Participatory Methods for Climate Change and Mental Health Research:

Photovoice in Nepal

by

Elizabeth King MacFarlane

Duke Global Health Institute
Duke University

Date:____________________

Approved:

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Brandon Kohrt, Supervisor

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Helen Berry

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Geni Eng

Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in the Duke Global Health Institute in the Graduate School of Duke University

2015
ABSTRACT

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Abstract

Background: Climate change is the largest global health threat of the 21st century and, despite currently limited empirical evidence, it is expected to directly and indirectly harm communities’ psychosocial wellbeing. Participatory methods represent ethical, feasible, and culturally-appropriate approaches to engage community members for mental health promotion in the context of climate change. Aim: Photovoice, a community-based participatory research methodology uses images as a tool to deconstruct problems by posing meaningful questions in a community to find actionable solutions. This community-enhancing technique was used to elicit experiences of climate change among women in rural Nepal and the association of climate change with mental health. Subjects and methods: Mixed-methods, including in-depth interviews and self-report questionnaires, were used to evaluate the experience of 10 women participating in photovoice. Quantitative tools included Nepali versions of Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI) and a Resilience Scale (RS). Results: Photovoice sessions revealed two main themes: water issues (both drought and monsoon) and disease (both physical and mental). Qualitative, in-depth exit interviews revealed three theme: the benefits of sharing environmental best practices; the importance of building community capacity to adapt to and mitigate for environmental issues in the community; and the importance of sharing stories to build confidence and ease pain.
Exit interviews highlighted barriers to maintaining photovoice projects in the community. Women also reported beneficial effects for mental health. The mean BDI\textit{allwomen} score prior to photovoice was 23.20 (SD=9.00), range 14-42 and two weeks after completion of photovoice, the mean BDI\textit{allwomen} score was 7.44 (SD=8.05), paired t-test = 7.97, \(p<.001\), \(n=10\). \textbf{Conclusion:} Photovoice, as a well-accepted participatory method, can help identify local and existing resources (e.g. women’s groups, existing environmental training), generate adaptive strategies and promote mental health.
Dedication

My time at Duke University so far has been an incredible one. I remember the first time I stepped foot on campus to visit the Master of Science in Global Health program and everyone I met was incredibly engaged, thoughtful, inspiring and generous with their time. There was one woman who exemplified these qualities. She was a second year student, who was so vibrant, smart and kindhearted. She gave me a tour of the campus and sat with me for a 2.5-hour lunch to share her experiences, insights, passions and answer any questions that I had. Her enthusiasm for the program, and for life, was something for which I aspired. She is absolutely one of the reasons I immediately felt at home at Duke and at the Global Health Institute. Before arriving at Duke, we talked multiple times on the phone, and we developed a friendship. After I started the program, we continued to stay in touch – not just about advice, but to catch up as old friends. A few months ago, she passed away. She is sorely missed, but her ripple lives on and within us. As a symbol of my deep gratitude and respect for this amazing woman and friend, I dedicate my thesis to you, Maddy Boccuzzi.
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global mental health burden – and with him on my team, I feel like, I too can make a
difference.

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Organization (TPO), Nanda Raj, Sauharda Rai, Suraj Koirala, Nagendra Luitel, and the
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feel comfortable, collect meaningful data, facilitate a focus group – go unmatched. Her
desire to learn, engage and make a difference in the world is inspiring. The women who
participated in this research were absolutely wonderful and my gratitude goes out to
them for sharing their pain, their joy, and opening their hearts to me and to the group.

This research would not have been possible without the support of DGHI
including Lysa MacKeen, Sarah Martin and Michael Russell. Liz Turner has been an
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Dr. Joe Egger for his help thinking through my quantitative analysis and sampling
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Dennis Clements, and Dr. Kearsley Stewart for their support over the last few years. I
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Financial support for this work was provided by DGHI and the Duke University Center for International Studies (DUCIS).

Last but not least, I want to thank my family and friends for all of their love and believing in me throughout this process. A special thank-you to Jana Schaich Borg, Stephanie Brown, Emily Waters, my Fuqua C-Lead Team, and my dear parents Anson MacFarlane, Paula King and Steven Mangold – thank you!
1. Introduction

“When there is pain in heart-mind [Nepali, man], there are tears in eyes. One drop of

tears means 3--4 kilograms of water, so much of water is lost, so our blood is also lost, and then

one becomes weak. Just like the rain of rainy season, tears are flowing through eyes the same way.

Heart-mind is crying, then how can there be happiness?” – Dalit/Nepali woman farmer age

49-years old from Jumla, Nepal.

1.1 Background – climate change overview

Climate Change is the largest global health threat of the 21st century (Costello, Abbas et al. 2009). Exacerbating volatile weather patterns and increasing the incidence of floods, heat waves, and storms, climate change directly affects the key determinates of health: air, water and food (World Health 2009, Field and G.-K. Plattner 2012) The most recent report from the Intergovernmental Panel on Climate Change (IPCC AR5) predicts that changes in weather will directly affect temperature and precipitation patterns further influencing crop yields, intensifying water system stress and changing the ecology of communities (Field and G.-K. Plattner 2012). These stressors influence the global burden of disease. The World Health Organization (WHO) estimates that modest warming has caused over 140,000 excess deaths annually since 2004 (World Health 2009).
1.2 Climate change and mental health

There are three primary types of studies related to climate change and mental health: (1) studies that present empirical evidence directly related to climate change and mental health, (2) studies that present arguments and ideas about climate change and mental health and (3) studies that are relevant to climate change and mental health (e.g. mental health impact of weather disasters) but do not make direct links to climate change. There are very few studies in category (1).

Global climate change is likely to have major negative psychosocial impacts on communities directly and indirectly affected by climate though there is little literature investigating specific mental health consequences related to climate change (Doherty and Clayton 2011). Despite currently limited empirical evidence, it is expected to directly and indirectly harm communities’ psychosocial wellbeing. Doherty and Clayton (2011) classify psychosocial impacts of global climate change into three categories: direct (acute trauma due to severe natural hazards), indirect (negative emotional response due to uncertainty of future risks) and psychosocial (chronic community effects of flooding, drought, migration etc.) (Figure 1). Vulnerable people and places, especially rural areas in developing countries, will be proportionally more affected by negative psychosocial impacts because of a specific socioeconomic disadvantage and reduced access to health services (Berry, Bowen et al. 2010).
Figure 1: Conceptual framework of mental health and psychosocial (MHPS) impacts of environmental disturbances due to climate change.

Berry, Bowen et al (2010) investigated the effect of climate change on rural farmers’ mental health in Australia stating that there is “very little – and inconclusive – quantitative evidence about farmers’ mental health” (Berry, Bowen et al, 2010 p.1) and there is a need for a systematic epidemiology of mental health in populations vulnerable to climate change. Another study in Australia conducted a self-report Strengths and Difficulties questionnaire given to 111 adolescents to better understand emotional distress in adolescents affected by drought (Dean and Stain, 2010). The results indicated that adolescents reported a significantly higher level of emotional distress than those in
a normative comparison group, with 12% of adolescents in the clinical case range versus 10% in the controls. In addition, the adolescent girls reported higher levels of emotional difficulties than boys. This suggests gender differences related to the psychosocial impacts of climate change.

Brukbaker et al (2011) suggested that heightened stress, fear and anxiety are associated with the storm season in two Alaskan communities. They stated that climate change increased vulnerability to mental stress, disease and injury; however, no data are reported.

Limited reviews exist on the health impacts of climate change in the Himalayan region (Ebi, Woodruff et al. 2007, Gautam 2013). In response to the limited data about the prevalence of symptomology in areas affected by or at risk to climate change, the effect of climate change on mental health requires further investigation.

1.2.1 Innovation

This study is innovative, as climate change and mental health are an emerging research field and little funding has been allocated to support this research area. In a recent review of NIH RePORTER funding, there are no active projects that incorporate “mental health” and “climate change” searching both NIH and NIMH databases. From all NIH databases there is only record of 45 unique projects since 1990, 15 of which related directly to climate change and/or natural disasters. NIMH has had 13 unique projects since 1990, which comprise less than .1% of the total NIMH awards. There is a
clear funding and research gap looking into the connections between mental health and climate change that needs to be addressed.

