

# Systematic Review of Culturally-Based Breast Cancer Health Studies in Hawai'i

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## Abstract

*Breast cancer disproportionately impacts Native Hawaiian and Pacific Islander communities in Hawai'i, as exemplified by high breast cancer prevalence and mortality rates. Breast cancer disparities are linked to socio-cultural determinants of health, signifying the importance of culturally-based interventions. This paper systematically reviewed breast cancer studies conducted in Hawai'i. The literature search yielded 813 published studies, with a final total of 13 peer-reviewed studies that met this paper's inclusion criteria. All but 1 study incorporated cultural components. By evaluating key intervention components and assessing the quality of each study, the research team aimed to analyze the importance of cultural values in health interventions. Family and spirituality in coping with a cancer diagnosis were key themes in patients' lived experiences. Other culturally-based components in these studies included community-engaged research and cultural training for health professionals. The collective findings suggest that breast cancer health interventions that incorporate cultural strengths, values, and worldviews may play a central role in reducing the overall breast cancer burden among these communities. The present review advocates for future research to take a more culturally-based strategy in addressing breast cancer health disparities among Native Hawaiian and Pacific Islanders in Hawai'i.*

## Keywords

*awareness, breast cancer, early detection, Hawai'i, health promotion, intervention, mammogram, prevention, program, public health*

## Abbreviations

CBPR = Community-based participatory research  
CINAHL = Cumulative Index to Nursing and Allied Health Literature  
NHPI = Native Hawaiian and Pacific Islander  
PRISMA = Preferred Reporting Items for Systematic Reviews  
and Meta-Analyses  
QAT = Quality assessment tool

## Introduction

Breast cancer is the second leading cause of cancer mortality of women in the US, following lung cancer.<sup>1</sup> In 2021, 2811 550 new cases of breast cancer were diagnosed and approximately 43 600 women died due to breast cancer.<sup>2</sup> In Hawai'i, approximately 170 deaths were attributed to female breast cancer in 2021.<sup>2</sup> Additionally, incidence rates of breast cancer in Hawai'i were 138.9 cases per 100 000 women, 13% greater than for US women in 2013-2017.<sup>3</sup> Breast cancer mortality rates are particularly high for Native Hawaiian and Pacific Islander (NHPI) women. In 2015, NHPIs had an alarming breast cancer mortality rate of 72.9 deaths per 100 000 women, exceeding

the state's breast cancer mortality average of 18.7 deaths per 100 000 women, a 290% difference.<sup>4</sup> Additionally, NHPI women have lower mammography rates, greater diagnoses of late-stage breast cancer, and lower 5-year survival rates for breast cancer.<sup>5</sup> There exists an urgent need to explore clinical practices that aim to reduce breast cancer health disparities experienced by NHPI women in Hawai'i.

Cancer and health disparities experienced by NHPI persons may be attributed to socio-cultural determinants of health, which include lack of medical insurance and difficulty accessing cancer screenings (especially in culturally-safe health care settings<sup>6</sup>)—both of which are pivotal in detecting cancer in early stages and maximizing survivorship.<sup>7</sup> Previous research identifies health disparities as consequences of historical oppression and losses of culture and language due to colonization, resulting in multigenerational trauma.<sup>8</sup> These systematic determinants continue to affect economic and psychosocial landscapes for contemporary NHPI persons.<sup>7,8</sup> In the context of breast cancer, limited access to treatment due to lack of medical insurance, insufficient culturally-based care related to screening and other cancer preventative behaviors and treatment disproportionately affect NHPI persons.<sup>8,9</sup> The cumulative impact of historical trauma may contribute to health disparities including late-stage cancer diagnoses and increased mortality at younger ages for NHPI persons.<sup>9</sup>

Breast cancer interventions for NHPI persons require a deep understanding of cultural values and community engagement.<sup>9,10-13</sup> Western conceptualizations of health are individualistic and fixate on physical symptoms of illness, rather than spiritual and relational elements.<sup>14-16</sup> In contrast, NHPI culture emphasizes the importance of holism and approaches health as being relational.<sup>17</sup> Burgeoning literature highlights the need for culturally-based approaches to addressing health disparities.<sup>13,18</sup> Culturally-based approaches to health may uplift community strengths, potentially rectifying medical mistrust among NHPI persons.

This paper's purpose was to systematically review existing breast cancer interventions in Hawai'i to better understand characteristics and intervention components that contribute to favorable health outcomes. Studies were examined to determine whether cultural components and community-engaged approaches enhanced health outcomes. Qualitative studies were also reviewed to identify common themes relating to breast cancer research for NHPI persons.

## Methods

This review includes articles published through June 2022 in PubMed MEDLINE, PsycINFO, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases. The Population; Intervention; Comparison; Outcome (PICO) framework was applied to develop the primary search terms: “Hawaii OR Hawai‘i” AND “Prevention OR intervention OR program OR awareness OR education OR screening OR early detection OR health promotion” AND “Breast cancer OR Mammogram OR Mammography.” Final search terms were reviewed by the last author and another expert in the field of cancer research. Unduplicated citations were imported into Rayyan<sup>19</sup> for first-line screening based on title and abstract. Second-line screening was conducted with a full-text review. Then, 2 authors applied the inclusion and exclusion criteria when reviewing the studies. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)<sup>20</sup> guidelines were used for evaluation.

