

Designing Technology to Facilitate Participation in Health Behavior Interventions among Under-served Populations: Proposal for a Mixed-Methods CBPR Approach to Reduce Health Disparities and Address New Norms since the COVID-19 Pandemic

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Abstract

Background: Everyday life has changed since the COVID-19 pandemic. Existing health disparities among underserved communities were exacerbated. Latinos and Native Hawaiians and Pacific Islanders (NHPI) disproportionately experience disparities in health, even when compared to other minority populations. Both populations have heart disease, cancer, and diabetes as leading causes of death; and both Latinos and NHPIs have high rates of obesity. As we begin to recover from the pandemic, we must consider the intersection of continued health disparities, new social norms and attitudes, and new patterns of health behavior.

Objective: The overarching goal of this project is to reduce health disparities among Latinos and Native NHPIs, considering new health behavior patterns, social norms, and increased technology use related to COVID-19. The research project specific aims are to: (1) conduct key informant interviews and focus groups among Latinos and NHPIs, (2) develop and implement a community health and health behavior survey, and (3) based on community feedback [from aims 1 and 2], co-design, develop and test new technology, in collaboration with the CSUSM Innovation Hub, that is meaningful and responsive to community needs and preferences.

Additionally, with commitment to training students underrepresented in biomedical research, we were purposeful in outlining research capacity specific aims. They are, to: (1) enhance the research capacity of students underrepresented in biomedical research, especially towards training future independent health disparity researchers and scholars, and (2) enhance the research capacity, sustainability, and excellence of CSUSM through meaningful collaborations between the principal investigator and the CSUSM National Latino research Center, Innovation Hub and other campus collaborators, consultants, and community partners.

Methods: Using a Community-based Participatory Research (CBPR) and mixed-methods approach, the interdisciplinary research team will develop new technology based on community insights (key informant interviews, focus groups, and a community health survey). We expect the new technology to be focused on mHealth smartphones applications. Components will likely include strategies to improve obesity-related health behaviors and mental health.

Results: This study received funding from the National Institute of General Medical Sciences in April 2022 as part of the Support for Research Excellence (SuRE) Program (R16). Key informant interviews and focus groups were completed by July 2023. Community health surveys were completed by August 2024. Development of the Beta mHealth app began in September

2024 in partnership with CSUSM computer science students. Beta testing and evaluation is expected to be completed by December 2025.

Conclusions: A major strength of this study is that it works with the communities of intended impact to directly inform new innovations to promote health behaviors. This study sets the foundation for a series of research grants in a purposeful, progressive sequence (i.e., R16[current], STTR, R21, R01). This work is also guided by a community advisory board and in collaboration with the CSUSM National Latino Research Center. This study includes unique partnerships and an interdisciplinary team of researchers, students, community members, and consultants/collaborators to inform practices that can impact Latino and NHPI health disparities with technology and strategies that are innovative and effective.

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Original Manuscript

Original Paper

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Key Words: mobile health; CBPR; community co-design; academic-community partnerships

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Conclusions: A major strength of this study is that it works with the communities of intended impact to directly inform new innovations to promote health behaviors. This study sets the foundation for a series of research grants in a purposeful, progressive sequence (i.e., R16[current], STTR, R21, R01). This work is also guided by a community advisory board and in collaboration with the CSUSM National Latino Research Center. This study includes unique partnerships and an interdisciplinary team of researchers, students, community members, and consultants/collaborators to inform practices that can impact Latino and NHPI health disparities with technology and strategies that are innovative and

effective.



Introduction

Background

The COVID-19 pandemic has changed life as we know it. Existing health disparities were exacerbated, especially for underserved communities; and NIH responded with funding to development and implement interventions to increase COVID-19 testing and address vaccine hesitancy. As we begin to recover from the pandemic, we must consider the intersection of continued health disparities, new social norms and attitudes, and new patterns of behavior, particularly in how these factors impact health behavior and participation in health behavior interventions. New norms include increases in technology use; and formative research is needed to inform strategies that best capture the needs for reducing health disparities.

The uptake of technology in this last year is unprecedented. Many families, especially with school-aged children, were required to engage in remote, online platforms for work and/or school, pushing our technology and its capabilities to grow faster than originally planned. However, while the digital divide continues to reveal itself during the pandemic and is still an important concern, the use of smartphones helps to close the gap, as smartphone usage among minority groups is comparable to non-Hispanic Whites (about 85%) [1]. Related to health, Latinos/Hispanics rely heavily on smartphones for health information and are more likely to use health apps, also known as mHealth [mobile health] [2,3]. Additionally, based on participant feedback from a pilot study, conducted by the PI of this proposal, NHPI participants expressed interest in developing a mobile application that would promote health behavior change and encourage participation in intervention activities (see preliminary studies section, below). Given the uncertainty of the “new normal”, it’s important to partner with communities to better understand how new habits and practices impact their health and health behaviors.

