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Women and Disasters

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CONTENTS

INTRODUCTION	3
PREPAREDNESS	3
EFFECTS OF DISASTER ON WOMEN	4
Post-disaster Distress.....	4
Posttraumatic Stress Disorder (PTSD).....	4
Major Depression.....	5
Substance Use Disorders.....	5
Posttraumatic Growth.....	6
Pregnant Women.....	6
Effects on Pregnant Women.....	6
Effects on Offspring.....	7
Older Adult Women.....	8
Violence Against Women.....	8
Intimate Partner Violence (IPV).....	8
RISK AND PROTECTIVE FACTORS	9
Risk Factors for Lack of Preparedness.....	9
Post-disaster Distress, PTSD, and Depression: Risk and Protective Factors.....	9
Risk and Protective Factors for Pregnant Women.....	10
Risk Factors for Violence Against Women and IPV.....	10
APPROACHES TO SUPPORT WOMEN AND ADDRESS IDENTIFIED NEEDS	10
Pregnant Women.....	10
Women at Risk of Experiencing GBV or IPV.....	11
CONCLUSION	12
REFERENCES	13

The focus of the *Supplemental Research Bulletin* is to provide an overview of the current literature on a specific topic and make it easy to understand for disaster behavioral health professionals who are not otherwise exposed to the research. The product aims to assist professionals and paraprofessionals involved in all-hazards planning, disaster behavioral health response and recovery, and/or Crisis Counseling Assistance and Training Program grant activities.

INTRODUCTION

This issue of the *Supplemental Research Bulletin* focuses on women and disasters. It covers research on how women experience disasters—both women in general and subgroups, such as pregnant women and older women. It considers disaster preparedness among women, effects of disaster on women, and risk and protective factors. It touches on approaches for disaster behavioral health programs to ensure they meet the needs of pregnant women and women at risk of gender-based violence (GBV).

In 2002, a review of disaster behavioral health research was published that encompassed research conducted over 20 years on 61,396 survivors of natural and human-caused disasters. The researchers identified several factors that increased the likelihood of adverse outcomes (such as psychological problems and distress) among disaster survivors. One of those factors, among adults, was female gender (Norris et al., 2002). Throughout the history of disaster behavioral health research, people have tended to think that women are more vulnerable to adverse mental health consequences of disaster than are men. We chose to focus on women and disasters in this *Supplemental Research Bulletin* to delve deeper into whether that is true.

We also selected this topic because of need. In recent years, disasters have become more frequent. Over the past 5 years, the United States has been affected by at least 10 “billion-dollar” natural disasters per year—so called because each resulted in economic damages of more than \$1 billion (National Centers for Environmental Information, 2019). In 2018 the world was affected by 315 natural disasters, which took 11,804 lives and affected 68.5 million people, causing \$132 billion in economic damages (Centre for Research on the Epidemiology of Disasters, 2019). From 2014 through 2018, there were 528 U.S. disaster declarations, averaging 106 per year (Federal Emergency Management Agency [FEMA], n.d.). Also, more than half of the U.S. population is female (U.S. Census Bureau, 2019). It is imperative to understand women’s experiences of disasters in support of disaster behavioral health planning and preparedness, response, and recovery, and an overall healthier nation.

This issue of the *Supplemental Research Bulletin* is based on literature and scientific publications found through the National Center for Biotechnology Information and U.S. National Library of Medicine (PubMed), as well as Google Scholar. All research cited in this issue was published in English, and most was conducted in the United States (with a few exceptions where investigations in other countries proved useful). We limited our review to studies involving participants identified as 18 years or older at the time of the study and female, or as women.

PREPAREDNESS

Research suggests that women are less likely than men to be prepared for disasters—though they may also have greater awareness of hazards in their area. Through a national survey of U.S. preparedness, FEMA found that men were more likely than women to report that they had been prepared for a disaster for at least 1 year, whereas women were more likely to be aware of hazards (42 percent of women versus 39 percent of men) (FEMA, 2018).

Another investigation examined personal preparedness among 439 Centers for Disease Control and Prevention (CDC) staff living in and around Atlanta, Georgia, and found that women were less likely to report household emergency preparedness than men (Thomas, Leander-Griffith, Harp, & Cioffi, 2015). Similarly, a study analyzed emergency preparedness data for 96,137 adults in 10 states and found that

women were less likely than men to report two of the three preparedness behaviors assessed: household preparedness (having a 3-day supply of water and food, battery-powered radio, and flashlight) and having a 3-day supply of medication (Ekenga & Ziyu, 2019). They were not less likely than men to have an emergency evacuation plan. A study that examined preparedness for natural disasters among adults ages 50 years and older found differences in preparedness based on age, physical disability, education, and income—but not on sex or gender (Al-rousan, Rubenstein, & Wallace, 2014).

