

## Trauma, socioeconomic resources, and self-rated health in an ethnically diverse adult cohort

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**Objectives.** To evaluate ethnic group differences in the association between trauma exposure and health status among an ethnically diverse sample originating in Hawai'i.

**Design.** Across a 10-year period (1998–2008), participants ( $N = 833$ ) completed five waves of questionnaire assessments. Trauma exposure was measured retrospectively at the most recent assessment (wave 5), socioeconomic resources (educational attainment and employment status) were measured at wave 1, and self-rated health was measured at each of the five waves.

**Results.** Results indicated that greater exposure to trauma was associated with poorer self-rated health, as were lower educational attainment and lower work status. In addition, there was ethnic group variation in health ratings, as well as in how strongly trauma exposure predicted health status. Specifically, within Filipino American and Native Hawaiian ethnic groups, there was a stronger negative association between trauma exposure and self-rated health.

**Conclusion.** These results suggest complex interrelations among trauma, ethnicity, socioeconomic status, and physical health. Further understanding these relations may have implications for medical and behavioral interventions in vulnerable populations.

**Keywords:** self-rated health; ethnicity; Native Hawaiians; socioeconomic resources

### Introduction

A large and growing body of research finds that experiencing trauma has significant negative impacts on physical health (e.g., Kendall-Tackett 2004, Schnurr and Green 2004). Converging evidence relating stress (e.g., Pennebaker *et al.* 1988), posttraumatic stress disorder (Green and Kimerling 2004), and interpersonal traumas (Kendall-Tackett 2004) to health and immune function, indicates that trauma is associated with a range of health concerns, including life-threatening illness such as cancer and heart disease (Felitti *et al.* 1998, Ford 2004, Green and Kimerling 2004).

Events that evoke strong fear responses have long been considered hallmark traumatic events, and these fear-based events lead to posttraumatic responses typified by posttraumatic stress disorder (PTSD, Riggs *et al.* 2006). Fear-based traumas include those that involve actual or threatened death or serious injury, or

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witnessing such an event occurring to another person. Betrayal trauma theory (Freyd 1996) describes a class of traumatic events that involve victimization by someone with whom the victim has a relationship. Betrayal trauma theory posits that the source of symptoms linked to betrayal-related traumas lies in avoidance of awareness of the trauma, in order to preserve attachment to the perpetrator. Exposure to such events has been associated with a variety of posttraumatic symptoms typified by avoidance responses including depression, anxiety, and dissociation (Freyd *et al.* 2005, Goldsmith *et al.* 2012). Betrayal traumas include such events as sexual, physical, and emotional abuse perpetrated by a close other. Both fear-based traumas and betrayal traumas have been associated with negative health outcomes (e.g., Green and Kimerling 2004, Freyd *et al.* 2005, Goldsmith *et al.* 2012). Researchers have suggested a number of possible pathways linking trauma and health, including physiological and behavioral health impacts of trauma-related cognitive and emotional changes (Kendall-Tackett and Klest 2009).

Different ethnic groups are differentially exposed to trauma and hence to its adverse health effects. Research on natural disasters has found that members of ethnic minority groups are more likely than majority groups to be exposed to life threat and injury during disasters (Perilla *et al.* 2002). Members of the indigenous Maori tribes of New Zealand experience higher lifetime rates of a variety of traumatic events when compared to Caucasians (Flett *et al.* 2004). In urban areas of the USA, members of ethnic minority groups have a twofold greater likelihood of exposure to assaultive violence than Caucasians (Breslau *et al.* 1998), and a nationally representative study of US adults found higher rates of child maltreatment and war-zone trauma among minorities as compared with Caucasians (Roberts *et al.* 2011). In rural reservation areas, Native Americans<sup>1</sup> have similarly high rates of violence exposure (Manson *et al.* 2005), and the United States Bureau of Justice Statistics reports that Blacks are more likely than other groups to be victims of violent crime, while Asians are less likely than others to be violent crime victims (Harrell 2009, Truman and Rand 2010). A study comparing combat exposure and posttraumatic stress disorder in Caucasians, Japanese Americans, and Native Hawaiians, found that rates of exposure were lowest for Japanese Americans and highest for Native Hawaiians (Friedman *et al.* 2004).

Self-rated health is a reliable and strong predictor of health status and mortality across ethnic groups (e.g., Idler and Benyamini 1997, McGee *et al.* 1999). African-Americans, Hispanics, and Native Americans are more likely to report poor health than Caucasians or Asian Americans (McGee *et al.* 1999, Peters *et al.* 2009), and recent research has shown that across ethnic groups, greater perceived discrimination is related to poorer self-rated health (Brondolo *et al.* 2011). Moreover, like objective measures of health functioning, self-rated health also appears to be affected by exposure to trauma. Prior research has found that exposure to trauma has a significant negative impact on self-rated health status, and that these findings mirror findings with other measures of health functioning, including number of chronic conditions and disability status (Krause *et al.* 2004). In addition, at least one study has demonstrated that physical symptom reports are more strongly associated with exposure to some types of traumas than others. Specifically, exposure to trauma that is interpersonal in nature, which is perpetrated by someone close to the victim (trauma with a high degree of betrayal), is more predictive of symptoms than trauma that has less of a betrayal component (Freyd *et al.* 2005).