Latinos and NHPIs are some of the fastest growing minority populations in the U.S., with a percent change from 2000-2019 at 70% and 61%, respectively [4]. California is an ideal location to engage with both the Latino and NHPI community, since it is home to more than 15 million Hispanic/Latinos and home to over 250,000 NHPIs, more than any other state, even Hawaii. In San Diego County, the population is over 30,000 for NHPIs and 1 million for Hispanic/Latinos [5]. Latino and NHPI disproportionately experience disparities in health, even when compared to other minority populations [6]. Both populations have heart disease, cancer, and diabetes as leading causes of death; and both have high rates of obesity [7]. Over 71% of Hispanic Americans and 75% of NHPI are overweight or obese [8]. Globally, out of the top 10 most obese countries, 8 were NHPI countries [9]. NHPI are the most obese compared to other groups in the U.S. and are more likely to be inactive [8]. Diabetes is a persistent health concern among both Latinos and NHPI. Over 17% of NHPI had diabetes compared to 13.4% of African-Americans, 12.2% of Hispanics, and 7.9% of Asian adults [8]. Serious mental illness is also a growing concern, with over 1 in 5 Latinos/Hispanics with a mental illness (about 17% of the population), having a serious mental illness [10]. NHPI also report alarming rates of serious psychological distress, with over 2 million adults between 2015-2016 [11]. These conditions and related health behaviors have been negatively impacted by COVID-19 restrictions, especially physical activity, sleep, mental health, and overall well-being [12,13]. Improving the health of Latino and NHPI communities is imperative in reducing health disparities; and working in partnership with communities provides the best insight into appropriate, culturally-relevant

strategies.

Theoretical Framework

There is growing emphasis for research that is community-based versus “community placed” [14]. This type of research translation highlights community partnership approaches in addressing health and health disparities, especially in diverse cultures. According to the Kellogg Health Scholars Program (Community Track), “CBPR in health is a collaborative approach to research that equitably involves all partners in the research process and recognizes the unique strengths that each brings. CBPR begins with a research topic of importance to the community and has the aim of combining knowledge with action and achieving social change to improve health outcomes and eliminate health disparities” [15]. Over 15 years ago, the Institute of Medicine (IOM) recommended CBPR as one of eight new areas in public health education [16]. Sometimes referred to as “research plus” [17], CBPR not only increases the body of knowledge but also has potential to identify interventions that are sustainable and ready for dissemination because they have been developed with the community at stake [18].

CBPR approaches are iterative in that the process allows for development of lasting partnerships between researchers and community members. However, lack of standardization in terminology, measurement, and evaluation are critiques of CBPR [19]. To complement the CBPR approach of the current study, we will include concepts from the RE-AIM framework, as highlighted by the Programmatic Area of Implementation Science in the Division of Cancer Control and Population Sciences, National Cancer Institute [20,21]. The RE-AIM Framework, which has five steps for translating research into practice (Reach, Effectiveness, Adoption, Implementation, and Maintenance), has been used to translate research-based interventions into community-based programs [18,22]. RE-AIM can be used for planning, implementation, and evaluation of research studies. In the current study, RE-AIM concepts will guide the type of formative information solicited from Latino and NHPI community members, particularly focusing on “reach”, “effectiveness”, and “adoption” of new technology for health behavior change. Taken together, concepts from the RE-AIM framework, along with a CBPR approach, provide a focused structure for the current study.

The overarching goals of this project are to reduce health disparities among Latinos and NHPs, especially considering new health behavior patterns, social norms, and increased technology use related to the COVID-19 pandemic. Through CBPR, we will partner with both communities to develop new technology, an mHealth application for smartphones, to improve the health concerns identified by the communities (e.g., obesity-related health behaviors and mental health). This project also focuses on training students, who are underrepresented in biomedical research, in all phases of the research and innovation development, with an emphasis on training future independent health disparities researchers and scholars. Students from diverse backgrounds and life experiences contribute to a more diverse workforce in the STEM fields. Beginning with this proposal and the academic-community partnerships established, each stage of work will continue to advance knowledge, practice, and innovative strategies for reducing disparities in the Latino and NHPI community.

Innovation

This research is novel in its responsiveness to the impact of the pandemic on health behaviors, social norms, practices, and preferences, and ultimately, how these factors influence the health of communities who already experience great disparities in health outcomes. A key component of this research is the development of new technology, an mHealth smartphone application, based on community insights through the CBPR process and formative research. While there have been some community-informed mHealth interventions [23-26], there is still a need to partner with communities to co-design and develop new technology, especially in partnership with underserved communities.

As far as we know, this study may be one of the first research projects to, not only co-design and develop new technology through the CBPR process, but to do so with the guidance of an innovation incubator; in this case, the CSUSM Innovation Hub. This research has a unique collaborative framework (Figure 1). Naturally incorporating the services of the Innovation Hub with our senior software engineer consultant, community partners and collaborators, this research will produce a unique experience in designing new technology for both the academic-community partners and students (underrepresented in biomedical research) – highlighting an excellence in research and research capacity.