EFFECTS OF DISASTER ON WOMEN

Post-disaster Distress

In a study of women affected by the Deepwater Horizon Oil Spill (2010), researchers collected data in two waves—approximately 2–4 years after the disaster, and then again approximately 4–6 years after the disaster (Rung et al., 2019). Substantial proportions of women in the study had depressive symptoms (28 percent in wave 1, and 36 percent in wave 2) and probable mental distress (13 percent with probable serious mental distress in waves 1 and 2, and 20 percent with probable moderate mental distress in wave 1 and 16 percent in wave 2) (Rung et al., 2019).

Another team of researchers surveyed New York City-area primary care patients after the World Trade Center attacks of September 11, 2001, and found that women were more likely than men to express increased worry about their families' safety, their own safety, and about staying in the United States (study participants were primarily Hispanic immigrants, with about 20 percent born in the United States). The differences in worry for women and men remained significant even after adjustment for sociodemographic variables (Weissman et al., 2005).

Posttraumatic Stress Disorder (PTSD)

Women seem to be more likely than men to develop disaster-related PTSD. In a study of directly exposed survivors of two bombings—one of the U.S. embassy in Nairobi, Kenya (1998), and the other of the Murrah Federal Building in Oklahoma City (1995)—researchers found that women were more likely than men to develop post-disaster bombing-related PTSD (North et al., 2005). About 34 percent of men and 49 percent of the women in the Nairobi sample had bombing-related PTSD; about 22 percent of men and 40 percent of women in the Oklahoma City sample had bombing-related PTSD. Another study reviewed data from directly exposed survivors of 10 disasters and found female gender to be positively associated with disaster-related PTSD (among several other predictors, including younger age, less education, and pre-disaster psychopathology) (North, Oliver, & Pandya, 2012).

Some research also suggests that PTSD after disasters linked to *any* trauma (including the disaster, but also other past traumatic events) may be more common among women than men—although such differences may disappear after adjustment for potentially confounding factors. In the study of survivors of Nairobi and Oklahoma City bombings, women were more likely than men to have PTSD associated with any event (including the bombings, but not limited to them) (North et al., 2005). In the study of New York City primary care patients exposed to the World Trade Center attacks (2001), researchers found that rates of PTSD were significantly higher in women in their sample, but differences between men and women fell below the level of statistical significance after adjustment for race/ethnicity, marital status, and education (Weissman et al., 2005). In a review of disaster behavioral health research, Goldmann and

Galea report that PTSD and other psychological outcomes after disasters are generally worse for women than for men and that this disparity aligns with the greater prevalence of mood and anxiety disorders among women and substance use disorders among men in general populations (Kessler et al., 1994; as cited in Goldmann & Galea, 2014).

Major Depression

Women seem to be more likely to experience major depression after disasters than are men. In the study done with bombing survivors in Nairobi and Oklahoma City, women in both locations were more likely than men to have major depression after the disaster, including depression beginning before the bombings and depression that started after the bombings. The difference was more pronounced among the Oklahoma survivors, for whom post-disaster major depression was more than twice as common among women as men (North et al., 2005). In another study of survivors of the September 11, 2001, attacks, researchers found that post-disaster new major depressive disorder (MDD) episodes were significantly more prevalent in women than in men (in 33 percent of women and 18 percent of men) (North et al., 2015). These researchers also found a significant difference based on gender in relation to lifetime prevalence of pre-disaster MDD, which they found in 37 percent of women and 24 percent of men (North et al., 2015). Among the New York City primary care patients affected by the 2001 World Trade Center attacks, the rate of MDD was also significantly higher among women in their sample, even after adjustment for race/ethnicity, marital status, and education (Weissman et al., 2005).

Substance Use Disorders

Women seem to be less likely to have alcohol use disorder than men after disasters—as well as outside of the context of disaster. In the study of bombing survivors in Nairobi and Oklahoma City, researchers reported lower prevalence of alcohol use disorder among women than men in both locations—both before and after the disasters (North et al., 2005). In another review of data from 10 natural and human-caused disasters, researchers found that women were significantly less likely to have pre-disaster and post-disaster alcohol misuse/dependence (11 percent of women versus 29 percent of men) (North et al., 2011).

