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DISASTER PREPAREDNESS AMONG WOMEN WITH A RECENT LIVE BIRTH IN HAWAII, RESULTS FROM THE PREGNANCY RISK ASSESSMENT MONITORING SYSTEM (PRAMS), 2016

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Abstract

Objective ——To examine emergency preparedness behaviors among women with a recent live birth in Hawaii.

Methods ——Using the 2016 Hawaii Pregnancy Risk Assessment Monitoring Survey we estimated weighted prevalence of eight preparedness behaviors.

Results ——Among 1,010 respondents (weighted response rate, 56.3%), 79.3% reported at least one preparedness behavior, and 11.2% performed all eight behaviors. The prevalence of women with a recent live birth in Hawaii reporting preparedness behaviors includes: 63.0% (95% CI: 58.7–67.1%) having enough supplies at home for at least seven days, 41.3% (95% CI: 37.1–45.6%) having an evacuation plan for their child(ren), 38.7% (95% CI: 34.5–43.0%) having methods to keep in touch, 37.8% (95% CI: 33.7–42.1%) having an emergency meeting place, 36.6% (95% CI: 32.6–40.9%) having an evacuation plan to leave home, 34.9% (95% CI: 30.9–39.2%) having emergencies supplies to take with if they have to leave quickly, 31.8% (95% CI: 27.9–36.0%) having copies of important documents, and 31.6% (95% CI: 27.7–35.8%) having practiced what to do.

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Conflicts of interest/Competing interests The authors have no conflicts of interest to report.

Ethics approval Human Subject Research #2233

Consent to participate All survey respondents provided verbal consent via phone or implied consent by returning a completed questionnaire.

Consent for publication All authors have consented for publication.

Availability of data and material Data are available through request at: https://www.cdc.gov/prams/prams-data/researchers.htm

Code availability SAS-callable SUDAAN code available upon request.

Conclusions ––—One in ten women practiced all eight behaviors indicating more awareness efforts are needed among this population in Hawaii. The impact of preparedness interventions implemented in Hawaii can be tracked with this question over time.

Keywords

Preparedness; PRAMS; Hawaii; postpartum

INTRODUCTION

The Federal Emergency Management Agency (FEMA) defines disasters as “natural catastrophes, technological accidents, or human caused events that has resulted in severe damage, death, and/or multiple injuries.”[1] FEMA declared disasters include major disaster declarations, emergency declarations, and fire management assistance declarations/fire suppression authorizations. From 2000 to 2016, the United States averaged 58 FEMA major disaster declarations annually.[2] During this same period, Hawaii (HI) experienced 11 FEMA major disaster declarations including severe storms, flooding, landslides, tsunami waves, an earthquake, and a volcanic eruption. In the past 20 years, major disasters have occurred more frequently in the United States; reinforcing the need for disaster preparation to mitigate damage and harm.[2–4]

Disasters can compound and exacerbate social vulnerabilities.[5,6] According to the Pandemic and All-Hazards Preparedness and Advancing Innovation Act (PAHPAI) of 2019, pregnant and postpartum women are considered a population with special clinical needs.[7] Following a disaster, shelters may be established which expose individuals to crowded, stressful environments. Basic resources such as clean water, nutritious foods, diapers, and safe sleeping areas may not be readily available but are especially important for pregnant and breastfeeding women and their infants.[8–10] Public health and medical services may be interrupted due to damaged infrastructure, power outages, and lack of trained personnel.[11] Depending on the type of disaster, there may be increased risk for environmental or infectious disease exposures, physical injuries, and mental health conditions.[12–14] Studies have reported stress,[15] anxiety, and depression among pregnant and postpartum women following a disaster.[16–18] Negative impacts of a disaster can persist long after a disaster has occurred. After a disaster, some reports describe increased incidence of negative birth outcomes such as preterm birth and low birth weight infants, although findings are inconsistent.[19–23]

Vulnerable populations such as pregnant and postpartum women may have a slow recovery after a disaster further amplified as a result of socioeconomic disadvantages, limited financial resources, and poor social support.[5,6,8,17,18] Preparedness is associated with reduced vulnerability.[3,4] FEMA describes preparedness as awareness of hazards and understanding of how to protect oneself and one’s family against hazards such as disasters.[24] Baseline measures of preparedness can inform public health education campaigns to increase preparedness and help in planning to meet the population’s needs during a disaster. Disaster preparedness guidance for pregnant and postpartum women is readily available on the internet; however limited information is available on the prevalence of

preparedness among this population.[25–30] It may be difficult to estimate baseline measures of preparedness among pregnant and postpartum women through traditional population-based sampling since they are a small percentage of the general population.[31] The Pregnancy Risk Assessment Monitoring System (PRAMS) is an annual survey conducted by states and the Centers for Disease Control and Prevention (CDC) which can be used to estimate baseline preparedness among women who recently had a live birth. PRAMS assesses maternal behaviors, attitudes, and experiences throughout pregnancy, including before and shortly after giving birth.[32] Currently, 47 states and four other jurisdictions participate in PRAMS, representing approximately 83% of United States live births.[32] An analysis of one 2009 Arkansas PRAMS emergency preparedness question provided the first prevalence estimate of postpartum women having an emergency preparedness plan.[25] The question lacked specificity as it did not capture what the plan entailed, and provided limited information for health departments to target preparedness education.[25] In 2016, PRAMS introduced an eight-part supplemental question to assess disaster preparedness.[33] This eight-part question was adapted from FEMA's *Introducing the Public Readiness Index and Citizen Corps 2009 National Survey* and the Behavioral Risk Factor Surveillance System's General Preparedness module.[34,35] Hawaii was one of two states to utilize the new supplemental emergency preparedness question on their 2016 PRAMS questionnaire and was the only state to meet the PRAMS reporting threshold. Using the 2016 PRAMS data, we assessed the prevalence of emergency preparedness behaviors among women that recently had a live birth in Hawaii. To look at characteristics associated with preparedness, we used factor analysis to distill the eight preparedness behaviors into correlated preparedness factors.