Social-context theories suggest that characteristics of the social environment, as well as access to resources, are important in the prediction of trauma exposure, and subsequent physical symptoms (Breslau *et al.* 1998, Dohrenwend 2000, Bonanno 2004, Adler and Rehkopf 2008). Social-context factors may help to explain differential exposure to traumatic events as well as differential symptom presentations across ethnic groups. For example, level of educational attainment is a consistent predictor of exposure to violence, in that less education is associated with greater violence exposure, (e.g., Breslau *et al.* 1998, Wilson *et al.* 2007). Members of ethnic minority groups are more likely to be among school dropouts, and less likely to have access to higher education (Manson *et al.* 2005). Educational attainment is also a predictor of health status, such that more educated individuals tend to report better health (Krause *et al.* 2004). Another important aspect of social context is employment status. Those who are unemployed tend to experience poorer health than those who are working (McKee-Ryan *et al.* 2005). Trauma exposure, self-rated health, socioeconomic resources (i.e., educational attainment and employment status), and ethnicity, all appear to relate to one another independently, yet few researchers have examined these variables together in a single study.

The current study examined the associations among trauma exposure, ethnicity, and self-rated physical health within an ethnically diverse sample from Hawai'i. Hawai'i's population includes numerous ethnic subgroups as a result of its history of colonization, immigration, and intentional social stratification (Edles 2004). The cultural landscape of Hawai'i has been in flux due to factors such as in-migration from and out-migration to the continental US, immigration from Europe and Asia, and intermarriage between members of different ethnic groups (Okamura 2008). However, at least since 1970, the social stratification among ethnic groups represented in Hawai'i has remained fairly constant, with the exception of Japanese Americans gaining status over the past two decades (Okamura 1990, 2008). Currently, when considering occupational status, education, and income, Caucasians, Japanese Americans, and Chinese Americans hold the highest status among ethnic groups in Hawai'i. Consistently at the bottom of the socioeconomic spectrum are Samoans, Filipino Americans, and Native Hawaiians, as well as a relatively smaller Latino population (Okamura 1990, 2008). For the purposes of the current study, we consider Caucasians, Chinese Americans, and Japanese Americans as 'higher status' (advantaged) ethnic groups, and Latinos, Filipino Americans, and Native Hawaiians as 'lower status' (disadvantaged) ethnic groups, based on these prior findings.

Native Hawaiians may be at particular risk for trauma exposure and development of symptoms (Mokuau and Matsuoka 1995). A history of colonization and attendant lack of self-determination and self-governance are important factors in the development of an array of social problems, including exposure to and perpetration of violence, mental health problems, poor education, and poverty (Mokuau 1990, Mokuau and Matsuoka 1995). Indeed, greater exposure to trauma has been observed in Native American groups, as well as the indigenous Maori of New Zealand (Flett *et al.* 2004, Manson *et al.* 2005). The history of Native Hawaiians has much in common with the history of Native Americans in the USA. If history and social context are important factors in determining exposure to trauma and health status, it is likely that Native Hawaiians are similar to Native Americans, who are at

greater risk than other groups not only for exposure to trauma, but also for a variety of serious health conditions (Bullock and Bell 2005).

### Research questions and hypotheses

We predicted that more exposure to trauma will be associated with poorer health in this sample. In addition, we hypothesized that traumas with a strong betrayal component (see Freyd 1996) will be more associated with health status than other types of traumas. We predicted that members of socially disadvantaged ethnic groups (Native Hawaiians, Filipino Americans, Latinos) will report poorer health than members of advantaged ethnic groups (Caucasians, Japanese Americans, Chinese Americans), and that lower levels of socioeconomic resources (specifically unemployment and less educational attainment) will be associated with poorer health ratings.

In addition, we hypothesized that the relation between trauma and health will be strongest within more disadvantaged ethnic groups. Because access to socioeconomic resources may serve as a protective factor against developing physical symptoms, it is expected that trauma will be more strongly associated with self-rated health within groups with the fewest resources, and less predictive of self-rated health within advantaged groups.

## Method

### Participants

Participants in this study were members of the Hawai'i Personality and Health cohort (Hampson *et al.* 2001). Originally, this was a population-based cohort of over 2000 elementary school children included in a study of personality characteristics between 1959 and 1967. Approximately 60% of the original cohort has participated in further studies of personality and health since 1999, including responding to mailed questionnaires (Hampson *et al.* 2006, 2007, Kanazawa *et al.* 2007). The current study included 833 cohort members (47% men, 53% women) who responded to the wave 5 questionnaire mailed in May 2008, which assessed traumatic events. Data from these participants from previous questionnaires (waves 1–4 mailed at approximately two-yearly intervals since 1999) were also used.