Research has arrived at similar findings in relation to substance use disorders. The researchers who surveyed New York City primary care patients after September 11, 2001, found that the rate of alcohol or drug use disorder was significantly higher among men than women (Weissman et al., 2005). In research on Hurricane Katrina (2005) survivors in New Orleans, Louisiana, researchers found that men were more likely than women to be hospitalized for substance use disorders before and after the disaster (Moise & Ruiz, 2016). In their review of disaster behavioral health research, Goldmann and Galea report that substance use disorders after disasters are generally more prevalent among men than women (van der Velden & Kleber, 2009; as cited in Goldmann & Galea, 2014). As noted earlier, they point out that this disparity aligns with the greater prevalence of substance use disorders among men in general populations around the world (Kessler et al., 1994; as cited in Goldmann & Galea, 2014). In a later review, North reports that research has found post-disaster prevalence of substance use disorders among men to be significantly higher than among women (Norris et al., 2002; North et al., 2013; North et al., 2011) (North, 2016).

Posttraumatic Growth

Researchers have identified a phenomenon called posttraumatic growth (PTG) in trauma survivors. PTG is “a positive psychological change as a result of cognitive processing after a traumatic event . . . includ[ing] greater appreciation of life, improved interpersonal relationships, a greater attunement to spiritual matters, a heightened sense of new possibilities, and increased personal strength” (Tedeschi & Calhoun, 1996; as cited in Schneider et al., 2019).

A study of survivors of Hurricane Sandy (2012) suggests that women may not be more or less likely to experience PTG because of their sex or gender. In the study, researchers found PTG to be associated with ethnicity (not being white, for example) and other variables (such as greater exposure to Hurricane Sandy)—but not with female sex or gender (Schneider et al., 2019).

Research has shed light on factors that may be associated with PTG in women. In a study of 334 low-income mothers who survived Hurricane Katrina, participants with probable PTSD after the disaster reported significantly greater PTG (Lowe, Manove, & Rhodes, 2013). Participants with a stronger sense of purpose *before* the disaster experienced significantly higher PTG after the disaster. Participants with a stronger sense of purpose *after* the disaster were significantly more likely to have higher PTG—but not higher levels of PTSD symptoms (Lowe et al., 2013).

In a related, smaller study of low-income Black mothers whose homes were damaged or destroyed in Hurricane Katrina, researchers combined in-depth interviews and assessment with the Posttraumatic Growth Inventory (PTGI) and found that 26 out of 32 participants, or 81 percent, reported experiencing PTG in the 5 domains of the PTGI (greater appreciation of life, improved relationships, increased spirituality, new possibilities, and personal strength) (Manove et al., 2019). In particular, participants noted the new possibilities that the hurricane had created for them and their families (Manove et al., 2019).

Another research team assessed PTG and resilience in 222 pregnant and 292 postpartum women who had survived Hurricane Katrina (Harville, Xiong, Buekens, Pridjian, & Elkind-Hirsch, 2010). Based on a definition of PTG related to benefits perceived of the hurricane, they found that 75–90 percent of the women had experienced PTG. Experiencing damage due to the storm was associated with PTG, while experiencing illness/injury or danger was not. Black women in the study were more likely than women of other races to experience PTG (Harville et al., 2010).

Pregnant Women

Challenging disaster experiences and related stress experienced by women during pregnancy may have effects on perinatal maternal depression, which, along with being a problem in itself, can affect child mental health, cognitive development, and physical health (Goodman et al., 2011; Grace et al., 2003; Gump et al., 2009; as cited in Brock et al., 2015).

EFFECTS ON PREGNANT WOMEN

A study involving perinatal women who were pregnant during eastern Iowa floods in 2008 found that greater severity of flood exposure was associated with greater depression throughout the perinatal period, as well as lower levels of well-being (Brock et al., 2015). They also determined that distress the women experienced around the time of the flooding was responsible for elevated symptoms of depression throughout the study period—though the same mediating relationship was not found between distress

and maternal well-being. They found that on average, women's symptoms of depression decreased at a significant rate over the times at which data were collected (Brock et al., 2015).