Unlike a more typical research trajectory leading from an R03, R21, to R21, the proposed research lays the foundation for purposeful and progressive funding by first establishing the new technology through an STTR grant. That is, starting with the SuRE R16, the results of this research will serve as a basis and preliminary work for a Small Business Technology Transfer (STTR) proposal, before moving onto non-STTR funds (i.e., R01). We will target the NIMHD SBIR/STTR Program, which prioritizes “research activities designed to empower health disparity communities to achieve health equity through health education, disease prevention, and partnering in community-based, problem-driven research.”

Research Project Specific Aims

Specific Aim 1

The first research project aim is to conduct key informant interviews and focus groups among Latinos and NHPs. Interviews and focus groups will center on gathering information, considering changing norms due to COVID-19, on attitudes, health needs, social norms, cultural beliefs, and preferences that will influence the ability and willingness to participate in a health behavior intervention. We will conduct 4-6 key informant interviews and 2 focus groups of 6-8 participants for each community (Latino and NHP).

Specific Aim 2

The second research project aim is to develop and implement a community health and health behavior survey. After the completion of aim 1, we will develop a survey which includes emerging themes from the interviews and focus groups. Quantitative data will assess social and cultural norms, health behavior knowledge and patterns, use and acceptance of technology, and other health risk behaviors. We will survey 200 Latinos and NHPs (about 100 participants from each community).

Specific Aim 3

The third research project aim is to co-design, develop and test new technology (beta version), in collaboration with the CSUSM Innovation Hub, that is responsive to community needs and preferences. Based on community feedback and in partnership, we will design

and test software application (app) that will help facilitate participation in a health behavior intervention. This product will be designed in a way that can be adapted for each community; for example, content adaptability and language options/controls. A diverse, interdisciplinary team of faculty, students, community members, and consultants will work to create a beta version of the intended product. We will recruit at least 30 participants from each community to test and use the new app. We will evaluate usability and acceptability and will evaluate the health behavior outcomes it aims to improve.

Research Capacity Specific Aims

Specific Aim 1

The first research capacity aim is to enhance the research capacity of students underrepresented in biomedical research, especially towards training future, independent health disparity researchers and scholars. We will work with the Office for Training, Research and Education in the Sciences to recruit underrepresented students. We will recruit students from public health, nursing, human development, kinesiology (health science track), business, engineering and other STEM disciplines. We will evaluate the demographics and number of graduate and undergraduate students trained through this research in each project year, including student outcomes (e.g., poster, papers, and graduate school application/acceptance rates).

Specific Aim 2

The second research capacity aim is to enhance the research capacity, sustainability, and excellence of CSUSM through meaningful collaborations between the principal investigator (Dr. Holub) and the CSUSM Innovation Hub, the CSUSM National Latino Research Center (NLRC), other campus collaborators, consultants, community partners, and community advisory boards. To ensure continued success of these collaborations, we will evaluate attitudes, satisfaction, trust, and perceived impact of the collaboration. A survey will be administered at the end of year 2 and 4 of the research project.

Methods

Through the CBPR process and formative research, this study focuses on reducing health disparities for Latino and NHPI communities through the co-design and development of new technology, an mHealth smartphone application, in collaboration with the CSUSM Innovation Hub. Key informant interviews, focus groups, and a community health survey will be used to collect community-informed formative research. Second, this study highly involves students who are underrepresented in biomedical research with the goal to train future independent health disparity researchers and scholars. This proposal builds on interdisciplinary teams and collaborations to increase research capacity and excellence and address societal needs, Figure 1. Measures to assess underrepresented student involvement (e.g., demographics, number, poster presentations, papers, and graduate school application/acceptance rates) and collaborations/partnerships (e.g., attitudes, satisfaction, trust, and perceived impact of the collaboration) will be collected.

Preliminary Studies

The first PIC Health Study (Pacific Islander Community Health Study) began in 2013 by creating a NHPI Community Advisory Board. This formative study was funded by the

American Cancer Society, Health Disparities Program. The PIC Health Study used a mixed-methods approach to inform the development of appropriate strategies and culturally-sensitive methods for behavior change interventions in the central/southern San Diego NHPI community. Beginning with a qualitative phase, key informant interviews and focus groups provided information for best practices in the recruitment of NHPIs, introducing research into the community, and cultural concepts for strategies to engage the community. The identification of and solutions for potential barriers was a focus of the interviews and focus groups. Informed by the qualitative phase, a quantitative community health survey was developed to assess the themes identified in the qualitative phase, and other health risk behaviors, including objective measures of physical activity and obesity. A total of 163 (quantitative) community health surveys were collected from NHPI in central/southern San Diego; 31% were Native Hawaiian, 20% Samoan, 47% Chamorro, and 3% Tongan or Tahitian. Responses from the PIC Health survey (also confirmed qualitatively) show that the health topics of interest were most similar between Native Hawaiians and Samoans, which were Obesity (65% of Native Hawaiians mentioned this; 60% of Samoans; 28% of Chamorros) and Diabetes (45% of Native Hawaiians; 52% of Samoans; 42% of Chamorros). This study focused on central/southern San Diego, whereas the current proposed research focuses on Northern areas of San Diego, CA, with high density of both Latino and NHPI populations, particularly Oceanside, San Marcos, and Escondido.