### Inclusion and Exclusion Criteria

Included studies needed to be: (1) a prevention, intervention, or management program, or a qualitative study that would inform future interventions; (2) breast cancer specific; (3) conducted in Hawai‘i; (4) inclusive of adults (18 years or older); and (5) a study that reported outcomes and discussed participants’ lived experiences related to prevention, intervention, or management programs, and/or provided recommendations for future programming. Excluded studies fell under 1 or more of the following characteristics: (1) studies conducted outside of Hawai‘i; (2) literature reviews; (3) studies that did not focus on breast cancer; (4) epidemiological and cross-sectional quantitative studies; (5) interventions that did not include a program (ie, prescription treatment, medicines, or dietary modification) or qualitative outcomes to inform future interventions; and (6) studies that did not report outcomes.

### Assessment of Quality, Community-Engagement, Cultural Integration, and the Socio-Ecological Model

The quality assessment tool (QAT) was used to appraise the quality of quantitative studies.<sup>21</sup> There are 8 components of the QAT: (1) Selection Bias; (2) Study Design; (3) Confounders; (4) Blinding; (5) Data Collection Methods; (6) Withdrawals and Drop-outs; (7) Intervention Integrity; and (8) Analysis Appropriate to Question. Global ratings range from “Strong,” “Moderate,” to “Weak.” Studies with a “Strong” global rating had no “Weak” ratings in any of the 8 components. Studies labeled “Moderate” had 1 “Weak” rating while studies with an overall “Weak” global rating consisted of 2 or more “Weak” ratings in any of the 8 components. To ensure consistency of the assessment, individual definitions were created for this review and applied to intervention-based studies with quantitative outcomes. The QAT was modified to include community engagement and culture in the research process:

(Q3a) “Did researchers take a community-based participatory research (CBPR) approach?” and (Q3b) “Was the importance of culture considered?”) (Appendix Tables A and B).

Authors assessed for community engagement in breast cancer studies. This assessment included the following classifications: community-engaged, CBPR, or community-driven. For this criterion, only 1 classification was assigned, with the greatest level of community engagement being assigned. If a study reported taking a CBPR approach and was community-driven, the authors documented the study as a community-driven intervention. For this review, authors defined community-engaged studies as engagement of community through inquiry of cultural values and through partnerships with community organizations (ie, academic researchers may guide the research process and consult community patterns throughout the process). CBPR is a form of community-engaged research that engages community leaders and stakeholders at all levels of the research process (ie, community and academic researchers engaging in the entire research process together through equitable means).<sup>22</sup> The CBPR approach to research increases collaboration and equity in the research process and acknowledges the strengths of community and academic research partners. Authors identified CBPR studies based on whether the CBPR approach was explicitly stated in the article. Community-driven studies engage the community at each step of the research process; however, the research process itself is led by the community and grounded in community values (ie, a community leader or organization led the entire research process).

