study sites. Although there is some variation in the percentage of networks in each of these sites, there seems to be surprising uniformity within each network type.

Table 3. Distribution of network types by gender, country, and resettlement status

			Tight network (range 26–62 %)	Extending network (range 10–29 %)	Network w/subgroups (range 16–41 %)	Sparse network (range 0–26 %)
Mexico	Not resettled	Female (n = 34; total 100 %)	35	15	41	9
		Male (n = 25; total 100 %)	44	24	16	16
	Resettled	Female (n = 95; total 100 %)	28	18	40	14
		Male (n = 42; total 100 %)	26	29	19	26
Ecuador	Not resettled	Female (n = 36; total 100 %)	50	22	28	0
		Male (n = 42; total 100 %)	62	10	29	0
	Resettled	Female (n = 77; total 100 %)	31	27	35	6
		Male (n = 62; total 100 %)	48	24	21	6

The next three tables are drawn from Table 3 in order to capture the relative predominance of each gender by context (country and resettlement type) for each network type. Table 4 indicates that networks might not be just a predictor or cause of certain aspects of well-being. In fact, networks seem to be part of a feedback loop owing to the pressures of extreme events. In Mexico, networks comprised of subgroups appear to be most frequent for women and least frequent for men, regardless of settlement type. Otherwise, the other three network types all have notable differences in frequency in relation to settlement status. Mexico-resettled men have the highest number of sparse networks and the lowest percentage of tight networks when compared with others. Similarly, non-resettled Ecuadorian men have the highest frequency of tight networks. Notably, as shown in Tables 3 and 4, we see that women have only one network type where they are the extreme—in Mexico, they have the highest percentage of subgroups—but have low frequencies similar to men for tight networks in resettled Mexico and in not-resettled Ecuador.

Table 4. Most frequent network types, combining gender with resettlement status in each country

	Tight network	Extending network	Network w/subgroups	Sparse network
Lowest frequency	Mexico-resettled women and men	Ecuador-not-resettled women and men	Mexico men	Ecuador-not-resettled women and men
Highest frequency	Ecuador-not-resettled men	Mexico-resettled men	Mexico women	Mexico-resettled men

Besides finding out when women are more likely than men to have a certain network type as in Table 4, we are interested in when females in each country are more or less likely than males to have a certain network type. In Table 5, we show which country and settlement status has the highest and lowest occurrence of a network type separately for females and males.

Table 5. Most frequent network types for each gender, by country and resettlement status

	Tight network	Extending network	Network w/subgroups	Sparse network
Women lowest frequency	Mexico resettled	Mexico not resettled	Ecuador not resettled	Ecuador not resettled
Men lowest frequency	Mexico resettled	Ecuador not resettled	Mexico not resettled	Ecuador not resettled
Women highest frequency	Ecuador not resettled	Ecuador resettled	Mexico	Mexico resettled
Men highest frequency	Ecuador not resettled	Mexico resettled	Ecuador not resettled	Mexico resettled

It is clear from Table 5 that the context (i.e., country by resettlement status) in which the lowest percentage and highest percentage of tight networks and sparse networks occur was the same for men and women. Women and men both had the lowest percentage of tight networks in the Mexico-resettled subsamples while the lowest for sparse network for both men and women in Ecuador were for non-resettled. The inverse is the case for the highest for each of these two contexts, with the Ecuador-not-resettled sample being the highest for tight networks, and the Mexico-resettled sample being the highest for sparse networks. This suggests that higher density occurs in the Ecuador-not-resettled samples and lowest density occurs in the Mexico-resettled sample.

In Table 6, we can quickly see which gender is more likely to have a certain type of network. Curiously, each country seems to have consistency between the genders, in that resettlement does not tend to predict which gender will have which kind of network—both resettled and non-

resettled in a country are often the same gender as the most likely to have a certain kind of network.