**Table 1: Funding facts from search query from NIH RePORTER.**

<table>
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</thead>
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</tr>
<tr>
<td>Total NIH Awards since 1990</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>Results of search: &quot;mental health&quot; &amp; &quot;climate change&quot; all research funding (current AND historical - since 1990)</td>
<td>45 unique projects</td>
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<table>
<thead>
<tr>
<th>NIMH</th>
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<tr>
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</tr>
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<tr>
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</tr>
<tr>
<td>Results of search: &quot;mental health&quot; &amp; &quot;climate change&quot; all research funding (current AND historical - since 1990)</td>
<td>13 unique projects (&lt; .1%)</td>
</tr>
</tbody>
</table>

**1.3 Climate change and women**

International calls for gender equity (e.g., from the World Health Organization and the United Nations) remind us that women have disproportionately high levels of underlying disadvantage; women may therefore face additional climate change-related harm, particularly in countries that have few resources and great risk. This study will limit its qualitative data collection to women because previous research indicates women are disproportionately impacted by climate change, because women, particularly
in lesser developed countries, face general gender-related inequalities (Denton 2002). Climate change is likely to accentuate the gaps between the world’s rich and poor where “women in developing countries constitute one of the poorest and most disadvantaged groups in society” (Denton 2002, p. 11). In addition, climate change effects and adaptations have a gender dimension (Lambrou and Paina 2006, Demetriades and Esplen 2008).

Though the qualitative component, without a control group of men, will not be able to show disproportionate impacts on women, this study will allow the opportunity for women’s voices to be expressed and heard by illuminating female narratives and perceptions of mental health and psychosocial impacts of climate change through the photovoice method.

1.4 Climate Change in Himalayan Region & Nepal

1.41 Himalayas as a vulnerable region

Those regions most vulnerable to climate change are regions that have limited capacity to plan for, adapt to, and respond to the adverse impacts of natural hazards and are generally less developed countries (Füssel 2010, Harmeling 2012).

The Himalayan region has been identified as an area affected by rapid and severe climate change (Chaudhary and Bawa 2011). Considered one of 34 global hotspots of biodiversity (Myers, Mittermeier et al. 2000) the Himalayas are vulnerable to
environmental, social, and economic consequences for more than 2 billion people (Chaudhary and Bawa 2011).

1.4.2 Nepal & Jumla District in Mid-Western Region

According to the Global Climate Risk Index 2014 report of GermanWatch, which analyzes the extent to which countries have been impacted by weather-related losses (e.g. number of storms, floods, heat waves, crop failures, financial losses etc.), Nepal ranks 14th as the country most vulnerable to climate change (see Table 2) (Sonke, K. and Eckstein, D., 2013). Existing observation indicates that the temperature is rising at a higher rate in Nepal than in the rest of the Himalayan region with the high mountains of Nepal exhibiting a winter warming rate of 1.2 Celsius per decade (Gautam 2013).

Jumla district has been identified by agricultural and climate specialists as a climate sensitive area (Gentle and Maraseni, 2012). Both climatic records and local perceptions reflect increasing temperature and decreasing rainfall trends in Jumla District over the last 30 years. (Gentle and Maraseni, 2012). In Gentle and Maraseni’s (2012) study, which included a Climate Vulnerability and Capacity Analysis (CVCA), the vulnerability matrix filled out by the residents of Jumla prioritized agriculture as the primary livelihood resource (versus wage labor, livestock rearing and seasonal migration). Focus groups revealed a “massive reduction in food production”, with the poorest households reporting no rice productions in three consecutive years. (Gentle and Maraseni, 2012, p.29). In addition, it was reported that environmental hazard risk
due to climate change was differentiated by socioeconomics in that the poorer households were situated in water scarce and landside-vulnerable areas (Gentle and Maraseni, 2012).

<table>
<thead>
<tr>
<th>Rank</th>
<th>CRI</th>
<th>Country</th>
<th>Overall CRI Score</th>
<th>Rank</th>
<th>Country</th>
<th>Overall CRI Score</th>
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</thead>
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<td>10</td>
<td>Guatemala</td>
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<tr>
<td>2</td>
<td></td>
<td>Myanmar</td>
<td>11.83</td>
<td>12</td>
<td>Pakistan</td>
<td>31.83</td>
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<tr>
<td>3</td>
<td></td>
<td>Haiti</td>
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<td>Grenada</td>
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<td>6</td>
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<tr>
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<td>31.17</td>
<td>17</td>
<td>Islamic Republic of Afghanistan</td>
<td>37.50</td>
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<tr>
<td>8</td>
<td></td>
<td>Mongolia</td>
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<td>18</td>
<td>India</td>
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<tr>
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<tr>
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<td>Thailand</td>
<td>31.50</td>
<td>20</td>
<td>Djibouti</td>
<td>40.50</td>
</tr>
</tbody>
</table>

1.4.3 Local perceptions of climate change

Previous studies in Nepal have compared climate change perceptions and climatic records, showing strong evidence that the local perceptions of climate change accurately match climatic event records, however long-term adaptive strategies may be inadequate (Chaudhary and Bawa 2011, Manandhar, Vogt et al. 2011). The study by Manandhar et al (2010) showed that most farmers perceived climate change and though farmers attempted to respond on an individual level, a plan to provide appropriate

---

1 CRI is calculated quantifying and analyzing impacts of extreme weather events (fatalities and economically) looking at absolute and relative impacts.
coping strategies is necessary to build capacity to respond to increasing impacts of climate change.

Similarly, Chaudhary and Bawa’s 2011 study in the Himalayas showed consistency between local knowledge and scientific observations related to climate change. Though this study investigated climate change perceptions (based on 18 indicators using a semi-structured questionnaire) it did not assess attitudes and physical and psychosocial effects on the community. One example of an indicator is: “Have you experienced early onset of summer?” The answers were limited to “Yes, have experienced”, “No, haven’t experienced” and “Don’t know about” and therefore did not address the effect of any such changes on health or wellbeing. This gap in the literature is an area where further research is needed. In addition, the focus group discussions were not analyzed “because the data were descriptive in nature and in line with the quantitative data collected from household surveys” (Chaudhary and Bawa, 2011, p.767). This was a missed opportunity to provide a nuanced and narrative perspective of climate change perceptions.

Haque, Yamamoto’s et al. 2012 study in Bangladesh addressed households’ perception of climate change and went one step further to include perceptions of human health risk. Results showed that over 70% of interviewees perceive health problems related to change in weather including diarrhea, asthma, and pneumonia (Haque, Yamamoto et al. 2012). The study did not specifically address the potential comorbidity
of mental health disorders or psychosocial impacts of the weather changes (Haque, Yamamoto et al. 2012). Though these health impacts align with the natural seasons, climate change can exacerbate health impacts. For example, two studies using time series analysis identified the relationship that when average temperature increased, so did the rate of local suicide (Hanigan et al., 2012; Nicholls et al., 2006).

1.5 Specific Aims

This study presents an opportunity to examine empirically how climate change can impact the mental health of a community, which has never been done in Nepal. The purpose of this community-based participatory research study is to investigate the psychosocial impacts of climate change in people living in Jumla - particularly women subsistence farmers: a population at risk in rural Nepal. The study will examine perspectives from both lower caste (Dalit/Nepali) and upper caste (Bahun/Thakuri) groups of women. Participatory methods represent ethical, feasible, and culturally-appropriate approaches to engage community members for mental health promotion in the context of climate change (Wang and Burris, 1997).

Photovoice, a community-based participatory research (CBPR) methodology uses images as a tool to deconstruct problems by posing meaningful questions in a community to find actionable solutions (Wang and Burris, 1997). This community-enhancing technique was used to elicit experiences of climate change among women in rural Nepal and the association of climate change with mental health.
In the short-term, findings from the study will promote dialogue about how the local environment has impacted the well-being of the community, which will hopefully translate into interventions and potential policy changes in the long-term.