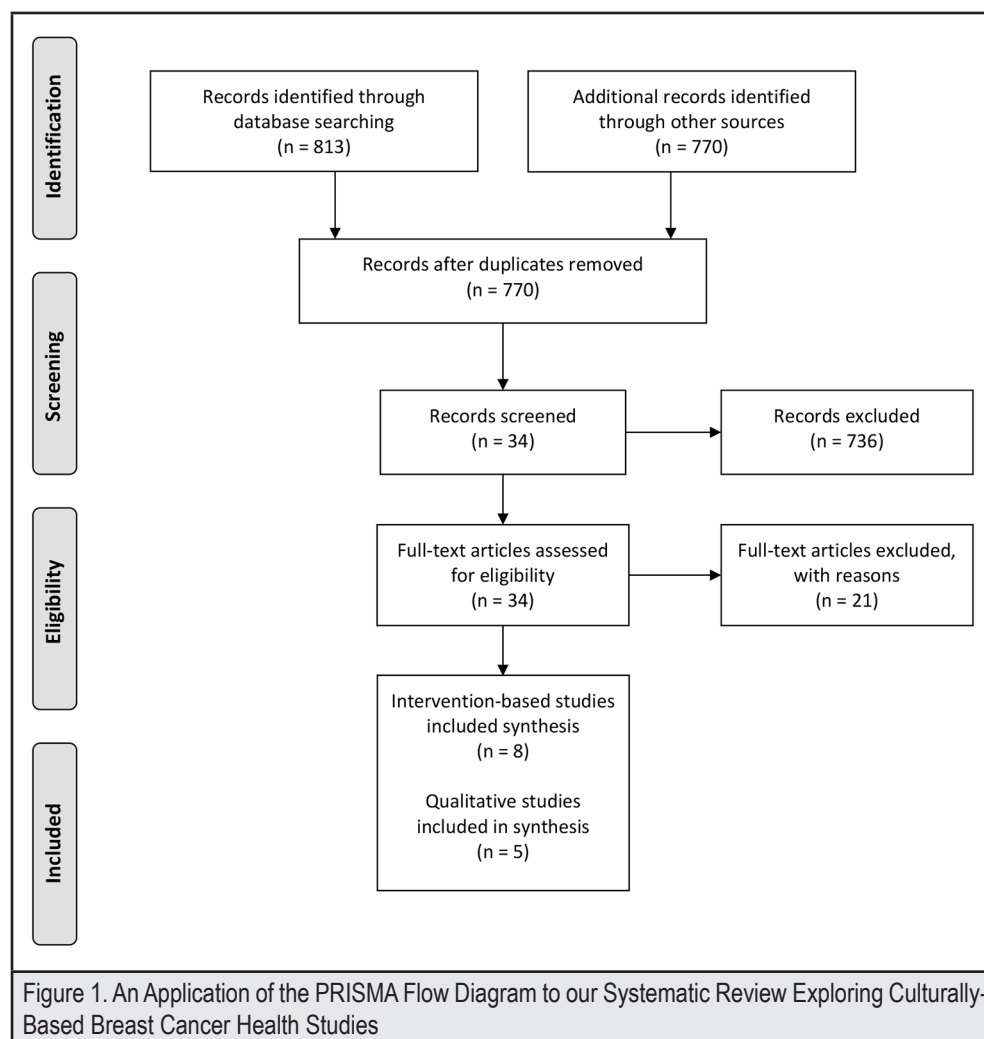
The authors evaluated the integration of cultural components using the cultural continuum.<sup>23</sup> The continuum includes non-adapted programs, surface-structure cultural adaptations, deep-structure cultural adaptations, and culturally-grounded programs. Non-adapted programs consist of generic or universal prevention programs; surface-structure cultural adaptation programs include universal prevention programs with surface-level differences such as changes in names and references to increase receptivity of content; deep-structure cultural adaptation programs are often based on empirically-supported programs, with cultural components and values that reflect participants of the program; and culturally-grounded programs are built from the ground-up based on cultural and social context that reflect participants receiving the program. For the purpose of this review, authors classified a research study as non-adapted, culturally-adapted (including surface-structure cultural adaptations and deep-structure cultural adaptations), or culturally-grounded. Similar to the community engagement criterion, only 1 classification was assigned, with the greatest level of cultural integration. For instance, if a study reported on an intervention that incorporated non-adapted and culturally-adapted components, the authors documented the study as a culturally-adapted intervention. In alignment with indigenous ways of knowing, which honors talk story as being grounded in culture, qualitative studies that used this approach were considered a culturally-grounded study.<sup>10,12,14,15,24</sup>

Studies were also evaluated for their ability to address behaviors on the individual, interpersonal, institutional/organizational, community, and public policy levels based on the socio-ecological model (SEM), a well-known framework in public health that addresses health behaviors at multiple levels including the interpersonal (eg, family), organizational (eg, schools), community (eg, neighborhood), and public policy (eg, local laws) levels.<sup>25</sup> The individual level was marked if a study reported on an individual's knowledge or behavior related to breast cancer health. The interpersonal level was marked if the intervention included social networks (eg, family). The institutional/organizational level was marked if an institution (eg, hospital) played a role in the intervention. The community level was marked if the community played any role in the intervention (eg, church), and the public policy level was marked if the intervention informed larger public health policies. For this criterion, authors documented levels of the SEM included in the results of the intervention-based or qualitative studies.

To ensure consistency of all assessments (ie, QAT, community-engagement, cultural integration, and the SEM), authors assessed 1 of the 13 included studies together, which guided the rest of the data extraction process completed by all authors. Any discrepancies were discussed as a team until consensus was achieved. For instance, if 2 of the 3 authors were in agreement, a discussion took place to identify a middle ground or determine the most appropriate scoring based on the collective group's decision.

## Results

The literature search yielded 813 studies: PubMed ( $n = 730$ ), PsycINFO ( $n = 32$ ), and CINAHL ( $n = 51$ ). A total of 31 studies remained after screening based on titles and abstract. The full-text was reviewed and 12 studies were examined for this review (**Figure 1**).



## Overview of Interventions

The majority of intervention-based studies focused on NHPI persons, particularly Native Hawaiian,<sup>10,12-15,24,26</sup> Pacific Islander,<sup>27</sup> Micronesian,<sup>28</sup> and Filipino<sup>29</sup> communities (**Table 1**). The majority of studies ( $n = 11$ ) focused on women,<sup>10,12-15,24,26-28,30,31</sup> while all qualitative studies focused on Native Hawaiian women.<sup>10,12,14,15,24</sup> The mean age of participants ranged from 40-75 years.<sup>10-15,24,26-31</sup> Several studies were qualitative research designs ( $n = 5$ ).<sup>10,12,14,15,24</sup> Of the 8 intervention-based studies, 4 focused on cancer screening and reported favorable outcomes (eg, increase in mammogram rates).<sup>13,26,28,29</sup> The majority of qualitative studies for this review emphasized social support,<sup>10,13-15,24,26,31</sup> spirituality,<sup>10,12-15,24,30</sup> and physician-patient interactions<sup>10,11,24,29,30</sup> in breast health interventions for Native Hawaiians and other ethnic groups disproportionately affected by cancer (**Table 2**).