METHODS

Data Collection

PRAMS is a state, population-based sample of women who recently had a live birth. State birth certificate files are used to select approximately 200 women each month in Hawaii. The surveys are self-reported and follow the systematic PRAMS methodology, previously described by Shulman et al.[36] Women receive the survey approximately two months after delivery. Contact is made initially by mail and then by phone. In Hawaii, PRAMS is only offered in English. Those who participate receive a $10 gift card to a local food market. Consent by mail is implied by returning a completed questionnaire; verbal consent is provided by phone. The protocol is reviewed and approved by the Institutional Review Boards of CDC and the Hawaii State Department of Health.

Variables

The eight pre-tested, standardized emergency preparedness questions on the PRAMS questionnaire include the following:

- **a.** I have an emergency meeting place for family members (other than my home).
- **b.** My family and I have practiced what to do in case of a disaster.
- **c.** I have a plan for how my family and I would keep in touch if we were separated.
- **d.** I have an evacuation plan if I need to leave my home and community.

e. I have an evacuation plan for my child or children in case of disaster (permission for day care or school to release my child to another adult).

f. I have copies of important documents like birth certificates and insurance policies in a safe place outside of my home.

g. I have emergency supplies in my home for my family such as enough extra water, food, and medicine to last for at least seven days.

h. I have emergency supplies that I keep in my car, at work, or at home to take with me if I have to leave quickly.

Women are asked to "check no if it is not something you have done to prepare for a disaster or yes if it is."[33]

Data from the Hawaii birth certificate included maternal age, maternal education, marital status, urban or rural residence, maternal race, and participation in Special Supplemental Nutrition Program for Women Infants and Children (WIC) during pregnancy. Age was collapsed into five categories: 19 years or less, 20 to 24 years, 25 to 29 years, 30 to 34 years, and 35 years or greater. Education was categorized as less than high school diploma, high school diploma or equivalent, some college, and baccalaureate degree or higher. The urban or rural residence variable was established by county, and Maui was classified as rural according to the 2012 Census classification. Race was categorized by the racial categories specific to Hawaiian birth certificates: White, Native Hawaiian, Filipino, Japanese, Other Pacific Islander, and other. Anyone selecting Native Hawaiian or part-Hawaiian was grouped into the Native Hawaiian race. Other Pacific Islander included those selecting the category, and Samoans and Guamanians. All other races were categorized as "other", consistent with methods described by Sorenson et al.[37]

Information obtained from PRAMS included current health insurance at time of survey, total income, and family size. Insurance status was categorized into three options: private, public, or none. Individuals that indicated having both private and public insurance were categorized as having private insurance. Military insurance was captured as a separate option on the survey and categorized as private for the analysis. Total income captured the reported household income 12 months prior to the birth, and family size was defined as number of individuals living on the total income in the 12 months prior to the live birth. Family sizes of five or greater were collapsed into a single category. A variable categorizing income as a percent of the federal poverty level (FPL) was developed from total income and family size, compared to the January 2016 poverty guidelines for Hawaii issued by the Federal Register of the Department of Health and Human Services.[38] Four FPL groups are reported: less than or equal to 100%, 101–185%, 186–300%, and greater than 300% FPL, consistent with federal programing eligibility and Hawaii PRAMS trends report.[38,39]

Statistical Analysis

The sample is weighted to be representative of the state by accounting for sampling stratification, nonresponse, and noncoverage. The sample is stratified initially by county (Honolulu, Maui, Hawaii, and Kauai) and within Honolulu county, by birthweight. All reported percentages are weighted.

Factor analysis was performed to assess underlying factors among the eight emergency preparedness behaviors. The dataset was converted to a tetrachoric correlation matrix, and factor analysis was performed using the maximum likelihood estimate and varimax rotation. The overall measure of sampling adequacy was 0.91 suggesting factor analysis could be used for these data.[40]

Data analysis was performed in SAS-callable SUDAAN 11.0 (SAS v9.4) to account for weighted data and complex survey methods. Multivariable logistic regression models were used to estimate predicted marginal prevalence ratios to assess characteristics of women associated with emergency preparedness behaviors. White was the referent category for race, otherwise the subcategory with the greatest proportion of women was used as the referent category. Variables included in the model were established *a priori* from existing literature and included age, education, marital status, urban or rural residence, race, insurance status, family size, FPL, and use of WIC during pregnancy.

RESULTS

Study Characteristics

In 2016, 1,999 women were contacted for PRAMS in Hawaii and 1,076 responded (weighted response rate, 56.3%). The final sample for this analysis included 1,010 women; 66 were excluded for not answering any of the emergency preparedness questions. Table 1 presents the demographic characteristics of the 1,010 women included in this analysis.