Disaster-related stress experienced by women during pregnancy may affect pregnancy outcomes and complications. In a study of approximately 150 women in New Orleans and Baton Rouge who were pregnant during or immediately after Hurricane Katrina, those who reported hurricane stress had significantly higher rates of labor induction (Oni, Harville, Xiong, & Buekens, 2015). Those who reported situations in their lives to be stressful were significantly more likely to have pregnancy-induced hypertension and gestational diabetes (Oni et al., 2015).

Coping styles that pregnant women use to manage disaster stress may reduce the likelihood of pregnancy complications. In the same study of pregnant women affected by Katrina, researchers found that coping styles of planning, acceptance, humor, instrumental support, and venting were associated with significant reduction in complications (Oni et al., 2015). Women who used a denial coping style had higher rates of gestational diabetes (Oni et al., 2015).

EFFECTS ON OFFSPRING

Disaster-related stress experienced by women during pregnancy may affect physical health in offspring. In another report on research on women who were pregnant during flooding in eastern Iowa, authors write that women who reported greater prenatal maternal stress (PNMS) were more likely to have children with greater body mass indexes (BMIs) at 30 months (Kroska et al., 2017). Another research team found that women who were pregnant during a 1998 Quebec ice storm or who became pregnant shortly after and who experienced objective hardship linked to the disaster were more likely to have offspring with higher BMIs and central adiposity (greater waist circumference relative to height) at several ages assessed (Liu, Dancause, Elgbeili, Laplante, & King, 2016).

Social support for pregnant women may have a protective effect in relation to disaster stress and child physical health outcomes. In the study of pregnant Iowa flood survivors and their children, high levels of social support, in terms of satisfaction with social support or size of social support network, buffered the effects of PNMS on child BMI at 30 months (Kroska et al., 2017).

Other aspects of the experience of a disaster during pregnancy may have effects on the physical health of children. In a study of women who were pregnant during the North Dakota Red River floods (2009), women who lived closer to the flood site were significantly more likely to have offspring of lower birth weight than women who lived farther away—but this relationship only held for women who were earlier in pregnancy at the time of the flood crest (Hilmert, Kvasnicka-Gates, Teoh, Bresin, & Fiebiger, 2016).

One study also found effects of disaster-related stress during pregnancy on child mental health outcomes. The study included 94 mother-child dyads with women who were pregnant during the 2008 Iowa floods and involved an assessment of stress reactivity in the 2½-year-old children (Yong Ping et al., 2015). Investigators found that PNMS was positively correlated with one measure of stress reactivity in toddlers, as was timing of the disaster in gestation—the later in pregnancy the flooding occurred, the greater one measure of stress reactivity in toddlers. Subjective PNMS was significantly associated with two measures of stress reactivity in 2½-year-old girls only (Yong Ping et al., 2015).

Older Adult Women

One study found that older women in a sample of about 1,600 people ages 65 years and older who survived Hurricane Sandy (2012) were significantly more likely to experience distress and fear linked to the disaster than older men (Sands, Xie, Pruchno, Heid, & Hong, 2018). Some research seems to suggest that older women may not be more likely than older men to develop PTSD after disaster. In a study involving 206 adults ages 60 years and older living in an area struck by Hurricane Ike (2008), researchers found three trajectories of disaster-related PTSD symptoms: resistant (low or no symptoms), chronic (chronically elevated, clinically significant symptoms), and delayed (delayed-onset, clinically significant symptoms). The only difference related to sex or gender that they found is that women were more likely to be in the resistant or chronic than delayed dysfunction groups (Pietrzak, Van Ness, Fried, Galea, & Norris, 2013).

One study suggests that older adult women may be more vulnerable than older adult men to post-disaster depression. Among 1,130 older adult survivors (ages 60 years and older) of 2004 hurricanes in Florida, those with more depressive symptoms were more likely to be female than male (Acierno, Ruggiero, Kilpatrick, Resnick, & Galea, 2006).

Violence Against Women

Violence against women may increase after disasters. In a study of GBV among 420 women displaced by Hurricane Katrina, researchers found that the crude rate of new cases of GBV among women more than tripled in the year after the hurricane (from 4.6 per 100,000 per day to 16.3 per 100,000 per day) and did not return to baseline in the following year (when the crude rate was 10.1 per 100,000 per day) (Anastario, Shehab, & Lawry, 2009). The main type of GBV causing the increase was intimate partner violence (Anastario et al., 2009).