## Quality Assessment

Based on the QAT, final global ratings of quantitative studies were either Strong ( $n = 2$ ),<sup>13,26</sup> Moderate ( $n = 1$ ),<sup>31</sup> or Weak ( $n = 5$ ).<sup>11,27,28-30</sup> Scores for the QAT included: (1) Selection Bias: Moderate ( $n = 7$ ) to Strong ( $n = 1$ ); (2) Study Design: Moderate ( $n = 6$ ) to Strong ( $n = 2$ ); (3) Confounders: Strong ( $n = 8$ ); (4) Blinding: Weak ( $n = 6$ ) to Moderate ( $n = 2$ ); (5) Data Collection Methods: Strong ( $n = 8$ ); and (6) Withdrawals and Dropouts:

Weak ( $n = 5$ ) to Strong ( $n = 3$ ). Low scores for Blinding and Withdrawals and Dropouts were due to missing information about participants' awareness of the research questions. Studies typically took place at a community, health care, or clinical setting. There was an overall high level of agreement for QAT ratings among the authors.

## Community Engagement

Of the 13 studies, 12 engaged communities. The remaining study did not report engagement from communities in the research process (**Table 3**).<sup>31</sup> Two studies were community-engaged<sup>26,29</sup> and 2 utilized CBPR principles.<sup>13,28</sup> The majority of studies were community-driven ( $n = 8$ ).<sup>10-12,14,15,24,27,30</sup> Aitaoto et al (2012) increased screening among Micronesian women with Micronesian organizations.<sup>28</sup> Ho et al (2010) engaged the community through partnerships with Filipino organizations to promote breast health awareness.<sup>29</sup> Hughes & Higuchi (2004) addressed screening barriers through community informants and the Native Hawaiian Breast Cancer Sub-Committee (NHBCSC).<sup>11</sup> Ka'opua et al (2011) described results from *Ka Lei Mana'olana* (KLM), a culturally-based educational intervention that employed CBPR principles.<sup>13</sup> Ka'opua (2003) involved key stakeholders in a *ho'oponopono* (traditional Native Hawaiian healing) training for 11 community practitioners.<sup>30</sup> Mokuau et al (2012) established relationships with community stakeholders to recruit

Reference	Observed Variables	Design	Setting	Total Sample	Participant Characteristics	Intervention Duration	QAT Score
Aitaoto et al, 2012	Mammography intent	Cohort	Community	567	Micronesian women (18 to 75 years)	18-months	3
Ho et al, 2010	Mammography intent, physician-patient interactions	Interrupted time series	Community	Not specified	Filipino community 40 years and older)	4-years	3
Hughes & Higuchi, 2004	Health care professionals, physician-patient interactions	Cohort	Clinical	300+	Various health care professionals (age not specified)	3-years	3
Ka'opua, 2003	Health practitioners, physician-patient interactions, spirituality	Cohort	Clinical	10	Women practitioners (average age 50 years)	16-hour training delivered in 2 sessions	3
Ka'opua et al, 2011	Spirituality, family support, mammography intent	RCT	Community	198	Native Hawaiian women (average age 60 years)	12-months	1
Loo et al, 2019	Physical activity	Cohort	Group	11	Asian/Pacific Islander women (average age 63 years)	6-months	3
Mokuau et al, 2012	Family support, self-efficacy, mammography intent	RCT	Home	29	Native Hawaiian women with breast cancer-related experiences (average age 50 years) Native Hawaiian family members (average age 40 years)	4-months	1
Teranishi-Hashimoto et al, 2021	Social support, Physical activity	Cohort	Group	25	Women (average age 55 years)	15-weeks	2

QAT = quality assessment tool, RCT = randomized clinical trial

participants.<sup>26</sup> All qualitative studies were community-driven and guided by indigenous storytelling.<sup>10,12,14,15,24</sup> Storytelling is a method that promotes healing through a resilience process where participants may share more about their experiences in a manner reminiscent of traditional Pacific and Hawaiian oral storytelling. For instance, Ka'opua & Anngela (2005) indicated that their focus group discussions on screening experiences were enhanced through culturally-familiar talk story approaches.<sup>12</sup>

Similarly, interviews conducted by Ka'opua et al (2008) were also enhanced through the talk story approach. This approach encouraged Native Hawaiian participants to share their cancer-related experiences in a culturally-familiar manner, providing deeper insight into cultural details and the experience of breast cancer survivorship.<sup>15</sup>

Reference	Observed Variables	Qualitative Design	Setting	Total Sample	Participant Characteristics	Intervention Duration
Eide, 2006	Family support, spirituality, physician-patient interactions	phenomenological study	Interview (talk story)	11	Native Hawaiian women (44 to 82 years)	Not reported
Ka'opua, 2008	Spirituality, family support	semi-structured interview design	Semi-structured interview (talk story)	60	Native Hawaiian women (average age 65 years)	Not reported
Ka'opua & Anngela, 2005	Spirituality	semi-structured interview design	Semi-structured interview (talk story)	50	Native Hawaiian women (average age 69.88 years)	Not reported
Ka'opua et al, 2008	Spirituality, spiritually-based resources, family support	semi-structured interview design	Semi-structured interview (talk story)	7	Native Hawaiian women and men (average age 59 years)	5-years
Mokuau & Braun, 2007	Family support, spirituality, physician-patient interactions	formative research design	Interview	25	Native Hawaiian women breast cancer survivors (average age 68 years) Native Hawaiian family members (average age 46 years)	4-months