The largest proportion of respondents for each demographic characteristic were aged 30–34 (31.2%), had completed a baccalaureate degree or higher (34.7%), were married (63.4%), lived in an urban area (72.3%), were Native Hawaiian race (30.3%), had private insurance at the time of the survey (69.1%), including themselves had a family size of two (30.4%), had an income greater than 300% FPL (33.2%) in the 12 months before the birth, and did not use WIC during their pregnancy (65.0%).

Preparedness Behaviors

Among the 1,010 women with a recent live birth, 79.3% (n=826) reported at least one preparedness behavior, and 11.2% (n=96) reported all eight. Having emergency supplies was the most commonly reported behavior with 63.0% (95% confidence interval [CI]: 58.7–67.1%) of women having enough supplies at home for at least seven days, followed by 41.3% (95% CI: 37.1–45.6%) having an evacuation plan for their child(ren). Less than 40% of women reported other preparedness behaviors: having an emergency meeting place (37.8%, 95% CI: 33.7–42.1%); practicing what to do in case of a disaster (31.6%, 95% CI: 27.7–35.8%); having a plan to keep in touch with family if separated (38.7%, 95% CI: 34.5–43.0%); having an evacuation plan to leave home (36.6%, 95% CI: 32.6–40.9%); having copies of important documents (31.8%, 95% CI: 27.9–36.0%); and having emergency supplies to take during an evacuation (34.9%, 95% CI: 30.9–39.2%). (Table 2)

Among 20.7% (n=184) of women reporting zero preparedness behaviors, significant differences were observed in urban or rural residence and race. Twenty-three percent of women living in an urban area and 16% of women living in a rural area reported zero

preparedness behaviors (p=0.019). Of the six races reported, Japanese women had the highest proportion reporting zero preparedness behaviors, while Other Pacific Islander women had the lowest proportion reporting zero preparedness behaviors. Reporting of zero preparedness behaviors did not vary by education, marital status, insurance, family size, FPL, or WIC participation. (Table 3)

We assessed factor loading plots and determined the eight preparedness behaviors could be described by three factors (supplemental figures 1–3). The first factor, having emergency plans, captured women that responded yes to at least one of the behaviors: emergency meeting place, practiced what to do, plan to keep in touch, plan for themselves to evacuate, or an evacuation plan for their child(ren). The second factor included women who responded yes to having copies of important documents, and the third factor, included women that had emergency supplies for at least seven days and/or had emergency supplies prepared if they had to leave quickly.

Within the sample, 59.8% (95% CI: 55.5–64.0%) of women had emergency plans; 31.8% (95% CI: 27.9–36.0%) had copies of important documents; and 66.8% (95% CI: 62.5–70.8%) had emergency supplies (Table 2). Having emergency plans varied by race; among Other Pacific Islander women, 78.7% (95% CI: 62.8–89.0%) reported an emergency planning behavior compared to 49.6% (95% CI: 37.0–62.2%) of Japanese women. Emergency planning also varied by family size and percent of the FPL. More than 70% of women with a family size of four or greater reported having emergency plans, while 53.5% (95% CI: 45.5–61.3%) of women with a family size of two reported these behaviors. Among women with an income of 186–300% FPL, 70.7% (95% CI: 60.6–79.1%) reported having emergency plans, whereas 50.3% (95% CI: 42.4–58.3%) of women with an income more than 300% FPL reported emergency planning behaviors. Demographic characteristics among women reporting having copies of important documents varied significantly by race and FPL. Having copies of important documents was most commonly reported among Native Hawaiians (44.5%, 95% CI: 36.9–52.4%). In contrast, 11.9% (95% CI: 6.0–22.4%) of Japanese women reported having copies of important documents. A greater percent of women living at 101–185% FPL (38.5%, 95% CI: 30.3–47.4%) had copies of important documents compared to 22.5% (95% CI: 16.5–29.8%) of women living at more than 300% FPL. Reporting of emergency supplies varied by urban or rural residence. More than 71% (95% CI: 68.0–75.2%) of women living in a rural residence and 64.9% (95% CI: 59.1–70.2%) of women living in an urban residence had emergency supplies. (Table 3)

Models

The results of the multivariable analysis are presented in Table 4. Results from women 19-years-old and younger, Other Pacific Islander, and those with no insurance at the time of survey, should be interpreted with caution as their sample size was small (30–59 respondents). Education and marital status were not associated with any preparedness factors. The prevalence of completing at least one planning emergency preparedness behavior differed significantly by race, family size, and poverty level. Other Pacific Islander women were 45% more likely to report having emergency plans compared to White women (adjusted prevalence ratio [aPR] 1.45, 95% CI: 1.09–1.93). Women with a family size of

one were 33% (aPR 0.67, 95% CI: 0.46–0.96) less likely to report having emergency plans compared to women with a family size of two. In contrast, having emergency plans is more common among women with a family size of four (aPR 1.31, 95% CI: 1.06–1.61) and five or more (aPR 1.33, 95% CI: 1.04–1.70) compared to those with a family size of two. Compared to women with an income above 300% FPL, those with an income between 186 and 300% FPL were 28% (aPR 1.28, 95% CI: 1.03–1.60) more likely to have emergency plans.