The specific aims of this study include:

**Aim1.** Assess the association between effects of climate change on daily life and mental health and psychosocial impacts with photovoice.

**Aim2a.** Explore whether photovoice, as a one-time four to five day intensive intervention can mobilize people to be more aware of environmental changes related to climate change.

**Aim2b.** Explore whether photovoice, as a one-time four to five day intervention can provide positive mental health outcomes (for example: be more resilient to environmental change).

**Hypothesis: Aim1:** Perceptions of environmental disturbance (both realized and anticipated) due to climate change will be associated with negative mental health and psychosocial impacts. Women in lower caste (Dalit/Nepali) will express greater negative mental health impact than those that have greater socioeconomic status (upper caste women). **Aim 2a&b:** Photovoice as a one-time four-to-five day intervention will have a positive impact on environmental awareness and adaptability as well as positive mental health impact. Baseline environmental adaptability will be higher for upper caste
women, but overall environmental adaptability and positive mental health outcome improvement will be higher for lower caste women.
2. Methods

2.1 Setting

Jumla district in the mid-western region of Nepal where this study takes place, has been identified as high-risk area for climate change (Gentle and Maraseni, 2012). With life expectancy 63.14 and a human development index of .409, Jumla district is one of the most underdeveloped and economically depressed districts of Nepal (UNDP, 2014). Jumla’s ecology is vulnerable to landslides, drought, and hailstorms which results in chronic food deficits, infrastructure damage and community displacement (UNFCO Report, 2010). According to Sapkota et al (2010), Jumla has seen unusual and more erratic changes in weather in recent years since the mid-1970s, which have seriously impacted crop yield, particularly damaging the production of rice in the district (Department of Hydrology and Meteorology – Nepal, 2013).

The cultural category of ‘caste’ is a central marker of identity in South Asia and prevalent in Nepal including Jumla district (Kohrt et al., 2009). The caste system in Nepal divides society into social rankings based on ancestral lineages (Hofer 2004). The two main upper caste groups are Brahman (historically priests) and Chhetri (historically warriors and rulers). The lower caste group is called the ‘untouchables’ or Dalit caste (Kohrt et al, 2009). In Nepal, the upper castes control politics, education, and business while the lower Dalit castes have been historically marginalized from positions of power. In Jumla district, where this study took place, the Dalit often self-identify as
Nepali caste. Therefore the term “Dalit/Nepali” will be used in this paper to describe this group as it incorporates both the preferred self-labeling of the group and the label commonly used by others. “Bahun” and “Thakuri” are local terms of the traditional Brahmin of Nepal. In this study upper caste women identified as either Bahun or Thakuri and will be described as “Bahun” in this study.

Gender also plays an important role in Jumla. In a previous study by Kohrt et al (2009) both high and low caste women reported male relatives’ abuse of alcohol as well as experiencing domestic violence, marital rape, and loss of income due to chemical dependency. Another finding from Kohrt et al (2009) was the pressure of bearing a great number of children to increase labor productivity while at the same time struggling with co-wives over resources for these offspring. There is also a wide discrepancy between husband and wives ages as women are encouraged to marry early (as young as 9 years old) to assure virginal status (Kohrt et al, 2009).

2.2 Participants

Participants were ten women subsistence farmers who participated voluntarily in this mixed methods study. Five lower caste (‘Dalit’, also known locally as the ‘Nepali’ caste) women and five upper caste (‘Bahun’ or ‘Thakuri’) women were recruited to create two separate photovoice groups by caste. Five women were selected for each group as n=5 is an acceptable photovoice size group based on standard photovoice methodology as well as being a feasible number to purchase camera equipment.
In a systematic literature review of photovoice projects in health and public health, the median size of the photovoice projects was 13 people, comparable to our n=10 sample size (Catalani and Minkler, 2010). Furthermore, the review found no relationship between group size and level of participation.

Women in this study were recruited by a key informant living in Jumla who works for our partner organisation, Transcultural Psychosocial Organization – Nepal. The women had to be 18+ years-old and live at a reasonable distance to be able to walk to the photovoice sessions held at the Jumla Transcultural Psychosocial Organization and HeartMind International Counseling Center (Table 3).

<table>
<thead>
<tr>
<th>Population</th>
<th>Photovoice participants</th>
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<td>Purposive sampling</td>
</tr>
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<td>Inclusion criteria</td>
<td>Female, age 18-65, resident of Jumla District, 5 lower caste (Dalit/Nepali) and 5 upper caste (Bahun/Thakuri) caste</td>
</tr>
<tr>
<td>Exclusion criteria</td>
<td>Men, females age &lt;18 or &gt;65</td>
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<td>Sample size</td>
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<td>Primary outcome</td>
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</tr>
<tr>
<td>Secondary outcomes</td>
<td>Photographs (depicting psychosocial impacts to environmental changes)</td>
</tr>
</tbody>
</table>

**Table 3: Design overview – Photovoice**

**2.3 Procedures**

Mixed-methods, including in-depth interviews and self-report questionnaires, were used to evaluate the experience of 10 women participating in photovoice.
Demographics were collected including age, religion, education, and caste groups. Caste groups were recorded based on locally used categories and were included in the study because of previously identified associations between caste and mental health (Kohrt et al., 2009). Quantitative tools included validated Nepali versions of Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) and a Resilience Scale (Kohrt et al., 2002; Kohrt et al., 2003). A comparison of pre and post- mental health assessments were performed through paired T-tests. In addition, exit interviews, at two different time points (immediately following photovoice sessions and two weeks later) were qualitatively analyzed.

2.3.1 Photovoice

“From outside, our face is fine, disease is inside, and we can’t take pictures of inside. But we can take picture of someone who is in pain.” – Dalit/Nepali woman farmer age 25-years old from Jumla, Nepal.

Photovoice defined by Wang and Burris 1997 as a “process by which people can identify, represent and enhance their community through a specific photographic technique” (Wang and Burris 1997, p. 369). Photovoice has previously been used as a method in climate change research in Uganda and Canada (Berrang-Ford et al., 2012; Healey et al., 2011). One of the strengths of the photovoice method is that it is a participatory methodology that gives agency to the community being studied and provides an important “contextual understanding of vulnerability that is vital to climate
change research” (Berrang-Ford, Dingle et al. 2012, p.1070). For example, in Uganda, photovoice has been used in the context of a health vulnerability framework specific to climate change (Berrang-Ford, Dingle et al. 2012) and in Canada it has been used to aggregate community perspectives on health themes related to changing weather (Healey, Magner et al. 2011). However, no research has used it to explore psychosocial impacts of climate change specifically.

In this project, photovoice was used to bring two groups of women farmers together – one lower caste, one upper caste. The caste system in South Asia is a hierarchical social classification that acts as a cultural category and central marker of identity (Kohrt et al., 2009). These two different caste groups discussed how climate change and a changing environment impact their mental health and psychosocial well-being. The research compared the subjective appraisals of impact on both the natural and built environment as well as its impact on mental health and well-being.

The standard photovoice model consists of five sessions – an introductory session, three (3) image analysis sessions, and one theme-validation session (see Appendix C). The same model was used in this study (Appendix A). Before the first formal session, participants were recruited by a key informant in the community, with a follow-up informal session with the principal investigator (PI) and research assistant to introduce oneself, build rapport, collect written consent and conduct pre-assessment
mental health measures (Beck Depression Inventory, Beck Anxiety Inventory and Resilience Scale).

In the first of five formal sessions, ethics, camera training, group norms were discussed, written consent from each participant was reviewed and a problem-posing question was ideated (for example: *what is the impact of water scarcity on well-being and livelihood*?). The introduction components included pictorials (e.g. drawing of a locked box to highlight confidentiality) were used due to literacy of the groups. During the analysis sessions, the images were deconstructed using a SHOWeD process, where the women reflected on what they saw in the picture, how it related it to their lives, and what action they could take to help mitigate the problem. The mnemonic SHOWeD analysis questions consist of: What do you See in the photograph? What is Happening in the photograph? How does this relate to Our lives? Why does this problem or strength exist? How do we become empowered with our new social understanding of problem-posing questions? What can we Do about it? These questions helped foster critical dialogue. This standard process was modified slightly to meet the cultural and contextual context (see Appendix D). For example, the “empowered” question was removed because we were concerned that despite high levels of NGO activity in Jumla, there is a tendency to use the word “empowerment” without the provision of sustainable services. With the relatively short duration of our time in the field, we did
not want to raise expectations or risk any repercussions by using the word “empowered” since it was a sensitive topic in the community.