Socio-Ecological Model								
Reference	QAT	Community Engagement	Cultural Continuum	Individual	Inter-personal	Organizational	Community	Public Policy
Intervention Based Studies								
Aitaoto et al, 2012	3	CBPR	Culturally adapted	X	X	X	X	
Ho et al, 2010	3	Community engaged	Culturally adapted	X	X	X	X	X
Hughes & Higuchi, 2004	3	Community driven	Culturally grounded	X	X	X	X	X
Ka'opua, 2003	3	Community driven	Culturally grounded	X	X	X	X	X
Ka'opua et al, 2011	1	CBPR	Culturally adapted	X			X	
Loo et al, 2019	3	Community driven	Culturally grounded	X	X		X	
Mokuau et al, 2012	1	Community engaged	Culturally adapted	X	X		X	
Teranishi-Hashimoto et al, 2021	2	No engagement	Non-adapted program	X	X	X	X	
Qualitative Studies								
Eide, 2006	N/A	Community driven	Culturally grounded	X	X	X	X	
Ka'opua & Anngela, 2005	N/A	Community driven	Culturally grounded	X	X	X	X	X
Ka'opua et al, 2008	N/A	Community driven	Culturally grounded	X	X	X	X	X
Ka'opua, 2008	N/A	Community driven	Culturally grounded	X	X	X	X	X
Mokuau & Braun, 2007	N/A	Community driven	Culturally grounded	X	X	X	X	X

## Cultural Continuum Assessment

Studies typically employed culturally-based approaches to increase screening. Of the 13 studies, 12 incorporated culture, with varying levels of cultural integration (Table 3). The remaining study did not incorporate culture nor took a community-engaged research approach (as mentioned above) but still yielded favorable health outcomes, specifically related to physical quality of life.<sup>31</sup> Four intervention-based studies culturally-adapted their interventions,<sup>13,26,28,29</sup> while 3 intervention-based studies<sup>11,27,30</sup> and 5 of the qualitative studies took a culturally-grounded approach.<sup>10,12,14,15,24</sup> Common cultural values cited as an important theme or intentionally included in intervention-based studies included family support and spirituality (eg, prayer).<sup>10,12,14,15,24</sup> Cultural practices and traditional healing were included in the intervention process for 2 studies.<sup>27,30</sup> Ka'opua (2003) conducted a feasibility study integrating ho'oponopono,<sup>32</sup> a process of healing physical ailments by identifying spiritual/interpersonal conflicts.<sup>30</sup> Loo et al (2019) demonstrated the feasibility of a Hula Dance intervention to increase physical activity among breast cancer survivors.<sup>27</sup> Hughes and Higuchi (2004) reported on the *Ka Lōkahi Wāhine* training for health professionals which featured a culturally-inclusive training video and manual on Native Hawaiian values.<sup>11</sup>

## SEM Outcomes

Based on the SEM, all studies were marked on the individual and community levels.<sup>10-15,24,26-31</sup> All but one study was marked as interpersonal.<sup>10-12,14,15,24,26-31</sup> Ten out of the 13 studies were marked on the institutional/organizational level<sup>10-12,14,15,24,28-31</sup> and only 7 studies were marked as public policy (Table 3).<sup>11,12,14,15,24,29,30</sup>

## Specific Outcomes for Intervention-Based Studies

Aitaoto et al (2012) increased screening compliance by 70% using educational materials incorporating Micronesian values.<sup>28</sup> Ho et al (2010) increased mammography rates by 9.3% through partnerships with the Filipino community.<sup>29</sup> Hughes & Higuchi (2004) indicated increased cultural knowledge among physicians, including spirituality, which is often underrepresented in health care.<sup>6,11,15</sup> Ka'opua (2003) increased adherence of *ho'oponopono* ( $P < .001$ ) among health practitioners.<sup>30</sup> Ka'opua et al (2011) increased breast cancer awareness ( $\chi^2 = 6.82, P < .01$ ) and mammogram intent ( $\chi^2 = 6.52, P < .05$ ).<sup>13</sup> Loo et al (2019) increased weekly moderate exercise in 73% of participants.<sup>27</sup> Mokuau et al (2012) demonstrated mastery of learning objectives and satisfaction with culturally-tailored educational materials among participants and their families (>86% in all categories) (Table 4).<sup>26</sup>