Having copies of important documents significantly differed in the adjusted models by residence, race, insurance status, family size, and WIC participation. This behavior was less common among women living in a rural residence compared to women living in an urban residence (aPR 0.75, 95% CI: 0.60–0.95), and among women that used WIC during pregnancy compared to those that did not (aPR 0.72, 95% CI: 0.53–0.98). Native Hawaiian (aPR 2.16, 95% CI: 1.45–3.24), Filipino (aPR 1.69, 95% CI: 1.06–2.69), and Other Pacific Islander women (aPR 2.02, 95% CI: 1.10–3.71) were more likely than White women to have copies of important documents. Additionally, having copies of important documents was more common among women with public insurance compared to women with private insurance (aPR 1.42, 95% CI: 1.04–1.93), and among women with a family size of four compared to women with a family size of two (aPR 1.50, 95% CI: 1.02–2.20).

Significant differences were noted by age, race, family size, and FPL in the adjusted model for emergency supplies. Women 19-years-old and younger were 33% more likely to have emergency supplies compared women 30–34 years old (aPR 1.33, 95% CI: 1.14–1.55). Having emergency supplies was also more likely among Other Pacific Islander women compared to White women (aPR 1.44, 95% CI: 1.18–1.76), and women with a family size of five or more, compared to those with a family size of two (aPR 1.24, 95% CI: 1.02–1.52). Women with an income at or less than 100% FPL were 26% (aPR 0.74, 95% CI: 0.57–0.97) less likely to have emergency supplies compared to women with an income more than 300% FPL.

DISCUSSION

Analysis of the 2016 Hawaii PRAMS data shows the eight preparedness behaviors can be generalized into three factors - having emergency plans, having copies of important documents, and having emergency supplies. About 80% of women participated in at least one preparedness behavior, and each behavior displayed at least 30% participation.

In this study, race and family size were associated with all three emergency preparedness behavior factors in the adjusted models. Race and ethnicity have previously been shown to be important predictors of preparedness, although no consensus exists between the direction of association of race and preparedness in current literature.[25,41–45] An assessment of the 2006–2010 Behavioral Risk Factor Surveillance System general preparedness module found Black and Hispanic respondents were more likely to have a three-day supply of water, and an evacuation plan prepared compared to White respondents; however White respondents were more likely to have a three-day supply of food, battery operated radio, and medication.[45] Among a nationally representative sample of households in the United States

completing an online survey to assess predictors of disaster preparedness and compliance, the authors found that non-White individuals were more likely to have emergency plans.[43] In our analysis, Other Pacific Islander women reported higher participation in all three factors than White women. Although the sample size of Other Pacific Islander women was small, PRAMS methodology is designed to be representative of the state. Other Pacific Islanders are a minority group in the United States, however many reside within Hawaii, making Hawaii an ideal state to assess behaviors among Other Pacific Islander women with a recent live birth.[46]

Family size was a significantly associated with each factor in multivariable analyses. A family size of one was associated with a lower likelihood of having emergency plans compared to a family size of two. Compared to women with a family size of two, family sizes of four or more were associated with increased likelihood of having emergency plans, a family size of four was associated with a higher likelihood of having copies of important documents, and a family size of five or more was associated with a higher likelihood of having emergency supplies. A study by Zilversmit et al observed families with five or more members were 30% more likely to have an emergency plan compared to families of one to four members when assessing the presence of an emergency plan among postpartum women in Arkansas.[25] A focus group discussing household emergency preparedness among homeowners found children in the home promote preparedness for two reasons: it is a way for parents to protect their children, and preparedness is a result of increased involvement in community activities that prompt preparedness behaviors.[44]

In this study, federal poverty level was assessed because it provides information about family-level income. The scale used in this study is consistent with government programming cut-offs, and prior Hawaii PRAMS reports. Women with an income at or below 100% FPL were less likely to have emergency supplies compared to women with an income greater than 300% FPL, but there were no differences between these groups for emergency plans or copies of important documents. Women with an income 186–300% FPL were more likely to have emergency plans than women with an income greater than 300% FPL. Data from the 2016 Styles survey suggests among adults in the United States, cost is a barrier to emergency preparedness, while discounts to buy preparedness supplies are noted as a motivator for emergency preparedness.[47] For a household with limited means, buying surplus supplies in case of an emergency may be economically burdensome.

The second factor, having copies of important documents, was associated with residence, current insurance status, and participation in WIC. Women living in rural areas of Hawaii were less likely to report having copies of important documents in a safe location outside of the home compared to women with an urban residence. A rural area may have fewer options for safe storage of important documents outside of the home. Having copies of important documents was 42% more likely among women with public insurance, compared to women with private insurance. Use of WIC was associated with a lower prevalence of having copies of important documents, compared to those not using WIC. Participation in WIC during pregnancy requires a woman to be classified as having a nutritional risk by a health professional, and have an income at or below 185% FPL.[49] However, in this study, FPL was not a significant predictor of having copies of important documents.