At the end of each session, the next problem-posing question was identified (see Appendix E for full list of photo assignments for each group). In the final session, we reviewed themes, salient quotes from the women’s narratives and agreed on what photographs would be displayed at the photography exhibit – the culmination and synthesis of the project shared with the community (see Appendix F).

The photovoice sessions typically have a week between each session (to provide time to take photographs). Due to the nature of the participants’ schedules, the photovoice sessions were held on consecutive days. The women often referred to this series of sessions as ‘photovoice training’ because there were learning how to use cameras for the first time. We want to be clear that the women were not receiving photovoice facilitation training. Each photovoice session was conducted in the future home of the Transcultural Psychosocial Organization (TPO) and HeartMind International (HMI) Jumla Counseling Center. Each session had a team-building warm-up and closing, consisting of yoga, song and dance. Following the final session, exit interviews (some individual, others in pairs due to time constraints) were conducted at two time points, immediately following the final session and at a two-week follow-up session (see Appendix B). Exit interviews typically lasted 30-60 minutes. Mental health
self-report questionnaires were administered one-on-one at pre-session and two-week follow-up (during second time point exit interview) and typically lasted 30 minutes.

Photovoice sessions and exit interviews were conducted in Nepali and co-facilitated by a Nepali research assistant and foreign researcher. The sessions were summarized in English throughout each session and transcripts were later translated into English for analysis. All but the Bahun/Thakuri second round exit interviews were completed before the photography exhibits due to the timing of photovoice sessions. Participants were compensated with lunch and a small daily travel stipend in accordance with local customs for compensation. All study procedures were approved by ethical review boards at Duke University and Nepal Health Research Council (NHRC). The approval numbers are Pro0052631 and 50, respectively.

2.4 Measures

2.4.1 Beck Depression Inventory (BDI)

The Beck Depression Inventory (BDI) is a 21-item scale used to assess depression symptoms in participants. Items are scored 0-3 with an instrument range of 0-62. The BDI has been validated for us in Nepal (Kohrt et al., 2002). Based on clinical validation of the BDI in Nepal, a score of 20 or higher suggest moderate depression with the need for mental health intervention (sensitivity=.73, specificity=.91). In a cross-sectional representative sample, the BDI’s Cronbach alpha – which represents internal reliability
was high – at $a=.90$; two-week test-retest reliability Spearman-Brown coefficients for the BDI were .84 (Kohrt et al, 2012).

### 2.4.2 Beck Anxiety Inventory (BAI)

The Beck Anxiety Inventory (BAI) is a 21-item scale used to assess anxiety symptoms in participants. Items are scored 0-3 with an instrument range of 0-62. The BAI has been validated for us in Nepal (Kohrt et al., 2003). Based on clinical validation of the BAI in Nepal, a score of 17 or higher suggest moderate anxiety with the need for mental health intervention (sensitivity=.77, specificity=.81). In a cross-sectional representative sample, The BAI’s Cronbach alpha – which represents internal reliability was high – at $a=.90$. Two-week test-retest reliability Spearman-Brown coefficients for the BAI were .88 (Kohrt et al, 2012).

### 2.4.3 Resilience Scale (RS)

The Resilience Scale (RS) is a 26-item scale used to assess resilience in participants (Wagnild and Young, 1993). Items are scored using a Likert Scale 1-7 ($1=$strongly disagree,$7=$strongly agree). Possible scores range from 26 to 182, with higher scores reflecting higher resilience. Cronbach’s alpha – representing internal validity – was high at $a=.89$ (Wagnild and Young, 1993).

### 2.5 Analysis

Qualitative transcripts were transcribed and translated from Nepali to English by Nepali research assistant. NVIVO for Mac (version 10) was used to code data and write
memos using a grounded theory approach. A codebook was developed and each transcript was coded for themes. An example conceptual model on water scarcity was created based on coding (Figure 2). Themes and conceptual model were reviewed by Nepali research assistant.

The mental health instruments (BDI, BAI, and RS) were quantitatively analyzed using STATA software 13.1. The data were entered in excel by research assistant and checked by principal investigator (PI). Missing data was dropped; one missing data score from yBDI, 12 yBAI missing data scores (11 of which were from one participant – participant # 11 - whom we dropped entirely from the BAI pre-post paired T-test) and two missing data scores from yRS were dropped. There were no outliers. A comparison of pre and post- mental health assessments were performed through paired T-tests.
3. Results

3.1 Demographics of photovoice participants

Ten women participated in the photovoice process. The age range was 27 to 49, mean age was 37.5. Eight women were illiterate. All women were Hindu, five were Dalit/Nepali (low caste, also locally identified as Nepali caste) and five were upper caste (Bahun or Thakuri). Because the vast majority of the upper caste women are Bahun (only one Thakuri), from this point forward upper caste will be referred to as “Bahun” only (Table 4).

Demographics were collected including age, religion, education, and caste groups. Caste groups were recorded based on locally used categories and were included in the study because of previously identified associations between caste and mental health (Kohrt et al., 2009).
Table 4: Demographics of photovoice participants

<table>
<thead>
<tr>
<th>#</th>
<th>Gender</th>
<th>Caste</th>
<th>Age</th>
<th>Education</th>
<th>Religion</th>
<th>Marital status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>Dalit/Nepali</td>
<td>49</td>
<td>Illiterate</td>
<td>Hindu</td>
<td>Married</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>Dalit/Nepali</td>
<td>44</td>
<td>Illiterate</td>
<td>Hindu</td>
<td>Widowed</td>
</tr>
<tr>
<td>3</td>
<td>Female</td>
<td>Dalit/Nepali</td>
<td>45</td>
<td>Illiterate</td>
<td>Hindu</td>
<td>Married</td>
</tr>
<tr>
<td>4</td>
<td>Female</td>
<td>Dalit/Nepali</td>
<td>25</td>
<td>Illiterate</td>
<td>Hindu</td>
<td>Married</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>Dalit/Nepali</td>
<td>45</td>
<td>Illiterate</td>
<td>Hindu</td>
<td>Married</td>
</tr>
<tr>
<td>6</td>
<td>Female</td>
<td>Bahun</td>
<td>27</td>
<td>Illiterate</td>
<td>Hindu</td>
<td>Married</td>
</tr>
<tr>
<td>7</td>
<td>Female</td>
<td>Bahun</td>
<td>30</td>
<td>School Leaving Certificate (SLC) - 10th grade equivalent</td>
<td>Hindu</td>
<td>Unmarried</td>
</tr>
<tr>
<td>8</td>
<td>Female</td>
<td>Bahun</td>
<td>27</td>
<td>Auxiliary Nursing &amp; Midwifery (ANM), Bachelor of Education (B.Ed)</td>
<td>Hindu</td>
<td>Married</td>
</tr>
<tr>
<td>9</td>
<td>Female</td>
<td>Bahun</td>
<td>40</td>
<td>Illiterate</td>
<td>Hindu</td>
<td>Married</td>
</tr>
<tr>
<td>10</td>
<td>Female</td>
<td>Thakuri</td>
<td>43</td>
<td>Illiterate</td>
<td>Hindu</td>
<td>Married</td>
</tr>
</tbody>
</table>

3.2 Photovoice session results: Assessing the association between the effects of climate change on daily life and mental health and psychosocial (MHPS) impacts - Specific Aim1

Many themes emerged from the photovoice discussions including water scarcity, disease (both physical and mental), livelihood issues, discrimination of women, adaptive environmental solutions, community resource identification, desire for foreign aid, and impacts of alcoholism in the home and community. Figure 3 and Figure 4 show the photograph that was selected to conduct the SHOWeD process from each photovoice session by the Dalit/Nepali and Bahun women, respectively. Both photovoice groups picked photographs to analyze that represented water issues, land issues, and disease (See Figure 3 and Figure 4). The two main themes most relevant to the specific aims of
this paper are: water issues (both scarcity and monsoon) and disease (both physical and mental). The other themes from the photovoice discussions (mentioned above) overlapped and intersected with these two main themes and will be discussed tangentially. Also, of note, the Bahun women discussed existing community resources and ideas for proactive adaptation more than the Dalit/Nepali women.