Table 4. Specific Outcomes for Intervention-Based Studies and Themes for Qualitative Studies	
Reference	Specific Outcomes
<b>Intervention-Based Studies</b>	
Aitaoto et al, 2012	Increased health awareness and health prevention, 70% increase in screening compliance.
Ho et al, 2010	Mammography screening rates significantly increased 9.3% from 2002 to 2008.
Hughes & Higuchi, 2004	Increased cultural knowledge and competency among health professionals, No specific statistics listed.
Ka'opua, 2003	Increased cultural competence and adherence of ho'oponopono, an Indigenous Hawaiian healing tradition, ( $P < .001$ ) among health practitioners.
Ka'opua et al, 2011	Increased awareness ( $\chi^2 = 6.82, P < .01$ ) and indicated greater intent to seek yearly mammograms ( $\chi^2 = 6.52, P < .05$ ).
Loo et al, 2019	Increased weekly moderate exercise in 73% of women enrolled in the intervention trial. Increased ( $P < .001$ ) in vigor during the intervention and post-intervention.
Mokuau et al, 2012	Mastery of learning objectives of the intervention, satisfaction with informational sessions and tailored educational materials among all participants and their families (>86% in all categories).
Teranishi-Hashimoto et al, 2021	Total QOL was improved ( $P < .05$ ), Body fat percentage and waist and hip circumferences were significantly reduced after the intervention ( $P < .05$ ).
<b>Qualitative Studies</b>	
Eide, 2006	Spirituality, social support, and appreciation of one's Hawaiian identity and cultural values (including restoring pono) were emphasized.
Ka'opua, 2008	The collective experience of a cancer diagnosis, social support, spirituality including holistic well-being, promotion of breast cancer awareness and hopeful messages from other Hawaiian breast cancer survivors, and implementation of Hawaiian cultural values and practices in breast cancer programs were emphasized.
Ka'opua & Anngela, 2005	Spirituality, Hopeful messages by church leaders and other Hawaiian breast cancer survivors), Collectivistic-oriented values were emphasized.
Ka'opua et al, 2008	Spirituality, social support, collectivistic values, and trusted community members and spiritual leaders as messengers for promoting screening were emphasized.
Mokuau & Braun, 2007	Sources of support (including family support, individual responsibility for health, and responsibility to the collective family), spirituality, types of support (including informational, tangible, and emotional support, and recommendations for health care to include cultural values were emphasized.

## Themes for Qualitative Studies

All qualitative studies took a culturally-grounded approach which allowed for an exploration of themes related to breast cancer processes and outcomes, but also health as a whole. Common themes identified in qualitative studies included spirituality, social support, physician-patient interactions, and cultural values to facilitate screening. All qualitative studies emphasized the importance of spirituality (eg, prayer) and social support (eg, community).<sup>10,12,14,15,24</sup> Church-settings and church leaders were cited as potential messengers to promote screening.<sup>12,14</sup> All qualitative studies emphasized Native Hawaiian cultural values, particularly relating to family.<sup>10,12,14,15,24</sup> Native Hawaiian patients in 1 qualitative study recommended that health care strengthen family support through patient-family-physician counseling (**Table 4**).<sup>24</sup>

## Discussion

This paper systematically reviewed 13 breast cancer studies conducted in Hawai‘i, including 8 intervention-based studies<sup>11,13,26-31</sup> and 5 qualitative studies.<sup>10,12,14,15,24</sup> This review suggests that qualitative approaches, particularly talk story, encourage participants to share their cancer-related experiences in a culturally-based manner and hold relevant cultural detail for future research and practice in receptivity of health interventions.<sup>10,12,14,15</sup> The studies included in this review may be used as templates for culturally-based health interventions for NHPI persons and will likely contribute to favorable outcomes (eg, higher mammography rates).

Given the importance of culturally-based interventions,<sup>33</sup> it is not surprising that 12 of the 13 studies were assessed as either “Culturally-adapted” ( $n = 4$ )<sup>13,26,28,29</sup> or “Culturally-grounded” ( $n = 8$ ).<sup>10,12,14,15,24,27,30</sup> Culturally-grounded interventions that increase cultural knowledge and competency of cultural values among physicians, such as spirituality for NHPI, may affect the receptivity of health interventions among NHPI persons and thus indicates the importance of spirituality in relation to health outcomes.<sup>11,30</sup> Furthermore, using culturally-grounded interventions has also been associated with favorable physical health outcomes, such as increase in physical activity, among NHPI persons.<sup>27</sup> Culturally-adapted programs demonstrated favorable outcomes such as increased health awareness and mammography screening rates.<sup>13,26,28,29</sup> These findings implicate the importance of integrating cultural values in health care to enhance holistic quality of life (physical, mental, spiritual, and emotional) for Hawai‘i’s diverse communities and indicate a pressing need to better understand holistic perspectives of health for NHPI persons in health care.

Community engagement also ensures the research process is grounded in culture, as demonstrated by the interventions included in this study. Particularly, studies using a CBPR approach or a community-driven approach increased favorable behavioral health outcomes (eg, increased mammography rates), health awareness and prevention, and cultural competency. Existing

literature also identifies the importance of engaging the family collective in health interventions for NHPI communities.<sup>16,34</sup> Particularly, the qualitative studies in this paper that explored familial support in cancer care among Native Hawaiian families indicated that the burden of a cancer diagnosis is experienced as a collective and that members have a shared commitment to care for one another.<sup>10,13-15,24,26</sup> Therefore, cancer screening may be framed as a commitment to family to incentivize screening participation. Similarly, other literature emphasizes inclusion of spirituality, spiritual leaders, and church settings which may increase screening participation among NHPI persons.<sup>8,34</sup> Although 1 study did not engage the community, this study took a multi-level approach by engaging groups of people in exercise therapy, which may organically create a sense of community among participants.<sup>31</sup> It may also be true that structuring meeting times to engage in the exercise-based intervention allowed participants to create a sense of community among participants thereby increasing quality of life and the behaviors associated with the aims of the intervention. The aforementioned study may support a multi-level approach to influence an individual’s health without engagement from the community; however, a study that takes a multi-level approach and also a cultural and community-based approach may have better overall health outcomes. This hypothesis is validated through other multi-level studies involving NHPI persons. For example, Ho et al (2010) and Hughes & Higuchi (2004) incorporated all levels and saw that participants also had increased knowledge and cultural competency.<sup>11,29</sup>