Based on the original PIC Health Study, a physical activity (PA) community-led Intervention among Pacific Islanders was conducted. This pilot study was funded by the University of California, San Diego, Clinical and Translational Research Institute, Academic-Community Partnership Pilot Project (2015) and the Howell Foundation for Women's Health Research, Community Engagement Initiative (2017). The primary goal of this pilot study was to be responsive to the formative research of the PIC Health Study indicating an interest in increasing PA among adult Native Hawaiian and Pacific Islanders (NHPI). The pilot study was a 12-week, pretest-posttest intervention study. We recruited 19 NHPI participants (18+ years old; 15 women, 4 men); who did not report more than 150 minutes of MVPA in the last 7 days and who were without medical conditions that may prohibit moderate-to-vigorous physical activity. The pilot study findings indicate that at 12 weeks, compared to baseline: (1) Participants decreased BMI by an average of 2.3 BMI points (3.6 points for women); (2) Participants were closer to meeting PA guidelines, increasing MVPA minutes per week by about 20 minutes (25 minutes for women), although still under the recommended 150 minutes per week (average: 137 minutes); (3) Participants increased fruit and vegetable intake, and decreased soda consumption; and (4) Most participants moved from "contemplation" to "action" for stages of change related to PA. Key stakeholders (community health promoter and fitness consultant) reported that adapting to behavior change may have been difficult for some participants, and future interventions should consider mental health and coping skills strategies to supplement the fitness program.

Feedback from the pilot study led us to conduct focus groups on mental health among pilot study participants. In 2019 and early 2020, current physical activity participants (as part of 2 focus groups) discussed mental health. Along with identifying themes on mental health stigma, motivation, health-seeking behavior, and healthy mindset strategies, the following theme is most relevant to the current proposal: *Development of a Mobile Application for Behavior Change*. Participants indicated that a mobile application that allows tracking of fitness progress may increase retention rates of members. In this study, participants identified benefits of a mobile fitness application that includes promoting consistent

accountability between members and instructors, promoting confidence in individuals to share fitness progress among members, and fitness education videos to educate beginners and veteran members. One participant mentioned, “I would really like to see a tracking system, to create a consistent accountability. An accountable practice where everybody tracks where they are....”

Contribution of Prior Studies to Current Proposal

Both the formative study, pilot study, and mental health focus group lay a foundation for the current proposed study in two ways: 1) Dr. Holub has experience in developing behavior change intervention based on academic-community partnerships and 2) NHPI participants stated that they would like to see the development of a mobile application to help with accountability of their health goals. While much of Dr. Holub's most current work highlights partnership with the NHPI community, her previous work extensively involved Latino communities. To complement, Dr. Holub's NHPI experience, Drs. Crespo and Martinez have joined as collaborators, each with relevant experience working with the Latino community. Dr. Crespo has additional experience around COVID-19 health disparities, particularly among Latino populations, and expertise in developing physical activity and behavioral interventions.

Study Research Design and Methods

Overview

This proposal has 3 research project specific aims and 2 research capacity specific aims. The research project specific aims are to: (1) conduct key informant interviews and focus groups among Latinos and NHPs, (2) develop and implement a community health and health behavior survey, and (3) co-design, develop and test new technology (beta version), in collaboration with the CSUSM Innovation Hub, that is responsive to community needs and preferences. The research capacity specific aims are to: (1) enhance the research capacity of students underrepresented in biomedical research, especially towards training future independent health disparity researchers and scholars, and (2) enhance the research capacity, sustainability, and excellence of CSUSM through meaningful collaborations between the principle investigator (Dr. Holub) and the CSUSM Innovation Hub, the CSUSM NLRC, other campus collaborators, consultants, community partners, and community advisory boards. The RE-AIM Planning Tool will help guide protocol and interview development, ensuring that information is gathered related to concepts of reach, effectiveness, and adoption of new technology [20,21]. The RE-AIM Planning Tool serves as a checklist for key issues to consider when planning and developing an intervention.

Participant Recruitment

Latino and NHPI community members from the Northern Region on San Diego County (i.e., Oceanside, San Marcos, and Escondido) will be recruited to participate in either the key informant Interviews (n=4-6 each community), focus groups (about 6-8 in 2 groups each), survey (n=100 each community) or product Beta testing (n=30 each community). NHPI participants in this study will be recruited from churches, hula “hālaus” (dance schools), and NHPI-related organizations and clubs, with support from Mr. Tana Lepule, who is a NHPI advocate and director of the Asian Pacific Islander Initiative. Dr. Holub has existing relationships with these organizations through her previous work. The CSUSM NLRC and collaborators will assist with recruiting Latino participants based on their long-standing relationships in the local area.