### Measures

#### Demographic information

Ethnic group identification was assessed by asking 'Which group best describes your cultural identity? (We recognize that many people have a diverse cultural background. If you identify with more than one group, please choose the one group with which you most strongly associate yourself.)' The options offered were developed in consultation with our research team in Hawai'i and, like all our questionnaire items, were reviewed by local focus groups representing the ethnic diversity of Hawai'i. The options were: 'African American, Aleutian/Alaskan/American Indian, Caucasian (European American), Chinese, Filipino, Hawaiian/Part Hawaiian, Japanese, Korean, Latino

(such as Latin American or Puerto Rican), Okinawan, Other Pacific Islander (such as Samoan or Tongan), and Other.'

Employment status was measured by asking participants to check as many as were applicable of the following options: employed for wages, self-employed, out of work for more than one year, out of work for less than one year, homemaker, student, retired, and permanently disabled/unable to work. Work status was coded by categorizing participants as (1) working for pay (2) versus not working. Educational attainment was assessed by asking participants to indicate the highest level of education they had completed. Response options included eighth grade or less, junior high or intermediate school, some high school, high-school graduate or GED certificate, some technical school, technical or nursing school graduate, some college or community college, college graduate, and postgraduate or professional degree. Educational attainment was coded on a 1–9 scale, with higher scores indicating higher levels of education attainment.

### Self-reported health

At all five waves of data collection, participants were asked to complete the statement 'Compared to others of your same age and sex, would you say that in general your health is...,' with one of the following response options: 1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent. Previous research has demonstrated that single-question assessments of self-rated health reliably predict health status and mortality across ethnic groups (e.g., McGee *et al.* 1999). Two variables were created from these ratings: (1) current self-rated health (assessed at wave 5 at the same time as trauma), (2) mean self-rated health across all waves.

### Trauma

Trauma exposure was assessed by the Brief Betrayal Trauma Survey (BBTS; Goldberg and Freyd 2006). Participants indicated whether they had experienced each of 14 types of traumatic events. Several versions of the BBTS have been used in research (see Freyd 2008), and the current study employed a version asking about experiences of each event before age 12, between ages 12 and 17, and at age 18 and over. Events on the survey ranged in level of betrayal from natural disasters (no betrayal) to sexual abuse by someone close (very high betrayal). The questions avoid using labels for the events and instead describe them behaviorally. Typically, the BBTS provides respondents a choice of the following options for how often they had experienced each event: 'never,' 'one or two times,' 'more than that' for each age range. The current version included additional response options to the question 'Have each of the following events happened to you?' including 'yes,' 'no,' 'don't know/can't remember,' and 'decline to respond.' These response options are meant to discourage respondents from simply leaving the question blank, or from selecting 'no' or 'never,' when a different response better captures the person's experience or decision-making. This measure has been demonstrated to be relatively reliable over time, and yields rates of trauma exposure similar to other measures (DePrince 2001, Goldberg and Freyd 2006).

Scores for the BBTS were computed by summing the number of 'yes' responses to the 14 items, for each of the three age periods assessed, with the total score indicating

how many different types of lifetime traumatic events participants had experienced. In addition to computing total scores, subscale scores were computed that divided traumatic events into traumas with a high degree of betrayal (more betrayal) and traumas with no betrayal or lesser degrees of betrayal (less betrayal). These scores were computed by summing the number of yes responses to the items in the two subscales.

#### *Ethical approval and consent procedures*

Ethical approval in accordance with requirements for research funded by the National Institutes of Health was obtained from the Institutional Review Boards of the Oregon Research Institute and the Kaiser Permanente Center for Health Research, Hawai'i. Participants provided written consent.

#### *Statistical analysis*

Frequency distributions and percentages were calculated for categorical data and means and SDs for continuous data. Multiple regression was used to predict self-rated health at wave 5 and average self-rated health across all five waves from the number of more-betrayal and less-betrayal traumas, controlling for gender, educational attainment, and employment status. One-way analysis of variance and Tukey's test for posthoc comparisons were used to test the association between ethnicity and self-rated health outcomes. Regression and ANOVA analyses were conducted using the statistical software SPSS.

Hierarchical linear modeling (HLM) was conducted using the statistical software HLM 6.06, to test whether level of trauma exposure was associated with health trajectory over time. In these analyses, self-rated health measurements were nested within individuals, as a strategy for analyzing each participant's change in self-rated health across time points while accounting for non-random dependency in the data. In addition, HLM allows for the assessment of variability in regression equations between different groups, and in these analyses individuals were nested within ethnic groups, as a strategy for comparing the relative strength of association between trauma and health within ethnic groups.