3.2.1 Water Scarcity: “The blood in our body is nothing other than water, if no water in body, that person dries up.” –Dalit/Nepali Woman, 25-years old

Women discussed both water scarcity and drought in similar ways. They shared that there is no water in the fields, no water to cook rice, no water to wash clothes and no water to drink. According to the women, there were caste differences with availability of water. In addition, both castes agreed the there was a lack of funding from the municipality to provide proper water taps (see Figure 2 for an example conceptual model). The Bahun women discussed water scarcity in contrast to monsoon season. The monsoon – they said – was equally harmful as drought, as the abundance of rain also destroyed crops. A 30-year-old Bahun woman shares, “neither drought nor rain gives us peace.”

One 45-year old Dalit/Nepali farmer participant reflected:

“Yesterday, I had gone far away than Urtu to work. At home, there was no water coming from the tap, so what to do? My granddaughter had cooked rice, which was half cooked due to lack of water. I went running to the other tap of higher caste people, they didn't allow us to fill my vessel, I came back to home, the rice was half cooked and burnt, what to do? I have come home tired, my daughter in law who had gone to work in the field had not returned till late, what to do granddaughter is crying the cows are bleating.
We served the half cooked rice to our children, my daughter in law and I slept empty stomach.”

Another 45-year old Dalit/Nepali woman farmer shares:

“All the rivers have dried up, so no water in the field. Our tap has also dried up, we have no water to drink. The half duration of monsoon has passed yet no rain, couldn’t plant crops and vegetables. Now we need to buy and eat. For now, we fetch water from river and drink. There is no water for livestock, they are going to die, at home also, we have nothing to eat, and there is no vegetables to eat.”

One 43-year old Bahun woman discusses the complexity of the relationship between water scarcity and monsoon flooding:

“…the problem is drought. During drought, everything dries up. All the plants dry up. It is not feasible to carry water from river and apply on plants…and in rainy season, landslide sweeps away everything, this is also big problem [laughter between women]…we work so hard to save our crops in drought, then the rain comes and washes away everything [more laughter]”

Some women reported drinking water from the irrigation canal as it is the only source of water for them. Others reflected that the root cause of water scarcity is god punishing the community for its collective sins. The 45-year old Dalit/Nepali woman continues, “It’s not just tap water, there is no water from heaven, so plants are deceived, no water from tap- so we are deceived.”

Some Dalit/Nepali women equated the water scarcity with caste discrimination saying upper caste people did not share from their individual taps. A 44-year old Dalit/Nepali woman farmer says, “this is how the Dalit/Nepali women lives. All other, upper caste people have jobs, have tap in home, his wife will also have facilities, in our case, we have no land, no water, we have to eat by working as labor, in all 75 districts, this is how the Dalit/Nepali women live, and thinking this my heart has ached.”
On the other hand, one upper caste 43-year old Bahun woman shares that the poverty and livelihood struggle is present for their caste as well:

“At home, we have tap which supplies drinking water, we can’t use that water much, because there is water measuring meter which keeps record of water consumption in liters. If we consume more water, we will have to pay more, in here due to poverty, it’s difficult for us to pay lot of money.”

Figure 2: Conceptual Model of women’s perceptions water scarcity origins, impacts and potential adaptations.
<table>
<thead>
<tr>
<th>Problem-posing question</th>
<th>Representative quotes</th>
<th>Photovoice results</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are problems faced due to drought?</td>
<td>“This woman who has gone to plough the field is lying sad thinking how to grow food.”</td>
<td></td>
</tr>
<tr>
<td>What are the impacts of water scarcity?</td>
<td>“Due to lack of water, these cows lick on the soil…There is not water, life seems dried up.”</td>
<td></td>
</tr>
<tr>
<td>Due to <em>hawapani bigriyera</em> (climate change), what diseases are contracted by us?</td>
<td>“Due to lack of drinking water, my little granddaughter is suffering from diarrhea and vomiting. This little child is suffering; sometimes her fever is going high, sometimes low. Elder people are also getting sick, I am also sick, I have dysentery”</td>
<td></td>
</tr>
<tr>
<td>What are the impacts of alcoholism?</td>
<td>“Not just beating wife is the problem, the problem is our child can’t study in school, and her brain would not focus in the study, when father and mother fight, and she can’t digest her meal. There is no benefit done by alcohol, its all disadvantages.”</td>
<td></td>
</tr>
<tr>
<td>Problem-posing question</td>
<td>Representative quotes</td>
<td>Photovoice results</td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>What are problems in monsoon season?</td>
<td>“Once the rainy season comes, it brings in lot of landslides as well. It could be dangerous to our health. Apart from that, with the rainy season, the surrounding is very dirty, there will be human as well as animal feces, this dirt will come in our drinking water, we will catch different diseases such as typhoid, diarrhea, dysentery, cholera and other skin disease such as scabies.”</td>
<td></td>
</tr>
<tr>
<td>What are the problems to grow vegetables in the winter?</td>
<td>“During winter, due to lack of vegetables, there is lot of problems, initially there is problem of money, during rainy season, and we sell vegetables and earn money. Even for our health, we need to eat green vegetables, from that we get vitamins. So, there is problem of money as well as health.</td>
<td></td>
</tr>
<tr>
<td>What are the causes of stress?</td>
<td>“Despite working very hard in the field, we cannot have good harvest; this gives pain in my heart.”</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: Photograph assignments taken by Bahun (upper caste) photovoice participants
3.2.2 Disease: “From outside, our face is fine, disease is inside, and we can’t take pictures of inside. But we can take picture of someone who is in pain.” -25-year-old illiterate Dalit/Nepali woman

Disease was a common topic of conversation from both the Dalit/Nepali and Bahun photovoice sessions. It was inextricably linked to environmental issues (environment being both built or natural) and captured both physical and mental well-being. Sources of sickness were due to lack of clean water, water scarcity, food scarcity, financial scarcity, abusive husbands and pollution, to name a few.

For example one 44-year old Dalit/Nepali woman mentioned, “due to the water scarcity if the person who has walked for long time and is out of breath and he is thirsty, he gets no water to drink so he is sick now.”

The disease was often discussed in the context of the kitchen and the ability to cook nutritious food. For example the 45-year old Dalit/Nepali participant who took a photograph of her granddaughter who was sick reflects,

“Eating and drinking in time, there will not be any disease. If we do not work, we have nothing to eat. After working whole day, we get back home, at home, there is no fire in fireplace, no water in water vessel and the stomach is empty. This grandchild is sick, because of this drought and lack of water, there are flies everywhere, no water to clean up, and then the sickness becomes more severe. Her eyes will sunken, her face will sunken, that’s all.”

A 27-year-old Bahun woman can relate to the stress caused by this, commenting, “so if the child can’t be provided balanced diet from the kitchen that also increases our stress. Moreover if one cannot eat balanced diet herself, that also causes stress.” The Bahun woman went on to say, while laughing, “There is a saying-- the man dies hoping
to marry next wife, the wife dies worrying what to cook for dal [laughter] …that is what happens.”

This gender differential in caring for the environment was a theme for both castes. For example, one 43-year old Bahun states, “About us, we are stressed because the tomatoes are rotten, but they [the men] don’t care about it.”