Approach and Measures

For research project specific aim 1 (interviews and focus groups), the purpose of key informant interviews is to collect in-depth, qualitative information from people who are familiar with the culture and health patterns of the Latino and Native Hawaiian and Pacific Islander community. We will specifically target community leaders and members who can provide insight into the health concerns of their community. These interviews will be conducted face-to-face by trained student researchers. We will conduct 4-6 key informant interviews. Additionally, we will conduct two focus groups of 6-8 participants for each community (Latino and NHPI). The focus groups will gather information gained from the interviews and related to health knowledge, cultural beliefs, culturally sensitive methods to conduct research in the community, the acceptability of using new technology like health apps (mHealth), and the identification of barriers and solutions to participating in health behavior interventions. A trained student researcher will conduct and lead the focus group discussion, which will last about one hour. A second person will take notes and the discussion will be audio-taped. Prior to the start of focus groups, a protocol will be developed based on key informant interviews and feedback from the research community boards.

To address research project specific aim 2 (community health and health behavior survey), we will collect quantitative data assessing Latino and NHPI cultural norms, health knowledge and screening history, and other risk behaviors, including measures of physical activity, health eating, and obesity. We will survey approximately 100 Latinos and 100 NHPs. Surveys will be self-administered. The measures listed below are not exhaustive as the qualitative phase of this study will help inform the development of the survey. Questions will include: factors in adoption of new technology, based on the extended unified theory of acceptance and use of technology (UTAUT) [27], including performance expectancy, social influence, effort expectancy, facilitating conditions, perceived enjoyment, mobile self-efficacy, satisfaction and trust [28]. Coping Skills and Cognitive Behavioral Process will be assessed using a 15-item scale [29]. Subjective PA will be assessed with a 16-item GPAQ- Global Physical Activity Questionnaire [30]. Sleep quality and amount; Demographic Variables: We will collect information on participant age, gender, marital status, household members (children/adults), employment, household income, and education [31], Acculturation will be measured using the Acculturation, Habits, and Interests Multicultural Scale, 8-items [32]. Perceived Religious Influence of Health Behavior will be measured using a 7-item scale developed by Holt and colleagues [33]; Partner Support will be measured using a 5-item scale [34]. Cultural values around family, respect, and gender roles are fundamental aspects among Latinos and NHPs. Church/Organization Food Environment around nutrition and healthy eating options during festivals and Sunday gatherings will be assessed. Other risk assessment will include BRFSS items on screening, alcohol use, smoking, and nutrition (NCI Fruit and Vegetable Screener).

To address research project specific aim 3 (co-design/test new technology), we will co-design, develop and test new technology (beta version), in collaboration with the CSUSM Innovation Hub, that is responsive to community needs and preferences. Based on community feedback from aims 1 and 2 and in partnership, we will test at least one component of a newly developed mHealth smartphone application. This product will be designed in a way that can be adapted for each community; for example, with content adaptability and language options/controls. A diverse, interdisciplinary team of faculty, students, community members and consultants will work to create a beta version of the intended product. We will recruit at least 30 participants from each community to test and use the new mHealth tool. We will evaluate usability and acceptability of the new app and will evaluate the health behavior outcomes it aims to improve (e.g. obesity-related health behaviors and mental health). Additionally, we will incorporate an evaluation framework, by Maar et al. (2017), which outlines an evaluation framework for mHealth interventions in diverse cultural settings [35]. This framework includes evaluation of major active components of the intervention, technology of the intervention, cultural congruence, task shifting, and unintended consequences [35]. Ultimately,

the goal is to create a product for future developing (in full) and testing in the next phase of research and funding.

Building Research Capacity

In line with the SuRE R16 mechanism, this project will train undergraduate and graduate students in all phases of this research, including conducting interviews, focus groups, and surveys, analyzing both qualitative and quantitative data, translating insights from the community to innovation development within an interdisciplinary team, and reporting the findings back to stakeholders and the communities. We will work with the CSUSM Office of Training, Research, and Education in the Sciences to recruit students who are underrepresented in biomedical research. The mission of this office is to provide a supportive multicultural environment for students in the biomedical sciences and related disciplines by sponsoring programs that focus on science education, student support services, research training, and research participation. In this regard, this campus collaboration will support the proposed research study by assisting in the recruitment of underrepresented students.

To demonstrate commitment to training a diverse group of students who are underrepresented in biomedical research, we were purposeful in including research capacity specific aims, which will be measured and evaluated. To assess research capacity specific aim 1 (training of underrepresented students), at the end of each project year, we will evaluate the demographics and number of graduate and undergraduate students exposed to this research in each project year, including other student outcomes (e.g., poster presentations, papers, and graduate school application/acceptance rates). We will enhance the research capacity of students from diverse backgrounds, especially towards training future independent health disparity researchers and scholars. We will also work with our campus partners to recruit students from a variety of departments including students from public health (graduate students), nursing, human development, biology, kinesiology (health science track), business, and engineering. We anticipate that, across the 4-year project time, at least 20 undergraduate and graduate students will be involved in the current study. This type of exposure to health disparities research that is based in the CBPR approach encourages students to pursue similar careers in health disparities research, behavioral sciences, and biomedical research. Dr. Holub has experience mentoring underrepresented students. In her prior studies, both undergraduate and graduate students were involved in the planning, implementation, and evaluation of the PIC Health Study and pilot study. Over 25 students have been involved in Dr. Holub's Pacific Islander research; the majority were underrepresented students (88%). As faculty, she has mentored 110 students in their thesis or capstones projects (approximately 50% or more were underrepresented minority and/or first-time college students).