## **Results**

#### *Participant characteristics and descriptive statistics*

The largest ethnic subgroups were Japanese or Okinawan (40%), Caucasian (20%), and Hawai'ian or other Pacific Islander (19%). Participants (53% female) ranged in age from 51 to 60 years ( $M = 55.05$ ,  $SD = 2.00$ ). On average, participants reported having some postsecondary education ( $M = 6.96$ ,  $SD = 1.77$ ), and 78.1% of participants were engaged in a form of work for pay. This sample was somewhat more educated than the general population of Hawai'i, and included a higher percentage of Native Hawaiians and lower percentage of Caucasians than are currently represented in Hawai'i as a whole (US Census Bureau 2009). Overall, 78.4% of the participants reported exposure to at least one traumatic event assessed by the BBTS, with 68.1% reporting at least one low-betrayal trauma, and 47.8% reporting at least one

high-betrayal trauma. On average, participants rated their health as 'good' to 'very good.' For a summary of demographics and descriptive statistics, see Table 1.

#### *Associations between trauma and health for the entire sample*

To test whether trauma exposure and other variables predicted self-rated health, separate regression analyses were conducted with current self-rated health and average self-rated health as outcome variables. In addition to exposure to higher and lower betrayal traumas, predictors included gender, educational attainment, and work status. Traumas high in betrayal were a significant predictor of average and current self-rated health, independent of the other predictors; more exposure to higher betrayal trauma correlated with worse self-rated health, whereas traumas lower in betrayal did not. In addition, educational attainment and work status were significant predictors of both measures of self-rated health; those with less education and those who were not employed for pay had poorer health. Men reported significantly worse self-rated health than women. The results of these analyses are summarized in Table 2.

To test whether trauma exposure was associated with health trajectory over time, the five measurements of self-rated general health from each wave were entered as outcome variables in HLM, with wave number functioning as the time variable. Traumas high in betrayal and traumas lower in betrayal were added as predictors. Overall, there was significant variability among participants in average self-rated health status ( $\chi^2 = 1838.32$ ,  $df = 702$ ,  $p < 0.001$ ), and in health status trajectory over time ( $\chi^2 = 1009.26$ ,  $df = 702$ ,  $p < 0.001$ ). Exposure to traumas lower in betrayal did not significantly predict average health status when controlling for exposure to traumas high in betrayal ( $t = 0.13$ ,  $df = 702$ ,  $p = 0.90$ ), but was marginally predictive of health trajectory over time ( $\chi^2 = 13.58$ ,  $df = 7$ ,  $p = 0.06$ ). Traumas high in betrayal significantly predicted both average health status ( $t = -2.08$ ,  $df = 702$ ,  $p < 0.05$ ) and health trajectory over time ( $\chi^2 = 15.74$ ,  $df = 7$ ,  $p < 0.05$ ).

The nature of the relation between high-betrayal traumas and health trajectory self-rated health over time was examined for the most frequently reported numbers of high-betrayal traumas (0, 1, 2, 3, 4, and 5). As shown in Figure 1, exposure to more high-betrayal traumas was associated with poorer initial self-rated health. In general, all participants reported a decline in health over time. Participants with fewer betrayal traumas reported a faster rate of decline than those reporting the most betrayal traumas. Although those participants reporting the fewest betrayal traumas reported greater rates of decline, participants with more betrayal traumas consistently reported the poorest self-rated health at all waves.

#### *Associations between trauma and health as moderated by ethnicity*

Means and standard deviations for each of the six largest ethnic groups for each measure of health are presented in Table 3. Separate one-way ANOVA analyses were run using ethnicity as the grouping factor and the self-rated health measures as separate dependent variables. Significant ethnic group differences were observed for self-rated health, both at wave 5 and for the average across waves.

Posthoc Tukey's tests indicated that Caucasian and Chinese participants reported better health than the other groups. Caucasians rated their health as better than Hawaiian, Latino, and Filipino participants at wave 5, and better than Japanese,

Table 1. Participant characteristics.