Younger age was significantly associated with having emergency supplies. Women less than 19 years old were 33% more likely to have supplies for an emergency compared to women aged 30–34. In contrast, a study among Florida residents identified those aged 40–70 were more prepared than other respondents.[42]

LIMITATIONS

Results from our study show some consistency with other preparedness reports, although limited literature on disaster preparedness among postpartum women is available. Our study identified minimal demographic differences with preparedness behaviors among women with a recent live birth in Hawaii, suggesting disaster preparedness interventions should target all pregnant and postpartum women. Among mailed surveys, shorter questionnaires are associated with higher response rates.[50,51] Therefore, reducing this eight-part preparedness question to three-parts identified through factor analysis may be feasible. This study is limited by self-reported data so misclassification and reporting bias may be present. Furthermore, dichotomous answer options do not capture levels of preparedness, nor specify a timeframe to consider when responding. For example, a woman may respond that she and her family have practiced what to do in case of a disaster, however the access and functional needs of the family may have changed since they last practiced what to do, and new hazards may need to be considered. Additionally, this eight-part preparedness question only captures if the respondent has a plan. It is unknown if these plans are known by other family members, including children. This analysis is limited as Hawaii PRAMS does not collect information on social support and nontangible resources; however, these have been described as a strong predictor of preparedness.[16,17,44,52,53]

CONCLUSION

This study provides a measure of emergency preparedness among women with a recent live birth in Hawaii and is the first to describe a methodology to analyze the eight-part PRAMS emergency preparedness question. If other states observe similar factor analysis results of these eight preparedness behaviors, this PRAMS question could be reformatted to three parts, capturing general trends in preparedness behaviors. Fewer questions may increase the use of this question by jurisdictions and participant response rates may improve. Additionally, these results can inform Hawaii's efforts to increasing disaster preparedness among postpartum women and families in Hawaii. Furthermore, tracking the prevalence of preparedness behaviors measured in this PRAMS question over time will allow the state of Hawaii to measure the effect of interventions to increase preparedness.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

ABBREVAITIONS

aPR	adjusted prevalence ratio
CDC	Centers for Disease Control and Prevention
CI	Confidence interval
FEMA	Federal Emergency Management Agency
FPL	Federal poverty level
HI	Hawaii
PAHPAI	Pandemic and All-Hazards Preparedness and Advancing Innovation Act of 2019
PRAMS	Pregnancy Risk Assessment Monitoring System
WIC	Special Supplemental Nutrition Program for Women Infants and Children

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Table 1.

Demographic characteristics of women with a recent live birth in Hawaii, 2016 Hawaii PRAMS (N=1,010)

	N (%)	95% CI
Age (years)		
≤19	33 (3.0)	(1.9, 4.8)
20–24	156 (14.5)	(11.7, 17.9)
25–29	288 (28.5)	(24.8, 32.6)
30–34	313 (31.2)	(27.3, 35.3)
≥35	220 (22.8)	(19.3, 26.6)
Education [a]		
Less than High School	147 (17.1)	(13.8, 20.9)
High School	174 (18.9)	(15.8, 22.5)
Some College	336 (29.3)	(25.6, 33.3)
Bachelors or More	352 (34.7)	(30.7, 38.9)
Marital status		
Married	604 (63.4)	(59.2, 67.4)
Not Married	406 (36.6)	(32.6, 40.8)
Residence		
Rural	590 (27.7)	(26.9, 28.5)
Urban	420 (72.3)	(71.5, 73.1)
Race [b]		
[1]White	227 (21.6)	(18.2, 25.3)
[2]Native Hawaiian	314 (30.3)	(26.5, 34.4)
Filipino	195 (16.9)	(13.9, 20.3)
Japanese	102 (12.1)	(9.5, 15.3)
[3]Other Pacific Islander	50 (5.7)	(4.0, 8.1)
[4]Other	119 (13.5)	(10.7, 16.9)
Insurance [c]		
[5]Private	624 (69.1)	(65.1, 72.8)
Public	332 (27.2)	(23.7, 31.1)
None	41 (3.7)	(2.5, 5.7)
Family size [d]		
1	113 (10.2)	(7.9, 13.1)
2	310 (30.4)	(26.5, 34.5)
3	249 (28.5)	(24.6, 32.6)
4	194 (18.6)	(15.5, 22.3)
≥5	120 (12.4)	(9.7, 15.6)
% FPL [e]		
≤100%	252 (24.3)	(20.8, 28.3)

	N (%)	95% CI
101–185%	254 (25.3)	(21.6, 29.3)
186–300%	167 (17.2)	(14.1, 20.8)
>300%	273 (33.2)	(29.1, 37.6)
WIC during pregnancy [e]		
Yes	337 (35.0)	(30.9, 39.4)
No	609 (65.0)	(60.6, 69.1)

Note. Reported sample sizes are unweighted and reported percentages are weighted.

Abbreviations: FPL, Federal Poverty Level; PRAMS, Pregnancy Risk Assessment Monitoring System; and WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

[a.] N=1,009

[b.] N=1,007

[c.] N=997

[d.] N=986

[e.] N=946

[1.] Includes Portuguese

[2.] Includes mixed race Native Hawaiians

[3.] Includes Samoan, Guamanian, Other Pacific Islander

[4.] Includes American Indian, Alaska Native, Asian Indian, Black, Chinese, Cuban, Mexican, Mixed Race, other Asian, Puerto Rican, and other

[5.] Includes military healthcare

[6.] Family size describes number of individuals living on total income in the 12 months prior to the birth.

[7.] Percent FPL determined by reported household income and number of individuals living on that income 12 months prior to birth, compared to the January 2016 poverty guidelines for Hawaii issued by the Federal Register of the Department of Health and Human Services.

Table 2.