Students will be part of interdisciplinary teams, which is tied to research capacity specific aim 2 (meaningful collaborations). To address this aim, we will enhance the research capacity, sustainability, and excellence of CSUSM through meaningful collaborations between the principal investigator (Dr. Holub) and the CSUSM Innovation Hub, the CSUSM National Latino Research Center, the Asian Pacific Islander Initiative, consultants, community partners, and community advisory boards. To ensure continued success of these collaborations, we will evaluate attitudes, satisfaction, trust, and perceived impact of the collaboration [36]. A survey will be administered to all collaborators at the end of year 2 and 4 of the research project. Unique to this proposal, is exposure to the development of innovation (e.g., mHealth tools) with the collaboration of the CSUSM Innovation Hub. This exposes students to a diverse, interdisciplinary team (i.e., public health, anthropology, computer science, and entrepreneurship.)

Analysis

Qualitative Data: Interviews from key informants and focus groups will be audio-taped, transcribed, and uploaded into ATLAS.ti, software used for qualitative coding and analysis. Two individuals, Dr. Holub and one trained research assistant, will code and extract themes from the interview/focus group transcripts. Transcripts will be analyzed using directed content analysis (DCA) to identify and categorize meaningful and detailed information about participant's opinions, perceptions and experiences [37]. Coding strategies will include highlighting passages for emergent themes and a priori categories derived from interviews [38]. Verification of emergent themes will be examined through investigator-based discussions of the developed coding framework. **Quantitative Data:** Using SPSS, descriptive statistics will be used to examine each construct in the community survey or beta testing evaluation. We will use basic bivariate and multivariate analyses to describe the data. Depending on the type of outcome, linear or logistic regression will be used to model the relationship between health behavior outcomes and independent variables (e.g., demographics, acculturation, religiosity, stress, etc.). Data will be examined by race/ethnicity. We will also examine usability and acceptability of the mHealth tool, student involvement, and collaboration impact.

Project Timeline

Year 1 will be dedicated to development of evaluation tools, research team training and recruitment and completion of key informant interviews and focus groups in the Latino and NHPI communities. Years 2 focuses on community health survey data collection and evaluation of all the formative research. Year 3 will focus on working with the Innovation Hub to co-design and evaluate the new technology (Beta testing). Year 4 is dedicated to finalizing the Beta testing/evaluation, interpretations of the findings, results dissemination (conferences, manuscript preparation, community presentations), and development of an STTR application in partnership with our collaborators and Latino and NHPI Community Advisory Boards (CAB). Student involvement is evaluated at the end of each project year and collaborations are evaluated at the end of the 2nd and 4th project year. See Figure 2.

Results

This study received funding from the National Institute of General Medical Sciences in April 2022 (R16GM145519) as part of the Support for Research Excellence (SuRE) Program (R16); and received prior approval by the CSUSM Institutional Review Board in January 2022. Recruitment began in late 2022. Key informant interviews (n=11) and four (4) focus groups (n=14) were completed by July 2023. Community health surveys were completed by August 2024 (n=219). Development of the Beta mHealth app began in September 2024 in partnership with CSUSM computer science students who were completing a capstone project in fall 2024. Our project continues to collaborate with computer science students completing a capstone project in spring 2025. Beta testing and evaluation is expected to be completed by December 2025. Findings from the qualitative data (key informant interviews and focus groups) are expected to be published in 2025. Findings from the mHealth app Beta testing are expected to be published in 2027.

Discussion

Given the COVID-19 pandemic's impact on new health behavior patterns, social norms, and increase use of technology, this proposal lays a strong foundation for collaborative co-design of new technology that advances knowledge, practice, and innovative strategies for reducing health disparities in a post-pandemic context. A major strength of this study is that it works with the communities of intended impact to directly inform new innovations to promote health behaviors. This proposal sets the foundation for a series of research grants in a purposeful, progressive sequence (i.e., R16[current], STTR, R21, R01). This work is also guided by a community advisory board and in collaboration with the CSUSM National Latino Research Center. This study includes unique partnerships and an interdisciplinary team of researchers, students, community members, and consultants/collaborators to inform practices that can impact Latino and NHPI health disparities with technology and strategies that are innovative and effective.