Like other systematic reviews, this paper is limited to selected search terms and databases as well as the interpretations of the authors. Similarly, this review may be limited by 13 studies with 5 out of 8 of the quantitative studies rated as “weak.” The results of the 13 studies included in this review may not be indicative of the NHPI community as a whole. This review does not consider grey literature, which has not been formally published in a peer-reviewed journal but may still contain pertinent information.<sup>35</sup> Nonetheless, the review’s strengths include the evaluation of breast cancer programs specific to Hawai‘i with an exploration of programs geared towards diverse communities.

## Conclusion

Despite increased efforts to address cancer health disparities among NHPI persons in Hawai‘i, cancer continues to have a marked impact on this population’s health. This review reiterates the importance of integrating cultural values in addressing cancer health disparities. In particular, family, community, and spiritual-based approaches take a multi-level and holistic approach to health, enhancing cultural sensitivity. A community-based and culturally-safe approach to breast cancer interventions may enhance the cultural relevance of breast cancer interventions and quality of health care for Hawaii’s diverse communities. To eliminate health disparities for NHPI communities related to breast cancer, it is pivotal to take a multi-level, community-based, and culturally-based approach.

## Conflict of Interest

None of the authors identify a conflict of interest.

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Appendix Table A. Modified Quality Assessment Tool Definitions to Include Community Engagement and Culture in the Research Process					
Component	Question	“N/A” and “No” will be scored the same.			
A) SELECTION BIAS	(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?	Mark “Very likely” if randomized.	Mark “Somewhat likely” if referred, but not random	Mark “Not likely” if self-referred.	“Can’t tell.”
	(Q2) What percentage of selected individuals agreed to participate?	Must explicitly state the exact percentage, otherwise mark as “Can’t tell.”			
	Rate this section	No modified definition listed.			
B) STUDY DESIGN	Indicate the study design	No modified definition listed.			
	Was the study described as randomized? If NO, go to Component C.	No modified definition listed.			
	If Yes, was the method of randomization described? (See dictionary)	No modified definition listed.			
	If Yes, was the method appropriate? (See dictionary)	No modified definition listed.			
	Rate this section	No modified definition listed.			
C) CONFOUNDERS	(Q1) Were there important differences between groups prior to the intervention?	Must explicitly state if there are significant differences at baseline between two groups.			
	(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (eg, stratification, matching) or analysis)?	Must explicitly state the exact percentage at baseline or pre-intervention.			
	Rate this section	Any study marked “Weak” or “Moderate” for the study design, should also be marked “Strong” in C) CONFOUNDERS section.			
D) BLINDING	(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?	No modified definition listed.			
	(Q2) Were the study participants aware of the research question?	If participants directly receiving an intervention are unaware of the research question, mark as “Can’t tell.”			
	Rate this section	If (Q1 is 1), and if (Q2 is 3), mark as “Weak.”			
E) DATA COLLECTION METHODS	(Q1) Were data collection tools shown to be valid?	A study is valid if it measured what it intended to measure. Talk story will be viewed as a valid method.			
	(Q2) Were data collection tools shown to be reliable?	A study is reliable if the data collection is consistent.			
	Rate this section	No modified definition listed.			
F) WITHDRAWALS AND DROP-OUTS	(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?	If explicitly stated for participants receiving the intervention, mark “Yes.” If there is no report on how many participants dropped out or reasons, mark as “Can’t tell.” If Q1 is “Can’t tell,” Q2 will also be “Can’t tell.” For one time surveys or interviews mark “N/A.”			
	(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest)	No modified definition listed.			
	Rate this section	No modified definition listed.			
G) INTERVENTION INTEGRITY	(Q1) What percentage of participants received the allocated intervention or exposure of interest?	No modified definition listed.			
	(Q2) Was the consistency of the intervention measured?	No modified definition listed.			
	(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?	If explicitly stated for participants receiving the intervention, mark “Yes.” If it is not explicitly stated, mark as “Can’t tell.”			
H) ANALYSES	(Q1) Indicate the unit of allocation (circle one)	Who received the intervention?	Anytime an institution plays a role in the intervention process, mark “Organizational/institution.”	Churches will be considered “Community.”	Practice/office-clinical settings will also be considered part of the organizational level (due to level of uncertainty).
	(Q2) Indicate the unit of analysis (circle one)	Is there a final analysis or actual outcome presented?			
	(Q3) Are the statistical methods appropriate for the study design?	Is the study appropriate for the community?			
	(Q3a) Did researchers take a CBPR approach?	No modified definition listed.			
	(Q3b) Was the importance of culture considered?	No modified definition listed.			
	(Q4) Is the analysis performed by intervention allocation status (ie, intention to treat) rather than the actual intervention received?	Was there actual treatment provided? (ie, “The researchers did/did not treat participants”). Informing future interventions will not be considered as intention-to-treat.			
	Rate this section	No modified definition listed.			
Global Rating	1, 2, or 3?	No modified definition listed.			