Prevalence of disaster preparedness behaviors among women with a recent live birth in Hawaii, 2016 Hawaii PRAMS (N=1,010)

	N (%)	95% CI
Individual Questions		
a. Emergency meeting place	373 (37.8)	(33.7, 42.1)
b. Practiced what to do	304 (31.6)	(27.7, 35.8)
c. Keeping in touch	390 (38.7)	(34.5, 43.0)
d. Evacuation plan to leave home and community	353 (36.6)	(32.6, 40.9)
e. Evacuation plan for child(ren)	407 (41.3)	(37.1, 45.6)
f. Copies of important documents	315 (31.8)	(27.9, 36.0)
g. Emergency supplies in home to last for at least 7 days	666 (63.0)	(58.7, 67.1)
h. Emergency supplies to take with if had to leave quickly	348 (34.9)	(30.9, 39.2)
Factor 1 (Plans)[1]	610 (59.8)	(55.5, 64.0)
Factor 2 (Documents)[2]	315 (31.8)	(27.9, 36.0)
Factor 3 (Supplies)[3]	697 (66.8)	(62.5, 70.8)

Note. Reported sample sizes are unweighted and reported percentages are weighted.

1. Answered yes to at least one behavior among: have an emergency meeting place, have practiced what to do in case of a disaster, have a plan for how family would keep in touch if separated, have an evacuation plan if she needed to leave her home and community, and have an evacuation plan for her child(ren) in case of disaster.

2. Answered yes to having copies of important documents in a safe place outside of the home.

3. Answered yes to having emergency supplies in the home for at least seven days and/or have emergency supplies to take with if she had to leave quickly.

Table 3.

Women with a recent live birth in Hawaii with emergency preparedness behaviors by demographic category, 2016 Hawaii PRAMS

	Factor 1[a] (Plans)			Factor 2[b] (Documents)			Factor 3[c] (Supplies)			No Preparedness Behaviors		
	Yes (%)	95% CI	p-value	Yes (%)	95% CI	p-value	Yes (%)	95% CI	p-value	Yes[d] (%)	95% CI	p-value
Age (years)												
[e]≤19	22 (60.2)	(36.2, 80.1)	0.8543	9 (38.5)	(18.7, 62.9)	0.9612	27 (80.2)	(54.1, 93.3)	0.1762	5 (18.8)	(6.0, 45.6)	0.3525
20–24	93 (58.3)	(46.7, 69.0)		56 (32.6)	(23.2, 43.6)		108 (63.2)	(51.4, 73.6)		28 (23.3)	(14.6, 35.0)	
25–29	164 (56.6)	(48.4, 64.5)		95 (32.1)	(25.0, 40.2)		195 (62.3)	(53.9, 69.9)		58 (24.8)	(18.1, 32.9)	
30–34	190 (62.8)	(55.2, 69.9)		95 (32.3)	(25.4, 40.1)		218 (72.6)	(65.5, 78.8)		54 (15.7)	(11.0, 22.0)	
≥35	141 (60.7)	(51.3, 69.3)		60 (29.5)	(21.8, 38.6)		149 (64.8)	(55.5, 73.2)		39 (21.2)	(14.4, 30.0)	
Education												
Less than High School	86 (55.7)	(44.0, 66.7)	0.6055	43 (30.8)	(21.2, 42.5)	0.1066	96 (61.2)	(49.4, 71.8)	0.6837	30 (26.4)	(17.3, 38.2)	0.2097
High School	115 (60.5)	(50.3, 69.8)		64 (39.6)	(30.3, 49.7)		122 (66.3)	(56.1, 75.2)		31 (24.1)	(16.1, 34.4)	
Some College	207 (63.8)	(56.2, 70.7)		118 (34.4)	(27.6, 41.9)		241 (69.5)	(61.9, 76.1)		52 (15.6)	(10.9, 22.0)	
Baccalaureate or higher	201 (58.1)	(50.8, 65.1)		89 (25.8)	(19.9, 32.8)		238 (67.6)	(60.4, 74.1)		71 (20.5)	(15.2, 27.1)	
Marital status												
Married	357 (60.0)	(54.5, 65.3)	0.9020	175 (29.1)	(24.3, 34.4)	0.0842	404 (64.7)	(59.2, 69.8)	0.1850	114 (20.8)	(16.5, 25.8)	0.9692
Not Married	253 (59.5)	(52.4, 66.2)		140 (36.6)	(30.1, 43.6)		293 (70.4)	(63.5, 76.4)		70 (20.6)	(15.3, 27.2)	
Residence												
Rural	374 (63.7)	(59.8, 67.5)	0.1259	182 (31.0)	(27.4, 34.8)	0.7218	424 (71.8)	(68.0, 75.2)	0.0415*	92 (15.8)	(13.1, 18.9)	0.0190*
Urban	236 (58.3)	(52.5, 63.9)		133 (32.2)	(27.0, 37.8)		273 (64.9)	(59.1, 70.2)		92 (22.6)	(18.1, 27.9)	
Race												
[f]White	117 (54.8)	(45.6, 63.7)	0.0465*	49 (20.0)	(13.8, 28.1)	<0.0001*	147 (62.5)	(53.1, 71.0)	0.1213	57 (27.2)	(19.7, 36.4)	0.0482*
[g]Native Hawaiian	211 (61.7)	(53.7, 69.1)		130 (44.5)	(36.9, 52.4)		230 (73.0)	(65.4, 79.5)		45 (16.9)	(11.5, 24.1)	
Filipino	129 (66.2)	(56.0, 75.2)		70 (36.3)	(27.0, 46.7)		147 (67.8)	(57.1, 76.9)		22 (15.4)	(8.9, 25.3)	
Japanese	54 (49.6)	(37.0, 62.2)		16 (11.9)	(6.0, 22.4)		64 (60.5)	(47.4, 72.2)		24 (28.2)	(17.9, 41.3)	
[e,h]Other Pacific Islander	35 (78.7)	(62.8, 89.0)		14 (38.6)	(22.5, 57.7)		35 (79.4)	(62.3, 90.0)		6 (9.6)	(3.5, 23.9)	
[i]Other	62 (56.2)	(43.8, 67.8)		35 (32.1)	(21.7, 44.6)		73 (59.9)	(47.4, 71.3)		30 (24.4)	(15.3, 36.6)	
Insurance												