Team Strengths

Dr. Holub (PI; first author) currently works with the NHPI community and has experience developing culturally-informed behavior change interventions for Latinos. Also related, she was the 2015 winner of SDSU's Innovation Challenge in social enterprise, which included creating an iPhone app to improve anxiety and depression. Dr. Holub also co-authored an mHealth paper [39]. Co-Authors: Dr. Crespo has expertise in Latino health and recently was funded to address COVID-19 health disparities and to conduct a large-scale physical activity and fitness intervention among Latinos. Dr. Martinez, an anthropologist, is a collaborator and Director of the CSUSM National Latino Research Center. Mr. Markidis is a senior software engineer with expertise in mobile application development. Mr. Lepule is an NHPI community advocate with an expertise in CBPR approaches, including within R01 and other research grants. Together, we bring the expertise to execute this proposal successfully.

Challenges and Solutions

We recognize the challenges of academic-community partnerships and that the proposed methods may be modified as we obtain additional community input. Any needed precautions related to the pandemic will follow state and county guidelines. The current proposal is informed by preliminary studies, a focus group, and extensive experience working with both the Latino and NHPI community by the PI (Dr. Holub) and collaborators (Drs. Crespo and Martinez). To address this potential challenge, we will take great care in the pace at which we introduce this new study to community members. We anticipate that with endorsement from community leaders in our advisory board, clear/open communication, flexibility, and with great attention to cultural sensitivity, we can work to overcome these barriers.

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Conflict of Interest

None declared.

Abbreviations

CBPR: Community-based participatory research

CSUSM: California State University San Marcos

NHPI: Native Hawaiian and Pacific Islander

NLRC: National Latino Research Center

PIC Health: Pacific Islander Community Health

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Figure 1. Research team and collaboration framework.