Appendix Table B. An Application of the Quality Assessment Tool for Intervention-Based Studies to our Systematic Review Exploring Culturally-Based Breast Cancer Health Studies

Modified Quality Assessment Tool to Critically Appraise the Quality of Intervention-Based Studies									
Component	Question	Aitaoto et al, 2012	Ho et al, 2010	Hughes & Higuchi, 2004	Ka'opua, 2003	Ka'opua et al, 2011	Loo et al, 2019	Mokuau et al, 2012	Teranishi – Hashimoto et al, 2021
A) SELECTION BIAS	(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?	Somewhat likely	Not likely	Somewhat likely	Somewhat likely	Very likely	Somewhat likely	Somewhat likely	Somewhat likely
	(Q2) What percentage of selected individuals agreed to participate?	Can't tell	Can't tell	Can't tell	Can't tell	80-100% agreement	80-100% agreement	80-100% agreement	Can't tell
	Rate this section	Moderate	Moderate	Moderate	Moderate	Strong	Moderate	Moderate	Moderate
B) STUDY DESIGN	Indicate the study design	Cohort	Interrupted time series	Cohort	Cohort	RCT	Cohort	RCT	Cohort
	Was the study described as randomized? If NO, go to Component C.	No	No	No	No	Yes	No	Yes	No
	If Yes, was the method of randomization described? (See dictionary)	No	No	No	No	Yes	No	No	No
	If Yes, was the method appropriate? (See dictionary)	No	No	No	No	Yes	No	Yes	No
	Rate this section	Moderate	Moderate	Moderate	Moderate	Strong	Moderate	Strong	Moderate
C) CONFOUNDERS	(Q1) Were there important differences between groups prior to the intervention?	No	No	No	No	No	No	No	No
	(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (eg, stratification, matching) or analysis)?	Can't tell	Can't tell	Can't tell	Can't tell	Can't tell	Can't tell	N/A	Can't tell
	Rate this section	Strong	Strong	Strong	Strong	Strong	Strong	Strong	Strong
D) BLINDING	(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes
	(Q2) Were the study participants aware of the research question?	Can't tell	Can't tell	Yes	Yes	Yes	Yes	Can't tell	Yes
	Rate this section	Weak	Weak	Weak	Weak	Moderate	Weak	Moderate	Weak
E) DATA COLLECTION METHODS	(Q1) Were data collection tools shown to be valid?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	(Q2) Were data collection tools shown to be reliable?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Rate this section	Strong	Strong	Strong	Strong	Strong	Strong	Strong	Strong
F) WITHDRAWALS AND DROP-OUTS	(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?	Can't tell	Can't tell	Can't tell	Yes	Yes	Can't tell	Yes	Yes
	(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest)	Can't tell	Can't tell	Can't tell	Can't tell	80-100%	Can't tell	80-100%	80-100%
	Rate this section	Weak	Weak	Weak	Weak	Strong	Weak	Strong	Strong
G) INTERVENTION INTEGRITY	(Q1) What percentage of participants received the allocated intervention or exposure of interest?	80-100%	60-79%	80-100%	80-100%	80-100%	60-79%	80-100%	80-100%
	(Q2) Was the consistency of the intervention measured?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?	Yes	Can't tell	Can't tell	Can't tell	Yes	Yes	Yes	Can't tell

Appendix Table B. An Application of the Quality Assessment Tool for Intervention-Based Studies to our Systematic Review Exploring Culturally-Based Breast Cancer Health Studies (Continued)

Component	Question	Aitaoto et al, 2012	Ho et al, 2010	Hughes & Higuchi, 2004	Ka'opua, 2003	Ka'opua et al, 2011	Loo et al, 2019	Mokuau et al, 2012	Teranishi – Hashimoto et al, 2021
H) ANALYSES	(Q1) Indicate the unit of allocation (mark one)								
	Individual	X	X	X	X	X	X	X	X
	Practice/office	X	X	X	X	X	X	X	X
	Org/institution	X	X	X	X	X	X	X	X
	Community	X	X		X	X			X
	(Q2) Indicate the unit of analysis (mark one)								
	Individual	X	X	X	X	X	X	X	X
	Practice/office		X	X	X	X			
	Org/institution		X	X	X	X			
	Community	X	X	X		X			
	(Q3) Are the statistical methods appropriate for the study design?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	(Q3a) Did the researchers take a CBPR approach?	Yes	No	No	No	Yes	No	No	No
	(Q3b) Was the importance of culture considered?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
(Q4) Is the analysis performed by intervention allocation status (ie, intention to treat) rather than the actual intervention received?	No	No	Yes	No	Yes	No	No	Yes	
Global Rating	1 (strong), 2 (moderate), or 3 (weak)?	3	3	3	3	1	3	1	2