Table 6. Predominance of each gender per network type in a country, by resettlement status

		More likely to have tight network	More likely to have extending network	More likely to have network w/subgroups	More likely to have sparse network
Mexico	Not resettled	Male	Male	Female	Male
	Resettled	Both	Male	Female	Male
Ecuador	Not resettled	Male	Female	n/a	n/a
	Resettled	Male	Female	Female	Both

One gender cited is higher by 10 % than the other gender for that case

Implications of Network Structure and Gendered Well-being in Disaster Settings

This analysis demonstrates a relationship between network structure and measures of well-being in different contexts and adds to our understanding of how the structure of personal network tends to be related to well-being. It is apparent, not surprisingly, that context is important and that one kind of network will not necessarily always do the same thing for one gender—there is no "one size fits all." We hypothesized that it matters how recently the event has happened, that it makes a difference how extreme the event has been in terms of ongoing effects as well as in terms of past trauma, and that it is significant whether resettlement occurred or not. Not only did we examine the relationship between network structure and well-being by gender but we also explored the predominance of different network types in these settings. We believe this is important because it is useful to know how many people of each kind are impacted or covered when remedial strategies or policies are implemented.

Enarson and Morrow (1997) propose reorienting disaster planning so that local gender relations and gendered activities are better incorporated. Generally, women should be able to directly influence recovery strategies in terms of design, implementation, and evaluation. Similarly, Norris et al. (2002) note the importance of support survivors to affect change, and others highlight the potential of informal support networks in the recovery process (Enarson 1998; Weist et al. 1994). In terms of the potential for informal support networks, policymakers must ask how relocation might result in a breakdown of community and of relationships. When relocation is not necessary, appropriate, or possible and even when relocation occurs, it is key to understand that suites of relationships do different things in different places. Having a tight-knit network helps in some settings, but hinders in others. Do women (or men) need flexibility to access other resources and opportunities, or do they need space away from conformist tendencies, or do they need everyone around them banded together in mutual support and collective action? This depends on the level of impact—past and current—as well as how recently the event occurred, whether resettlement is involved, and how evacuations have occurred.

Relocation strategies have relatively low chances of success without the participation of women who experienced the disaster . Beyond taking into consideration local beliefs, resources, skills, external linkages, existing social groups, and internal social obligations (Kozaitis 2002), and supporting the development of a representative women's committee with its own building/room and that might support micro-loans, handicrafts, literacy, violence reporting, community watch,

traditional healing, reproductive education, water access, needs assessments, and distribution of assistance—our research suggests that women's personal networks are relevant for designing interventions.

Although resettled women in both Ecuador and Mexico reported the worst well-being scores for any network type, there was variation within the resettled women within each country that points to the role of personal networks. Subgroups were promising for resettled women in both Ecuador and Mexico, which suggests the importance of building upon existing networks to include new and diverse relationships. In terms of leveraging personal networks or at least leveraging structural aspects of personal networks, we suggest the following:

Since women are more likely than men to have personal networks with subgroups and at least one-third of women have these subgroup networks on average, and since subgroups appear to be the most psychologically protective in non-relocated settings, policy for women in non-relocation settings should seek to help women diversify their personal networks and then help them to moderately integrate those new components of their network.

Since sparse personal networks are generally not protective for women in resettlement settings, and somewhat protective of men in resettlement settings, again, helping women integrate subsections or disconnected parts of their network would be important and this need not necessarily be done for men in resettlement settings.

Since women in recent resettlement settings tend to function, yet experience higher distress and depression than do men in these settings, care should be taken to provide mental health support so that there is not a large gap between function and distress that can cause greater stress and health problems. The focus of mental health support in resettlement for women would be on distress, while for men it would be on functioning.

The interplay of personal networks and gendered well-being following disasters helps to understand the dynamics of vulnerability and thus should be considered when looking at mitigation strategies, community sustainability, and resilience. In this regard, we have explored similarities and differences between women and men in Mexico and Ecuador in terms of how their personal networks figured into their well-being in resettlement and non-resettlement situations where disasters have occurred. The outcome suggests further study to determine more subtle roles of gender and networks in post-disaster settings.

Acknowledgments

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