Variable (wave) <i>n</i> (%) or <i>M</i> (SD)	Japanese and Okinawan ( <i>n</i> = 314)	Chinese ( <i>n</i> = 47)	Caucasian ( <i>n</i> = 162)	Filipino ( <i>n</i> = 73)	HPI ( <i>n</i> = 152)	Korean ( <i>n</i> = 6)	Latino ( <i>n</i> = 23)	Other ( <i>n</i> = 14)
Male (wave 1)	152 (48.4)	21 (44.7)	72 (44.4)	40 (54.8)	65 (42.8)	3 (50.0)	12 (52.2)	6 (42.9)
Educational attainment (wave 1)								
<i>M</i> (SD)	7.60 (1.27)	7.98 (1.10)	7.35 (1.62)	6.01 (1.95)	5.71 (1.80)	7.00 (2.19)	5.65 (1.85)	7.50 (1.83)
Eighth grade or less	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Junior high school	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.4)	1 (0.7)	0 (0.0)	1 (4.3)	0 (0.0)
Some high school	0 (0.0)	0 (0.0)	1 (0.6)	1 (1.4)	6 (3.9)	1 (16.7)	1 (4.3)	0 (0.0)
High school grad or GED	19 (6.1)	2 (4.3)	18 (11.1)	24 (32.9)	55 (36.2)	0 (0.0)	8 (34.8)	2 (14.3)
Some technical school	6 (1.9)	0 (0.0)	7 (4.3)	3 (4.1)	9 (5.9)	0 (0.0)	0 (0.0)	0 (0.0)
Technical school graduate	12 (3.8)	0 (0.0)	3 (1.9)	1 (1.4)	7 (4.6)	0 (0.0)	1 (4.3)	1 (7.1)
Some college	75 (23.9)	8 (17.0)	46 (28.4)	24 (32.9)	43 (28.3)	3 (50.0)	9 (39.1)	4 (28.6)
College graduate	128 (40.8)	21 (44.7)	38 (23.5)	11 (15.1)	16 (10.5)	0 (0.0)	3 (13.0)	0 (0.0)
Postgraduate/professional degree	69 (22.0)	15 (31.9)	46 (28.4)	6 (8.2)	8 (5.3)	2 (33.3)	0 (0.0)	7 (50.0)
Employed for pay (wave 1)	273 (86.9)	40 (85.1)	129 (79.6)	51 (69.9)	99 (65.1)	5 (83.3)	13 (56.5)	9 (64.3)
Self-rated general health								
<i>M</i> (SD) of waves 1–5	3.43 (0.72)	3.65 (0.86)	3.75 (0.78)	3.35 (0.74)	3.24 (0.82)	3.42 (0.58)	3.05 (1.00)	3.70 (0.76)
Wave 1	3.40 (0.88)	3.57 (0.90)	3.75 (0.88)	3.36 (0.90)	3.22 (0.98)	3.83 (0.75)	3.04 (1.17)	3.71 (0.47)
Wave 2	3.47 (0.87)	3.66 (1.06)	3.71 (0.86)	3.24 (0.99)	3.40 (0.97)	3.60 (0.55)	3.50 (1.31)	4.10 (1.10)
Wave 3	3.46 (0.85)	3.73 (0.93)	3.81 (0.82)	3.32 (0.89)	3.35 (0.91)	3.00 (0.63)	3.06 (1.06)	3.73 (0.65)
Wave 4	3.42 (0.83)	3.68 (1.01)	3.79 (0.88)	3.45 (0.86)	3.28 (1.00)	3.40 (1.14)	3.13 (1.26)	3.69 (1.11)
Wave 5	3.42 (0.89)	3.52 (1.09)	3.67 (0.91)	3.27 (0.84)	3.14 (0.94)	3.17 (0.75)	3.00 (1.18)	3.50 (0.67)
Traumas high in betrayal (wave 5)								
<i>M</i> (SD)	0.96 (1.79)	0.98 (1.66)	1.44 (2.17)	1.73 (2.40)	3.26 (3.46)	0.33 (0.52)	2.65 (4.02)	2.14 (2.74)
0	196 (62.4)	28 (59.6)	84 (51.9)	36 (49.3)	47 (30.9)	4 (66.7)	14 (60.9)	6 (42.9)
1	46 (14.6)	5 (10.6)	26 (16.0)	10 (13.7)	17 (11.2)	2 (33.3)	0 (0.0)	0 (0.0)
2	35 (11.1)	9 (19.1)	12 (7.4)	6 (8.2)	13 (8.6)	0 (0.0)	1 (4.3)	3 (21.4)

Table 1 (Continued)

Variable (wave) <i>n</i> (%) or <i>M</i> (SD)	Japanese and Okinawan ( <i>n</i> = 314)	Chinese ( <i>n</i> = 47)	Caucasian ( <i>n</i> = 162)	Filipino ( <i>n</i> = 73)	HPI ( <i>n</i> = 152)	Korean ( <i>n</i> = 6)	Latino ( <i>n</i> = 23)	Other ( <i>n</i> = 14)
3	11 (3.5)	2 (4.3)	18 (11.1)	7 (9.6)	15 (9.9)	0 (0.0)	1 (4.3)	2 (14.3)
4	9 (2.9)	2 (4.3)	8 (4.9)	4 (5.5)	17 (11.2)	0 (0.0)	1 (4.3)	2 (14.3)
5 or more	17 (5.4)	1 (2.1)	14 (8.6)	10 (13.7)	43 (28.3)	0 (0.0)	6 (26.1)	1 (7.1)
Traumas low in betrayal (wave 5)								
<i>M</i> (SD)	1.77 (2.29)	1.08 (2.03)	2.09 (2.54)	2.42 (2.30)	3.88 (3.92)	1.17 (0.75)	2.52 (2.94)	3.64 (3.13)
0	118 (37.6)	24 (51.1)	47 (29.0)	22 (30.1)	32 (21.1)	1 (16.7)	6 (26.1)	1 (7.1)
1	69 (22.0)	13 (27.7)	39 (24.1)	9 (12.3)	20 (13.2)	3 (50.0)	5 (21.7)	1 (7.1)
2	42 (13.4)	5 (10.6)	29 (17.9)	7 (9.6)	17 (11.2)	2 (33.3)	2 (8.7)	4 (28.6)
3	39 (12.4)	2 (4.3)	13 (8.0)	13 (17.8)	17 (11.2)	0 (0.0)	4 (17.4)	2 (14.3)
4	17 (5.4)	0 (0.0)	14 (8.6)	10 (13.7)	16 (10.5)	0 (0.0)	2 (8.7)	3 (21.4)
5 or more	29 (9.2)	3 (6.4)	20 (12.3)	12 (16.4)	50 (32.9)	0 (0.0)	4 (17.4)	3 (21.4)