Adaptive strategies that emerged from the group conversation included: traditional healing (using herb remedies for disease), talk therapy (“when we are chatting and laughing, our heart is lighter, but as the dusk approaches and we enter our home, then tears flows through our eyes, we are startled” - 44-year-old Dalit/Nepali woman), foreign aid (financing medicine and technical expertise from foreign investments), going back to eating locally sourced foods (instead of the foreign rice that has been imported), eating less processed food (“we eat food covered in plastic, we are also like plastic” – 25-year-old Dalit/Nepali woman) and educating the youth about what is healthy to eat and best hygiene practices.

After some discussion, all of the women agreed that the biggest cause of disease was stress (“well the truth is, the biggest cause of disease is stress” - 45-year-old Dalit/Nepali woman). For example, she continues, “So instead of being stressed after your husband beats you or quarrels with you, even after that, if you eat stomach full and laugh loudly, then you are healthy. But if you take stress and stop eating, e.g. I took stress and didn’t eat before my dumb son was born. So stress gives rise to [his] disease.”
The biggest cause of stress, according to the women, was alcohol ("Where there is spreading of alcohol, the stress also spreads" -49-year-old Dalit/Nepali woman). This stress creates suicidal thoughts and "had it not been for the children, I would have committed suicide, for their sake, I am still alive" (45-year-old Dalit/Nepal woman). The women talked about alcoholism and stress as a contagious phenomenon that could be passed down to generations. In addition, the women share that alcoholism and stress are perpetuated by environmental changes ("it's not human spoilt, it's the environment spoilt" -25-year-old Dalit/Nepali woman). As mentioned above, the environment, such as a failed crop (e.g. rotten tomatoes) is a cause for stress. "Nature has also cheated us, and such is the topography, geography of Jumla", 27-year-old Bahun states. The Bahun women also mentioned the inability to find time to study was a stressor. See Figure 5 for diagram of themes discussed by lower and upper caste groups.

![Venn diagram of themes discussed by caste group](image)

*Figure 5: Venn diagram of themes discussed by caste group*
Two photography exhibits were erected in the community – one for each photovoice group. The Dalit/Nepali group’s photography exhibit was housed in a future women’s center in a village in the hills. The Bahun/Thakuri group’s photography exhibit was housed in the Transcultural Psychosocial Organization (TPO)’s office. Both men and women – young and old – attended the exhibits (though the attendance was majority female). Influential advocates were invited to both exhibits. Environmental advocates from Local Initiatives for Biodiversity, Research, and Development (Li-Bird), and mental health advocates from Transcultural Psychosocial Organization (TPO) attended the Bahun/Thakuri exhibit. Li-Bird – with a local focus on climate change mitigation and adaption - expressed interest in continuing environmentally-focused photovoice groups in the community.

3.3 Specific Aim 2a: Exploring photovoice as a one-time four to five day intensive intervention - exit interviews results

In qualitative interviews after photovoice, women reported climate change adaptation, behavior change strategies and positive mental health outcomes including (1) benefits of sharing environmental best practices, (2) importance of building community capacity to adapt to and mitigate for environmental issues in the community and (3) importance of sharing stories during photovoice to build confidence and ease pain. In addition (4) there were barriers to the sustainability of photovoice sessions (see
Finally, there were caste differences with regards discussion of adaptive qualities.

Table 5: Participants' accounts of mental health impact

<table>
<thead>
<tr>
<th>Theme</th>
<th>Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits of sharing environmental best practices</td>
<td>“We talked about water scarcity, drought, and we understood about the pain in our heart, this is very big learning… if we try to dig deeper, there will be made a hole in the ground, but if we don’t dig the ground will be smooth. That is if you want to keep on digging deeper, there will always be more to share.”</td>
</tr>
<tr>
<td></td>
<td>25-years-old, Dalit/Nepali, illiterate</td>
</tr>
<tr>
<td>Importance of building community capacity to adapt to and mitigate for environmental issues in the community</td>
<td>“I am helpless woman, I have in my heart the wish to helping other helpless woman...Uniting all women, sitting in a group and conducting meeting, I want to do these things.”</td>
</tr>
<tr>
<td></td>
<td>44-years-old, Dalit/Nepali, illiterate</td>
</tr>
<tr>
<td></td>
<td>“To solve this problem whenever there is any program in the community…there should be equal participation of both male and female rather than targeting just female or just male. When you do that, if most of the participants are female then male will not listen and vice versa. And the most important thing is education, educated people have open mind.”</td>
</tr>
<tr>
<td></td>
<td>27-year old Bahun. Literate</td>
</tr>
<tr>
<td>Importance of sharing stories to build confidence and ease pain</td>
<td>“In this training, we learned that we women need to come together and talk and sing and dance. We all women have pain in our heart, so we can come together, talk funny things and smile too to get rid of pain, this also we learned. … Besides that I also learned to speak in front of people.”</td>
</tr>
<tr>
<td></td>
<td>49-years-old, Dalit/Nepali, illiterate</td>
</tr>
<tr>
<td>Barriers to sustainability of photovoice</td>
<td>“Without remuneration who will come to take training? These women from village, when they have to speak in front of the group, their heart trembles…so if there was no money being given, why would they come then?”</td>
</tr>
<tr>
<td></td>
<td>45-years-old, Dalit/Nepali, illiterate</td>
</tr>
</tbody>
</table>

Exit interviews highlighted barriers to maintaining photovoice projects in the community (Table 5) including: no one to train or facilitate; no funding to participate (60% said they would need compensation and food to participate in facilitator training or future photovoice sessions); and envy from non-participants in the community.
Notably, though 40% stated needing a non-peer facilitator, 60% said they could self-facilitate if facilitator training were available. The Dalit/Nepali women were more effusive when talking about the photovoice sessions as well as being more enthusiastic about participating in a subsequent photovoice project.

### 3.3.1 Caste Differences when ideating solutions “We need to work hard, not to harm others.”

Bahun women expressed more adaptive capabilities, innovations and ideas when discussing issues with the environment. There was also a sense of accountability and ownership (which then translated into feeling empowered to be change agents). For example a 27-year-old Bahun woman shared,

“What I feel is, though I am a part of a problem, I can take few small steps like, I can plant a tree after cutting one tree. I can educate my children. I can keep my surrounding clean. I can speak good things and I don’t want to be a leg puller. If I do good things like these and then people will also follow. That is how our society will progress. We should behave positively with everyone and not to think negatively about others. We shouldn’t lie.”

Both castes agree that unity is one of the most important mechanisms to create change (“the most important thing is unity, if we all unite, go together and tell them [NGOs, Gov’t] about our problems, and if they have financial resources they will help as well” -27-year-old Bahun woman).

### 3.4 Specific Aim 2b: Exploring photovoice as a one-time four to five day intensive intervention - Mental health self-report results

Quantitative instruments also revealed that women reported beneficial effects for mental health. Paired t-tests revealed a significant reduction in depression and anxiety as well as a significant increase in resilience. The mean BDI_{all women} score prior to
photovoice was 23.20 (SD=9.00), range 14-42 and two weeks after completion of photovoice, the mean BDI allwomen score was 7.44 (SD=8.05), paired t-test = 7.97, p<.001, n=10. The mean BA allwomen score prior to photovoice was 25.11 (SD=9.96) and two weeks after completion of photovoice, the mean BA allwomen score was 12.32 (SD=7.61), paired t-test = 3.447, p=0.009, n=9. The mean RS allwomen score prior to photovoice was 129.40 (SD=6.03) and two weeks after completion of photovoice, the mean RS allwomen score was 172.2 (SD=3.06), paired t-test = -5.90, p<.001, n=10.
4. Discussion

4.1 Results summary

The goals of this study were to use photovoice to assess the association between the effects of climate change on daily life and mental health. In addition the aims were to investigate whether community-based participatory research can help women in a vulnerable developing country setting understand and adapt to important environmental challenges related to climate change; and whether this activity could help promote mental health. While further studies using larger samples and different settings will be needed to confirm these findings, women subsistence farmers in this study reported reduced depression and anxiety and increase in resilience after sharing stories and ideas using photovoice.