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	Factor 1[a] (Plans)			Factor 2[b] (Documents)			Factor 3[c] (Supplies)			No Preparedness Behaviors		
	Yes (%)	95% CI	p-value	Yes (%)	95% CI	p-value	Yes (%)	95% CI	p-value	Yes[d] (%)	95% CI	p-value
[f]Private	367 (58.8)	(53.4, 64.0)	0.7467	181 (29.0)	(24.4, 34.1)	0.1588	434 (66.2)	(60.9, 71.2)	0.3894	119 (21.3)	(17.1, 26.1)	0.8623
Public	208 (61.0)	(52.9, 68.4)		113 (38.1)	(30.6, 46.1)		227 (69.4)	(61.8, 76.2)		57 (19.4)	(13.7, 26.9)	
[e]None	26 (66.1)	(43.8, 83.0)		14 (32.4)	(16.3, 54.0)		25 (53.2)	(32.4, 73.0)		8 (24.0)	(9.3, 49.3)	
Family size												
1	60 (42.9)	(30.9, 55.9)	0.0007*	37 (37.5)	(25.5, 51.3)	0.0729	81 (60.2)	(46.3, 72.6)	0.3813	23 (28.4)	(17.5, 42.7)	0.3197
2	157 (53.5)	(45.5, 61.3)		84 (24.5)	(18.4, 31.9)		211 (61.9)	(53.8, 69.4)		65 (24.3)	(17.9, 32.1)	
3	162 (59.8)	(51.3, 67.8)		76 (31.9)	(24.6, 40.2)		177 (70.6)	(62.3, 77.7)		40 (18.3)	(12.6, 25.9)	
4	129 (71.8)	(62.4, 79.6)		60 (41.6)	(32.0, 51.9)		125 (70.6)	(61.2, 78.5)		37 (16.2)	(10.3, 24.6)	
≥5	89 (72.5)	(59.5, 82.6)		49 (29.5)	(20.2, 40.9)		89 (69.6)	(56.3, 80.2)		12 (16.8)	(8.6, 30.3)	
% FPL												
≤100%	162 (62.4)	(53.3, 70.6)	0.0122*	85 (34.2)	(26.3, 43.1)	0.0168*	170 (63.3)	(54.3, 71.5)	0.0821	42 (20.3)	(13.8, 29.0)	0.4031
101–185%	165 (63.1)	(54.3, 71.2)		91 (38.5)	(30.3, 47.4)		172 (62.5)	(53.5, 70.7)		41 (20.2)	(13.8, 28.5)	
186–300%	104 (70.7)	(60.6, 79.1)		51 (34.9)	(25.4, 45.7)		121 (77.2)	(67.4, 84.7)		31 (15.0)	(9.0, 24.1)	
>300%	142 (50.3)	(42.4, 58.3)		65 (22.5)	(16.5, 29.8)		189 (66.9)	(58.9, 74.0)		58 (24.0)	(17.7, 31.7)	
WIC during pregnancy												
Yes	222 (63.5)	(55.8, 70.6)	0.2420	111 (32.6)	(25.9, 40.2)	0.9776	230 (64.2)	(56.5, 71.3)	0.3081	58 (21.9)	(15.9, 29.3)	0.6031
No	354 (58.0)	(52.4, 63.4)		185 (32.5)	(27.5, 38.0)		425 (69.0)	(63.6, 73.9)		113 (19.7)	(15.6, 24.6)	

Note. Reported sample sizes are unweighted and reported percentages are weighted. Percentages describe women in category sub-group (from Table 1) having preparedness factor.

Abbreviations: FPL, Federal Poverty Level; PRAMS, Pregnancy Risk Assessment Monitoring System; and WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

[a]Answered yes to at least one behavior among: have an emergency meeting place, have practiced what to do in case of a disaster, have a plan for how family would keep in touch if separated, have an evacuation plan if she needed to leave her home and community, and have an evacuation plan for her child(ren) in case of disaster.

[b]Answered yes to having copies of important documents in a safe place outside of the home.

[c]Answered yes to having emergency supplies in the home for at least seven days and/or have emergency supplies to take with if she had to leave quickly.

[d]Women reporting no preparedness behaviors

[e]Subgroup contains 30–59 respondents, results should be interpreted with caution

[f]Includes Portuguese

[g] Includes mixed race Native Hawaiians

[h] Includes Samoan, Guamanian, Other Pacific Islander

[i] Includes American Indian, Alaska Native, Asian Indian, Black, Chinese, Cuban, Mexican, Mixed Race, other Asian, Puerto Rican, and other

[j] Includes military healthcare

[*] Significant at alpha=0.05 for Wald Chi-square test

Table 4.