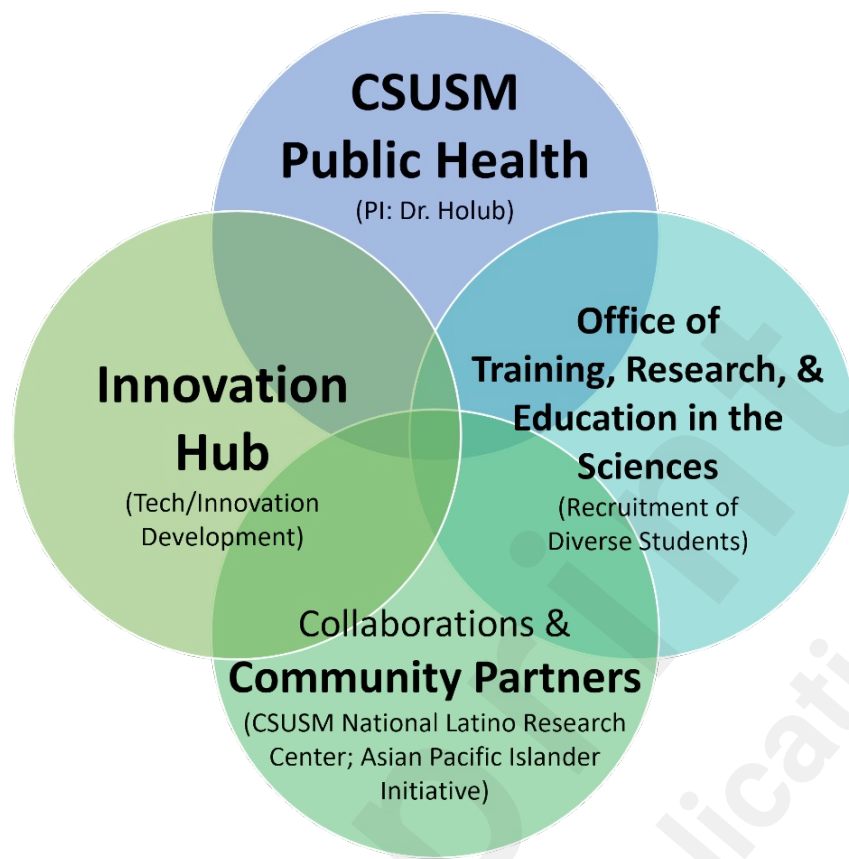


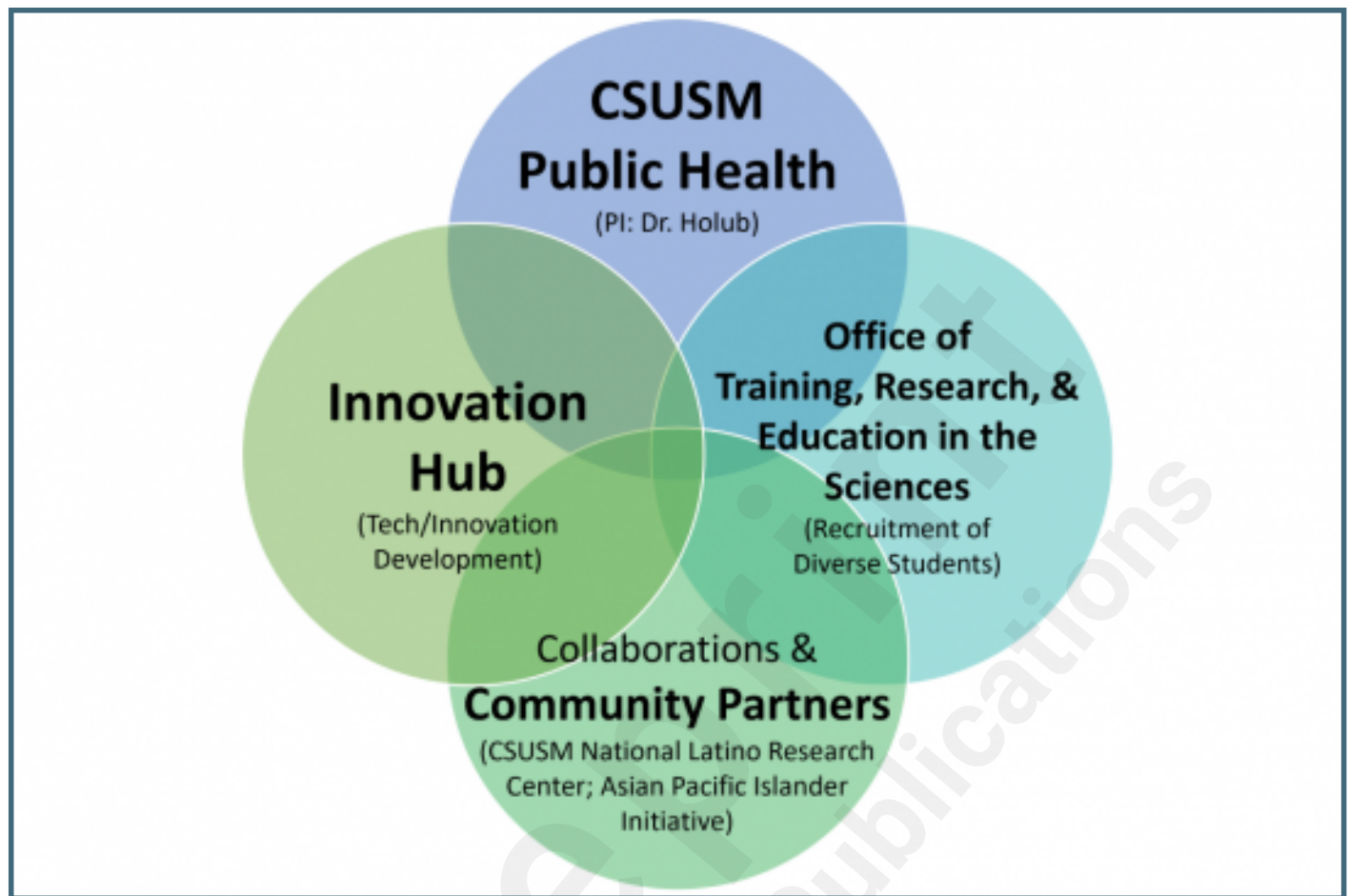
Figure 2. Study and Evaluation Timeline.

Study and Evaluation Timeline	Year 1				Year 2				Year 3				Year 4			
Activity	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Protocol and Program Development	x	x														
Develop Evaluation Tools and Material	x	x														
Train Research Team (Staff & Students)		x	ongoing													
Recruit Participants, Latino and NHPi		x	x													
Key Informant Interviews / Focus Groups (RP Aim 1)			x	x												
Community Health Survey (RP Aim 2)					x	x	x									
Eval/Analysis of Formative Research				x			x	x								
Work w/ Innovation Hub to develop product based on community feedback									x	x	x					
Beta Test Product (RP Aim 3)											x	x	x			
Eval/Analysis of Beta Testing														x	x	
Evaluate Student Involvement (RC Aim 1)				x				x				x				x
Evaluate Collaborations (RC Aim 2)								x								x
Dissemination; Manuscript Preparation															x	x
Development of STTR grant with CAB															x	x

Supplementary Files

Figures

Research team and collaboration framework.



Study and Evaluation Timeline.

Study and Evaluation Timeline	Year 1				Year 2				Year 3				Year 4			
Activity	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Protocol and Program Development	x	x														
Develop Evaluation Tools and Material	x	x														
Train Research Team (Staff & Students)		x	ongoing													
Recruit Participants, Latino and NHPi		x	x													
Key Informant Interviews / Focus Groups (RP Aim 1)			x	x												
Community Health Survey (RP Aim 2)					x	x	x									
Eval/Analysis of Formative Research				x			x	x								
Work w/ Innovation Hub to develop product based on community feedback									x	x	x					
Beta Test Product (RP Aim 3)											x	x	x			
Eval/Analysis of Beta Testing														x	x	
Evaluate Student Involvement (RC Aim 1)				x				x				x				x
Evaluate Collaborations (RC Aim 2)								x								x
Dissemination, Manuscript Preparation															x	x
Development of STTR grant with CAB															x	x

Multimedia Appendixes

Summary Statement.

URL: <http://asset.jmir.pub/assets/27a4eda201cd153ddb88f3dfd0611245.pdf>