The women shared that they learned many things about their lived experiences during photovoice regarding their environment. Topics included drought, mental health, and environmental best practices in Jumla, Nepal. The women also talked about the importance of community support, specifically support from other women in the context of environment. The photovoice sessions provided a venue for this community support and capacity building. Each session included singing, dance, yoga, and personal story-telling. In the exit interviews they highlighted a strong desire for a women’s group to come together and attend future photovoice sessions. Quantitative instruments’ – including Beck Depression Inventory, Beck Anxiety Inventory and Resilience Scale –
showed that women reported beneficial effects for mental health and results are significant.

4.2 Specific Aim1: Photovoice session discussion: Assessing the association between the effects of climate change on daily life and mental health and psychosocial (MHPS) impacts -

We hypothesized that perceptions of environmental disturbance (both realized and anticipated) due to climate change would be associated with negative mental health and psychosocial impacts. And women in the lower caste (Dalit/Nepali) would express greater negative mental health impact than those that have greater socioeconomic status (upper caste women). The results support this as well as supporting literature.

4.2.1 Water Scarcity

According to “Drought as a mental health exposure” (Obrien et al., 2014) – which quantifies drought in terms of duration and intensity of relative dryness – there is an association with drought and increased distress for rural dwellers. Previous quantitative studies have only looked at drought and suicide. Using time-series analysis, these studies found a relationship between reduced precipitation and a rise in local suicide rate (Hanigan et al., 2012; Nicholls et al., 2006). Obrien et al (2014) stressed the importance of locality and that rural areas were more sensitive to drought conditions. Though this research is qualitative in nature, it reflects these findings that drought (particularly in rural Jumla) has an impact on livelihood, food production and mental
well-being. It is important to note that these studies reflect related topics to climate change (E.g. drought) and do not mention climate change specifically.

4.2.2 Disease

One of the primary concerns for disease was food scarcity. Much of the dialogue focused on stress with cooking in the kitchen, crop failure, and lack of water - all of which the women related to disease. In the May 2014 World Nutrition issue, McMichael, Berry and Butler discuss the effects of climate change on food systems – particularly the decline in regional food yields and freshwater shortages. The participants in this study felt these two issues of food scarcity and water scarcity. The article commented on “climate-sensitive illnesses” such as under-nutrition and diarrheal disease – that will only be exacerbated by climate change, particularly in poorer and vulnerable populations. In this study, every woman spoke of these climate-sensitive illnesses and shared first hand experiences living with them. As in Uganda (Berrang-Ford et al., 2012), the Nepali women’s photovoice discussions elucidated climate-sensitive health issues and showed how social and cultural factors influenced these.

The photovoice exhibits provided the first step to creating a forum to discuss mental health as it relates to climate change. Decision-makers in the community visited the upper caste photography exhibit and engaged in critical dialogue around the thematic topics presented. However, these decision-makers did not attend the opening of the lower caste exhibit, likely due to the 30-minute hike up to the village to attend.
This suggests that access is essential when sharing data and should be considered in future projects.

**4.3 Specific Aim 2a&b: Exploring photovoice as a one-time four to five day intensive intervention**

Sharing stories during the photovoice sessions promoted positive mental health outcomes including, relief from pain, tension, anxiety, as well as building confidence and resilience. These Nepali women engaged with and enjoyed photovoice, supporting the view that participatory methods represent ethical, feasible and culturally-appropriate approaches to engage community members for mental health promotion in the context of climate change (Wang and Burris, 1997); and that these methods can help reduce health disparities (Wallerstein and Duran, 2006). Photovoice could thus be used as a community-based and participatory mental health intervention in the context of climate change.

We hypothesized that women in the lower caste group would be impacted more by environmental changes. The results support this as do previous findings by Berry (2011) entitled, “Climate Change and Farmers’ Mental Health: Risks and Responses”, which concluded that rural vulnerability to climate change is compounded by socioeconomic disadvantage.

As hypothesized, the baseline mental health of the farmers was poor and both groups (Dalit/Nepali and Bahun) were suffering from depression and anxiety. Farmers of all castes reported less hope for their future than non-farmers according to Hogan et
al (2008). Even more so, a major effect of climate change on mental health will be through its effect on growing health inequalities (Costello et al., 2009). This is particularly true and salient in a low-income country, such as Nepal, and a rural area, such as Jumla.

The change to positive mental health outcomes after the photovoice intervention also aligned with the hypothesis that both groups would increase. However, we don’t know if photovoice was the active ingredient without a comparison group of some kind and therefore cannot attribute causality. We hypothesized Dalit/Nepali caste would more positively affected by training. Though the sample size was two small to make comparisons across groups, the Dalit/Nepali women were more effusive of the photovoice process as well as expressed a greater desire to participate in photovoice in the future during the exit interviews. Historically, photovoice has been used with the most marginal groups in society, and has benefited these groups the most (Catalani and Minkler, 2009).

4.4 Implications for policy and practice

Photovoice, as a participatory method, has potential to inform resources, adaptive strategies and potential interventions for climate change and mental health. Exit interviews revealed three themes: the benefits of sharing environmental best practices; the importance of building community capacity to adapt to and mitigate for
environmental issues in the community; and the importance of sharing stories to build confidence and ease pain.

These findings imply that local Jumla policy should be adapted to support women in place and that dedicated resources are needed for this. Community health workers can help by promoting community resilience and educating communities about the mental health effects of climate change (Maughan, 2014). Photovoice can be used as a well-accepted tool to achieve these goals, particularly for building needed social capital.

### 4.5 Implications for further research

Results illustrate opportunities for further research including future photovoice projects (the women mentioned the need and desire for both photovoice projects from the men’s perspective, as well as photovoice projects with both men and women present), a more systematic comparison and longer term horizon to investigate whether or not photovoice as an intervention can be used to sustain positive mental health outcomes, and a comparison of photovoice sessions with other communities (either comparable communities to Jumla, or more urban environments such as Kathmandu). An investigation of alcoholism and gender-based violence (GBV) – other salient themes that emerged - could also be explored.
In addition, mental health and climate change must be empirically studied. For example, an assessment of whether the prevalence of mental health indicators of well-being is greater among farmers than in comparison to a more urban population (e.g. Kathmandu) – this is similar to Berry et al (2011) suggestion for future topics needed to be explored to elucidate patterns of mental health risks and outcomes.

**4.6 Study strengths and limitations**

One of the biggest strengths of the study was the participatory methodology used. This encouraged community-capacity development and women empowerment in the community. Using mixed-methods (including mental health measures at baseline and two weeks after photovoice sessions) is an important contribution to the literature.

In addition, photography exhibits (that remain permanent installments in the Jumla community) highlighted women’s photographs and narratives providing the opportunity to share stores and concerns with the broader community and engage others in dialogue. The strong partnership with Transcultural Psychosocial Organization – Nepal was an integral part of the study as it provided expertise regarding psychosocial ethical considerations, had existing relationships with people in Jumla, and helped oversee the study’s progress. An additional strength regarding this partnership is the enthusiasm about learning more about photovoice methodology. A training session was held at the Transcultural Psychosocial Organization’s Kathmandu office, as well as training materials left at the office to encourage future participatory photovoice projects.
Though photovoice methodology was a strength for its participatory nature, much of the analysis of the themes and the development of the conceptual models happened after the principal investigator left Nepal. Though the themes and conceptual models were reviewed by the Nepali research collaborator and translator for feedback, they were not reviewed by the participants. This is a limitation of the data analysis process.

One of the themes that emerged throughout the conversations was the sustainability of photovoice methodology. These barriers to the sustainability of photovoice paralleled some of the limitations of this work. Due to the participatory model of the project the participants were highly engaged with one another, which may bias narratives or results on mental health instruments (Beck Depression Inventory, Beck Anxiety Inventory, Resilience Scale). Implementation of photovoice in the future should closely consider season, time-of-day, duration and frequency of sessions, physical space, compensation, participant gender and caste dynamics. Creating opportunities, such as photovoice, to share stories about the changing environment may help to strengthen mental health and emotional capacity (Doherty and Clayton, 2011).