In another study, researchers interviewed 66 women ages 18 to 49 years who were living in FEMA trailer parks in Louisiana to which they had been evacuated after Hurricane Katrina (Picardo, Burton, Naponick, & Katrina Reproductive Assessment Team, 2010). Nearly one-fourth of the women (23 percent) reported being hit or verbally threatened since the hurricane. Of that group, about two-thirds reported new or increased abuse since the disaster. Four women (about 6 percent) had experienced sexual abuse (been forced to have sex) since the hurricane. Those women were significantly less likely to be the head of their household than women reporting no sexual abuse since the hurricane (Picardo et al., 2010).

INTIMATE PARTNER VIOLENCE (IPV)

After disasters, women may be more vulnerable than men to IPV involving physical abuse. In a study involving 445 married or cohabiting adult survivors of Hurricane Katrina, researchers assessed participants for physical and psychological IPV, stressful life events associated with the hurricane, PTSD, and depression (Schumacher et al., 2010). They found a significant increase in the percentage of women experiencing psychological victimization after the hurricane (from 33.6 to 45.2 percent). They found a 98 percent increase in the prevalence of physical victimization among women after the hurricane. Men also reported an increase in psychological victimization (from 36.7 to 43.1 percent), but, unlike women, no change in physical victimization (Schumacher et al., 2010).

Post-disaster IPV and GBV may be associated with heightened risk for some mental illnesses in disaster survivors who are women. In the study of GBV among women displaced by Katrina, researchers found

a significant association of GBV and poor mental health outcomes such as depression (Anastario et al., 2009). Also, in the study of IPV among married or cohabiting hurricane survivors, researchers found that both psychological and physical IPV heightened risk for Katrina-related PTSD and that physical IPV raised the risk of post-disaster depression (Schumacher et al., 2010).

RISK AND PROTECTIVE FACTORS

The research reviewed for this *Supplemental Research Bulletin* did not include extensive information about risk and protective factors associated with sex and gender. In this section, we present the insights that did appear in studies we reviewed.

Risk Factors for Lack of Preparedness

The study examining household preparedness data for approximately 96,100 adults found that women who were divorced, widowed, or separated and living in a household with children were less likely to report household preparedness than other women (Ekenga & Ziyu, 2019).

Post-disaster Distress, PTSD, and Depression: Risk and Protective Factors

In the study of women affected by the Deepwater Horizon oil spill (2010), at the first point at which they collected data, researchers assessed self-reported exposure, including economic exposure (income loss, degree of economic influence on the respondent relative to others, and the oil spill's effects on household finances) and physical exposure (Rung et al., 2019). After adjusting for sociodemographic variables, they found that women with higher levels of both types of exposure also experienced higher levels of depressive symptoms and mental distress to a significant extent at both times at which they collected data (Rung et al., 2019). In another study of women who survived Deepwater Horizon, women with the most severe symptoms of depression had lower levels of education and income, higher prevalence of unemployment, and the lowest levels of perceived social support—suggesting that less education and income, unemployment, and low perceived social support may all be risk factors for depression after disaster in women (Gaston et al., 2016). In another report drawing from the same data, social support and cognitive social capital (related to sense of community and informal social control) were protective in relation to depression (Rung et al., 2017). Another team of researchers analyzed data from 386 low-income, predominantly Black single mothers who survived Hurricanes Katrina and Rita (2005) and found that post-disaster optimism and sense of purpose was protective against psychological distress (Chan, Rhodes, & Pérez, 2012). Researchers who studied 102 mothers of young children who survived Hurricanes Katrina and Gustav (2008) found that those with high levels of social support after Katrina had better mental health after Gustav (Harville et al., 2011).

Being married may be a risk factor for post-disaster depression for women, whereas among men it may be a protective factor (Norris et al., 2002, as cited in Goldmann & Galea, 2014). On the other hand, the researchers who surveyed New York City primary care patients after the attacks of September 11 found that the significantly higher rate of PTSD for women in their sample disappeared after adjustment for marital status, while the difference between rates in men and women of MDD remained even after adjustment (Weissman et al., 2005). The researchers write that “these results suggest that marital status—which may be a reflection of social supports—could play a role in protecting women against PTSD but less of a role in protecting women against MDD” (Weissman et al., 2005, p. 7).

Risk and Protective Factors for Pregnant Women

Please refer to the section about [pregnant women](#) for full discussion of factors associated with negative and positive outcomes for pregnant women affected by disasters and their children.