HPI, Hawaiian/Pacific Islander.

Table 2. Regression analyses predicting self-rated health from high- and low-betrayal trauma, gender, educational attainment, and work status.

Dependent variable	<i>R</i>	<i>F</i> (df)	Semi-partial <i>r</i>				
			Traumas low in betrayal	Traumas high in betrayal	Gender	Educational attainment	Work status
Self-rated health (average)	0.33***	19.69 (5, 785)	0.02	-0.12**	0.08*	0.22***	-0.13**
Self-rated health (current)	0.28***	11.65 (5, 687)	0.04	-0.10**	0.05	0.20***	-0.11**

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

Hawaiian, Latino, and Filipino participants on average across all waves. Chinese participants reported their health as better than Hawaiian and Filipino participants on average across all waves. The results of these analyses are summarized in Table 4.

#### Trauma, symptoms, and social resources

Next, we tested the hypothesis that relations between health status, access to resources, and exposure to trauma would vary by ethnic group. Using HLM, a multilevel model was based on individuals nested within ethnic groups. The outcome variable was average self-rated health. The intercept coefficients for the null models

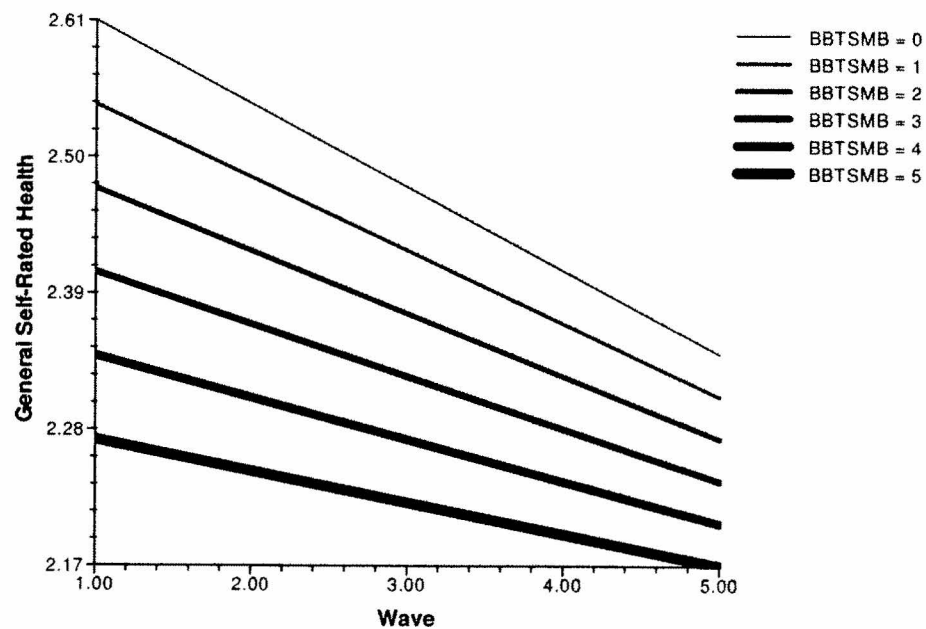


Figure 1. Trajectories of self-rated health over time for different levels of high-betrayal trauma. Note: BBTSMB, Brief betrayal trauma sum of more betrayal, i.e., number of high-betrayal traumas. Values for all other variables in the model are held constant at zero.

Table 3. Means for self-rated health at wave 5 and averaged across all five waves by largest ethnic group.