Multivariable logistic regression of the characteristics of women with a recent live birth and presence of emergency preparedness behavior factors, 2016 Hawaii PRAMS

	Factor 1[a] (Plans)		Factor 2[b] (Documents)		Factor 3[c] (Supplies)	
	Prevalence Ratio	**95% CI**	**Prevalence Ratio**	**95% CI**	**Prevalence Ratio**	**95% CI**
Age (years)						
[d]≤19	1.27	(0.96, 1.69)	1.33	(0.74, 2.42)	1.33	(1.14, 1.55)
20–24	1.06	(0.82, 1.38)	1.21	(0.80, 1.84)	1.00	(0.81, 1.25)
25–29	0.96	(0.79, 1.18)	1.01	(0.71, 1.45)	0.92	(0.77, 1.09)
30–34	Referent		Referent		Referent	
≥35	1.00	(0.82, 1.23)	1.08	(0.75, 1.56)	0.90	(0.75, 1.09)
Education						
Less than High School	0.81	(0.59, 1.11)	0.76	(0.45, 1.30)	0.89	(0.69, 1.14)
High School	0.95	(0.75, 1.21)	1.25	(0.85, 1.84)	0.93	(0.75, 1.16)
Some College	1.02	(0.85, 1.23)	1.06	(0.75, 1.51)	1.01	(0.86, 1.17)
Baccalaureate or higher	Referent		Referent		Referent	
Marital status						
Married	Referent		Referent		Referent	
Not Married	0.98	(0.80, 1.19)	0.89	(0.64, 1.25)	1.14	(0.98, 1.33)
Residence						
Rural	1.08	(0.95, 1.23)	0.75	(0.60, 0.95)	1.10	(0.99, 1.23)
Urban	Referent		Referent		Referent	
Race						
[e]White	Referent		Referent		Referent	
[f]Native Hawaiian	1.16	(0.93, 1.44)	2.16	(1.45, 3.24)	1.18	(0.98, 1.42)
Filipino	1.23	(0.98, 1.55)	1.69	(1.06, 2.69)	1.07	(0.87, 1.32)
Japanese	1.06	(0.78, 1.43)	0.75	(0.34, 1.69)	0.99	(0.76, 1.29)
[d,g]Other Pacific Islander	1.45	(1.09, 1.93)	2.02	(1.10, 3.71)	1.44	(1.18, 1.76)
[h]Other	1.03	(0.77, 1.38)	1.50	(0.89, 2.52)	1.02	(0.80, 1.30)
Insurance						
[i]Private	Referent		Referent		Referent	
Public	1.02	(0.85, 1.23)	1.42	(1.04, 1.93)	1.06	(0.91, 1.24)
[d]None	0.91	(0.60, 1.38)	0.92	(0.38, 2.27)	0.81	(0.53, 1.25)
Family size						
1	0.67	(0.46, 0.96)	1.26	(0.80, 1.97)	0.86	(0.64, 1.15)
2	Referent		Referent		Referent	
3	1.09	(0.88, 1.35)	1.23	(0.85, 1.78)	1.12	(0.94, 1.34)
4	1.31	(1.06, 1.61)	1.50	(1.02, 2.20)	1.19	(0.99, 1.43)
≥5	1.33	(1.04, 1.70)	1.02	(0.62, 1.67)	1.24	(1.02, 1.52)
% **FPL**						

	Factor 1[a] (Plans)		Factor 2[b] (Documents)		Factor 3[c] (Supplies)	
	Prevalence Ratio	**95% CI**	**Prevalence Ratio**	**95% CI**	**Prevalence Ratio**	**95% CI**
≤100%	1.05	(0.77, 1.43)	1.07	(0.65, 1.75)	0.74	(0.57, 0.97)
101–185%	1.01	(0.79, 1.31)	1.47	(0.99, 2.20)	0.84	(0.69, 1.02)
186–300%	1.28	(1.03, 1.60)	1.41	(0.94, 2.10)	1.10	(0.94, 1.28)
>300%	Referent		Referent		Referent	
WIC during pregnancy						
Yes	1.11	(0.94, 1.31)	0.72	(0.53, 0.98)	0.96	(0.82, 1.12)
No	Referent		Referent		Referent	

Note. Reported prevalence ratios are adjusted for all variables included in models.

Abbreviations: FPL, Federal Poverty Level; PRAMS, Pregnancy Risk Assessment Monitoring System; and WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

a. Answered yes to at least one behavior among: have an emergency meeting place, have practiced what to do in case of a disaster, have a plan for how family would keep in touch if separated, have an evacuation plan if she needed to leave her home and community, and have an evacuation plan for her child(ren) in case of disaster.

b. Answered yes to having copies of important documents in a safe place outside of the home.

c. Answered yes to having emergency supplies in the home for at least seven days and/or have emergency supplies to take with if she had to leave quickly.

d. Subgroup contains 30–59 respondents, results should be interpreted with caution

e. Includes Portuguese

f. Includes mixed race Native Hawaiians

g. Includes Samoan, Guamanian, Other Pacific Islander

h. Includes American Indian, Alaska Native, Asian Indian, Black, Chinese, Cuban, Mexican, Mixed Race, other Asian, Puerto Rican, and other

i. Includes military healthcare