Risk Factors for Violence Against Women and IPV

In the post-Katrina study of IPV among 445 married or cohabiting adult survivors, researchers found that the strongest predictor of post-Katrina IPV was pre-Katrina IPV, for both men and women. They also found that if women had experienced multiple stressors linked to Katrina, they were at increased risk of post-disaster physical IPV (Schumacher et al., 2010). Another team of researchers surveyed 123 women who had survived Hurricane Katrina 6 months after they had given birth and found associations between hurricane damage to home or property and post-disaster aggression and violence as part of IPV (Harville et al., 2011).

APPROACHES TO SUPPORT WOMEN AND ADDRESS IDENTIFIED NEEDS

In this section, we examine approaches to support women before, during, and after disasters. We anticipated finding research and other literature about interventions designed specifically for women, but we did not find any such research related to women in the United States. This lack of woman-specific interventions may reflect greater equality between women and men in the United States, less attention to women as a special population within the United States, or the greater tendency of women to seek out mental health support after disaster.

Pregnant Women

The Committee on Health Care for Underserved Women of the American College of Obstetricians and Gynecologists (ACOG) recommends several steps that obstetrician-gynecologists can take to support emergency preparedness for women (2010). These include encouraging patients to develop a disaster evacuation plan, collaborating with public health officials to identify facilities that can provide prenatal and obstetric services during a disaster, and promoting prompt attention to mental health needs (2010).

The researchers who studied women who were pregnant during the 2008 Iowa floods note that their study has implications for interventions to prevent and treat perinatal depression (Brock et al., 2015). Specifically, they note that their study highlights peritraumatic distress as key in the relationship between disaster exposure and depression, and they note that interventions could include psycho-education about traumatic stress, coping skills training, and guidance on accessing resources such as social support. They also note that the Peritraumatic Distress Inventory, which they used in their study, can be used to identify disaster-affected women at risk for perinatal depression, so that care and follow-up can be provided to those with the greatest distress, and individuals with moderate distress can be monitored (Guardia et al., 2013; as cited in Brock et al., 2015).

Women at Risk of Experiencing GBV or IPV

The ACOG Committee on Health Care for Underserved Women also recommends measures in shelters to help prevent violence against women (2010). These include establishment of rule of law, safety, and order in disaster shelters, as well as ensuring availability of services to survivors of sexual assault, such as emergency contraception and sexual assault examiners (2010).

The researchers who studied women displaced by Hurricane Katrina point to the importance of several steps after disasters, including providing information about safe havens for women experiencing abuse at the same time as food, clothing, and other supplies are distributed (Picardo et al., 2010). They also write that relief workers should be aware of abuse as a potential issue and have service providers to whom they can refer women if needed (Picardo et al., 2010).

CONCLUSION

More than half of the U.S. population is female, and so it is imperative to ensure understanding of how women experience disaster and inclusion of women in disaster planning and preparedness, response, and recovery. Research suggests that women may be less prepared at an individual and household level for disasters than are men. Studies have found women to be likely to experience distress after disasters, sometimes more so than men. A great deal of research has shown women to be more likely to develop disaster-related PTSD and MDD after disasters, which researchers have observed seems to echo the increased lifetime prevalence of these disorders in women relative to men. Women seem to be less likely after disasters to have substance use disorders than men are. After disasters, women may also experience PTG.

Disaster effects on pregnant women include depression and lower levels of well-being, though research also suggests the ability to recover quickly in relation to depression. Effects associated with maternal stress during pregnancy include higher rates of labor induction, pregnancy-induced hypertension, and gestational diabetes. Several maternal coping styles seem to be protective. PNMS has also been found to be associated with negative physical and mental health outcomes in children. Some research suggests that older adult women may not be as vulnerable to adverse post-disaster mental health outcomes as younger women, though findings are mixed.

Violence against women may increase after disasters, sometimes to a dramatic degree. IPV also may increase. Both IPV and GBV have been found to be associated with increased risk for some mental illnesses in women disaster survivors.

Specific types and intensities of disaster exposure seem to be associated with heightened risk of some mental illnesses in women. Being married may be a protective factor for women in relation to post-disaster PTSD. In addition to pre-disaster IPV, disaster-related stressors and certain types of disaster damages have been associated with heightened risk of post-disaster IPV for women.

Assessment of peritraumatic distress may help identify pregnant women at risk of post-disaster depression, and steps can be taken to follow up with women at greatest risk and to monitor those at an intermediate level of risk. Relief workers should provide disaster survivors with information about safe havens for women experiencing GBV and have service providers to whom they can refer women if needed.

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