Ethnic group	<i>n</i>	<i>M</i> (SD)	
		Self-rated health (wave 5)	Self-rated health (average)
Japanese	314	3.42 (0.89)	3.43 (0.72)
Caucasian	161	3.67 (0.91)	3.75 (0.78)
Chinese	47	3.52 (1.09)	3.65 (0.86)
Hawaiian	151	3.14 (0.94)	3.24 (0.82)
Latino	23	3.00 (1.18)	3.05 (1.01)
Filipino	73	3.27 (0.84)	3.35 (0.74)

(a model with no predictors to assess how much variability exists between groups) indicated significant ethnic group variability for self-rated health ( $\chi^2 = 45.27$ ,  $df = 5$ ,  $p < 0.001$ ), but after adding trauma exposure, education, and work status to the model, there were no significant ethnic group differences in symptoms ( $\chi^2 = 8.94$ ,  $df = 5$ ,  $ns$ ). This indicates that these factors account for the observed variability between groups in this model.

Examination of random-effects coefficients in this model (i.e., indicators of between-group variation, in this case ethnic group variation, in the strength of association between predictors and outcomes) indicated that the relations between traumas and self-rated health differed for different ethnic groups in this sample. Marginally significant ethnic group differences in the relations between traumas lower in betrayal and self-rated health were observed ( $\chi^2 = 10.57$ ,  $df = 5$ ,  $p < 0.10$ ), and significant ethnic group variability in the relations between traumas high in betrayal and self-rated health was detected ( $\chi^2 = 15.78$ ,  $df = 5$ ,  $p < 0.01$ ).

Figure 2 shows the regression lines for each group comparing higher status with lower status groups, in which the relation between exposure to trauma high in betrayal and self-rated health was plotted, holding other predictors constant. Examining the regression equations for each ethnic group separately, it appears that controlling for educational attainment, work status, and exposure to trauma lower in betrayal, high-betrayal trauma is a significant predictor of poorer health for two of the three lower status groups, Filipino Americans and Native Hawaiians, but not for any of the other ethnic groups.

Table 4. ANOVAs testing mean differences among ethnic groups on self-reported health.

Dependent variable	<i>df</i>	<i>F</i>	Largest group differences (Tukey's posthoc tests)	
Self-rated health (wave 5)	5, 666	5.88***	Caucasian >	Hawaiian*** Latino*
Self-rated health (average)	5, 765	9.19***	Caucasian >	Filipino* Japanese*** Hawaiian*** Latino*** Filipino**

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

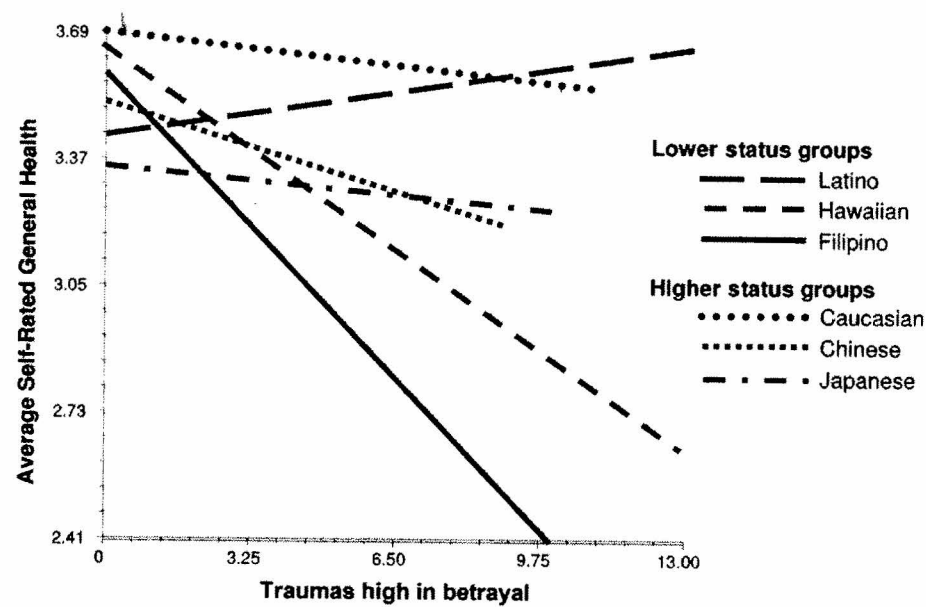


Figure 2. Associations (regression lines) between number of high-betrayal traumas and average self-rated health for the six main ethnic groups categorized as low- or high-status.

### Discussion

Consistent with predictions, exposure to traumas was predictive of poorer self-rated health, and traumas high in betrayal were more predictive of self-rated health than were traumas low in betrayal. These results are consistent with prior research, and point to the importance of including a variety of types of trauma exposure in models predicting health status.

As predicted, when controlling for trauma exposure and gender, lower educational attainment predicted worse average self-rated health. Similarly, being employed for pay predicted better self-rated health. Importantly, educational attainment and employment status are each uniquely predictive of health ratings, above and beyond the predictive power of gender and trauma exposure. These results indicate that access to socioeconomic resources is significantly associated with better self-rated health. This is consistent with previous research demonstrating that lack of access to social resources is a significant predictor of poorer health (Gorman and Read 2006, Adler and Rehkopf 2008).

When controlling for trauma exposure, work status, and educational attainment, men had poorer self-rated health on average than did women. This finding, while unexpected, is consistent with some prior research in which women reported poorer health on average, but when men and women had similar access to socioeconomic resources, men reported worse health than women (Gorman and Read 2006). This is supportive of the theory that at least some gender disparities in health status are accounted for by the differential socioeconomic status of men and women.

Health trajectories were measured by assessing changes in self-rated health over the course of the five waves of data collection in this study. In general, participants in this study saw themselves as becoming less healthy over time. This finding is not

entirely unexpected, as health tends to decline over time, especially past middle age. The trajectory analysis showed that greater exposure to traumas high in betrayal predicted both worse average levels of self-rated health and a slower decline in health status over time, as compared with no exposure or less exposure. At first glance, this appears to suggest that high-betrayal trauma exposure is protective against declining health; however closer examination contradicts this claim. Participants with the least trauma exposure still reported better health at wave 5 than participants with the most trauma exposure report at wave 1. Thus even considering their slower rate of health decline, participants with more trauma exposure saw their health as poorer overall than those with less exposure. The apparent slower rate of decline may be an artifact of disparate initial levels – that is, if a participant has poor health to begin with, there is less room to get worse, whereas when beginning in relatively good health, there may be more room for aging to impact health. Overall, exposure to traumas high in betrayal has a negative impact on self-rated general health.

With regard to ethnic differences in health, in partial support of our predictions, Caucasian participants reported better average self-rated health than Native Hawaiian, Latino, and Filipino participants, and Chinese Americans also reported better health than Native Hawaiian and Latino participants. However, contrary to expectations, Caucasian participants reported better health than Japanese Americans (another high-status group). Prior research has found that Asian Americans report better self-rated health than Caucasians, however these studies frequently do not distinguish among different groups within the large category 'Asian American,' (McGee *et al.* 1999). Although the present finding is contrary to expectations, it is unclear whether it is inconsistent with previous research. Japanese Americans did not report significantly better health than lower status groups. Although health differences between Japanese Americans and lower status groups (Native Hawaiians, Filipino Americans, and Latinos) did not reach statistical significance, mean differences were in the expected direction.

Trauma exposure was more strongly associated with poorer health among Filipino Americans and Native Hawaiians. Controlling for educational attainment and employment status, trauma exposure was not a significant predictor of self-rated health for Caucasian, Japanese American, Chinese American, and Latino participants, but was significantly predictive of poorer health ratings for Native Hawaiians and Filipino Americans. It appears that Native Hawaiian and Filipino Americans may be at increased risk of poor self-rated health following trauma exposure, particularly for traumas high in betrayal.

### Limitations and future directions

The current study has several limitations that support cautious interpretation of some results. First, unequal sample sizes for different ethnic groups at times made interpretation of results difficult. It is unclear, for example, whether findings for Latinos in this study were as reliable as findings for other groups with more participants. Ethnic group and social stratification in Hawai'i differs from that of the mainland USA, and thus findings about specific ethnic groups in this study may not generalize to the same groups in other populations. Similarly, a specific age cohort was used in the current study, and thus results may not generalize to other age groups. This study relied on self-report measures, and in such cases biased

responding cannot be ruled out. Finally, the design of the current study was correlational in nature. Thus it is not possible to determine causality in the associations among trauma exposure, socioeconomic resources, and health status. Indeed, it is possible that all these pathways are bidirectional. While causality cannot be determined, this does not change the general implications of this research – trauma, social resources, and health status all relate, and to fully understand one of these topics it is important to address the others.

The results of this study suggest several directions for future research. The inclusion of additional cultural information in future studies may be useful in further understanding the relations observed here. Ethnic group membership provides very limited information about the complex identity and social relations of participants. Recent research on social exclusion has found that across ethnic minority groups, greater perceived discrimination relates to poorer self-rated health (Brandolo *et al.* 2011), and thus discrimination experiences may be an important factor to consider in future research. Similarly, collecting more detailed information about access to social resources would strengthen claims regarding the role of resources in predicting health status. While educational attainment and employment status were predictive, so might be other factors such as actual income, other tangible resources, and availability of social support. In addition, personal factors such as coping styles and health behaviors might also add to prediction of health status. It would be valuable to examine the relative contribution of each of these variables in determining outcomes, and the degree to which they are interrelated.

#### Key messages

- Trauma exposure was more frequent in less advantaged ethnic groups in Hawai'i with access to fewer socioeconomic resources (Native Hawaiians, Filipino, and Latinos).
- The association between traumas and poorer self-reported health was stronger for Native Hawaiians and Filipinos, suggesting they are at particular risk.
- A brief assessment of trauma exposure and demographic information may help to identify at-risk patients.

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#### Note

1. We use the term 'Native Americans' to refer to peoples indigenous to North America, not inclusive of Native Hawaiians. We recognize and respect that the term 'American Indian' is preferred by some groups.

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