A few ethical concerns also are potential limitations of the study. Mental health is a sensitive topic and potential stigmatization of community members may result in talking about mental health in a participatory, group setting. Even though much effort was used to set expectations, the available mental health resources (future and present)
may have been misperceived. In addition, social desirability may arise where the participants may be biased in their self-report mental health questionnaires leading to an over-reported positive mental health impact results.

The data in this study have limited generalizability to other areas due to small sample size and purposive sampling of the recruitment of the participants. In addition, photovoice as a methodology is relatively new, which may bias results. Finally, limitations may arise due to interpreter and translator biases.
5. Conclusion

Climate change and mental health is an emerging field – one that is essential to focus on in the 21st Century. The relationship between mental health and climate change is complex, and no studies to date have examined empirically how climate change can impact mental health of community in Nepal. Participatory methods represent ethical, feasible, and culturally-appropriate approaches to engage community members for mental health promotion in the context of climate change.

Women subsistence farmers in developing country settings face formidable climate change risks. Photovoice, as a well-accepted participatory method, can help identify local and existing resources (e.g. women’s groups, existing environmental training), generate adaptive strategies and promote mental health. This study highlights the importance of climate change-related mental health and emotional responses and their effect on adaptive capacities, coping and community capacity. Creating opportunities, such as photovoice, to share stories about the changing environment, and to discuss adaptive responses, may help to strengthen emotional resilience.
Appendix A

Photovoice process: focus group discussions

Photovoice Focus Group Discussion – high-level overview

1. Brief introductions – of field team, PhotoVoice methodology, objectives of study
2. Reiterate consent process, rights as a participant and how participation in Focus Group is voluntary
3. Group introductions – each participant introduces oneself
4. Group norms – identify, list and get feedback from the group
5. Photovoice camera training – teach participants how to use a camera, etc.
6. Send participants out for 2-5 hours to take photographs under the question: “How has the environment affected you or your family or your community’s well-being?”
7. Regroup with participants and share photographs
8. Discuss photographs using SHOWeD methodology
   a. Questions to help guide discussion
      i. What do you SEE in this photograph?
      ii. What is HAPPENING in this photograph?
      iii. How does this relate to OUR lives?
      iv. WHY do these issues exist?
      v. How can we become EMPOWERED by our new social understanding?
      vi. What can we DO to address these issues?
9. Generate themes
10. Gather oral feedback form participants on process
11. Discuss next meeting and participants’ preferences
12. Determine next meeting time and place
13. Following meeting – field team meets (over the course of 2 separate meetings) to (1) debrief, discuss next steps, ideate next question for next Focus Group session and (2) begin to analyze qualitative data (transcript from focus group)

Example Photovoice assignment: Take pictures of things that have changed in Jumla. Take pictures of things that have hardly changed at all.
EXAMPLE FOCUS GROUP DISCUSSION SESSIONS

I. Introductory session with participants recruited with help of key informants and research assistant in Jumla

1. Obtain human subjects approval & consent
2. Review informed consent, confidentiality, and photography etiquette
3. Explain Photovoice project & timeline (with time for questions)
4. Establish group norms
5. Distribute cameras (that participants will bring back to next session)
6. Identify first Photovoice assignment

II. 3-PhotoVoice Assignment sessions (sessions will be audio recorded and later transcribed and translated without identifiable material)

1. Review photographs and have group pick 1-2 to discuss
2. Utilize SHOWED methods to identify themes
3. Create next PhotoVoice assignment

III. Final/Wrap-up session

1. Review common themes and get participants feedback
2. Discuss next steps (include presentations to class and partner organization)
3. Participants to return cameras and data cards
Appendix B

Exit interview guide (semi-structured): 2 time points

EXIT INTERVIEW ROUND #1: INITIAL REFLECTIONS

1. What was your favorite part of the training?
2. What was your least favorite part of the training?
3. How would you change or improve the training?
4. Would you recommend the training to a friend?
5. What was your biggest take-away?
6. How were the group dynamics for you (did you feel you built more sense of community in this group? Why or why not?)?
7. Did you learn anything new about yourself during the training?
8. Did you learn anything new about your community during the training?
9. Did you learn anything in which you will apply in your life?
10. What skills did you take away? Are they applicable in your life? If so, how?
11. How was your experience working with a foreign researcher?
12. What do you feel in your heartmind in this moment? *

*This question was added for the second photovoice training wit the Chhetri women.

EXIT INTERVIEW ROUND #2: WHAT CHANGED

1. Two weeks out, how are you feeling about training?
2. Looking back two weeks ago, what was your favorite part of the training?
3. Looking back two weeks ago, what was your least favorite part of the training?
4. Looking back two weeks ago, what would you change or improve about the training?
5. What else do you remember about the training from two weeks ago?
6. In the past two weeks, how have you applied what you have learned during the training?
7. What do you feel in your heartmind in this moment?
8. If given the space, would you do photovoice as peer facilitation? What about Nanda Raj as a facilitator?
9. SHOWeD process: What additional training would you need to lead?
10. Would you need compensation? Food?
Appendix C

Photovoice session plan

<table>
<thead>
<tr>
<th>Photovoice sessions</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-introduction</td>
<td>Pre-photovoice assessments (BDI, BAI, Resilience Scale)</td>
</tr>
<tr>
<td>Introduction</td>
<td>Ice-breaker, consent forms, confidentiality, photovoice ethics, introduction to SHOWeD, camera demonstration, decide on first question</td>
</tr>
<tr>
<td>Photovoice assignment #1</td>
<td>SHOWeD Method, Heartmind mapping, decide 2\textsuperscript{nd} question, transcribe session</td>
</tr>
<tr>
<td>Photovoice assignment #2</td>
<td>SHOWeD Method, resource mapping, decide 3\textsuperscript{rd} question, transcribe session</td>
</tr>
<tr>
<td>Photovoice assignment #3</td>
<td>SHOWeD Method, measurement tool, transcribe session &amp; theme ideation</td>
</tr>
<tr>
<td>Final session</td>
<td>Present initial themes &amp; preliminary results</td>
</tr>
<tr>
<td>Post-final session</td>
<td>Post-photovoice assessments (BDI, BAI, Resilience Scale), exit interviews</td>
</tr>
</tbody>
</table>
Appendix D

Photovoice adaptation to use in the field

1. **Photovoice Standard Methodology**
   - SHOWeD methodology:
     - What do you SEE?
     - What is HAPPENING?
     - How do these issues relate to OUR lives?
     - WHY these issues?
     - How can we become EMPOWERED with our new understanding?
     - What can we DO?
   - N=5

2. **Photovoice + Child Led Indicator methodologies combined & adapted**
   - Drop the “E” (empowered) from SHOWeD
   - Inclusion of CLI methods including Heartmind mapping, resource mapping
   - Addition of participatory, community-measurement exercise

3. **Methodology used in the field**
   - Dropped “E”
   - Did not formally do mapping exercise
   - Asked questions about measurement, heartmind & resources
   - Pre & post-assessments (BDI, BAI, & Resilience Scale)
   - N=5 (2 groups)
### Photovoice + Child Led Indicator methodologies combined & adapted

#### Data Collection: SHOWED Method

<table>
<thead>
<tr>
<th>See</th>
<th>What do we literally SEE in the photo?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concrete Questions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Happen</th>
<th>What is HAPPENING in the photo?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concrete Questions</td>
</tr>
</tbody>
</table>

| Do | How do these issues relate to OUR lives and how do we feel about them |
|    | Personalizing Questions          |

| Why | WHY have these issues arisen (on an individual, family, and societal level)? |
|     | Analytic Questions               |

<table>
<thead>
<tr>
<th>Experience</th>
<th>Are you, as a team, EMPowered with our new social understandings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Problem Solving</td>
</tr>
</tbody>
</table>

| Do | What can we DO about these issues in our lives? |
|    | Problem Solving |

(See Wallenstein, 1994)

#### Adaptation for project:
- Inclusion of CLI methods
- Remove "E" from process
- What ARE we doing? [Resource Mapping Exercise]
  And what CAN we do? [Indicator development exercise]
- What self-monitoring can be developed?
Appendix E

Photovoice assignments – Dalit/Nepali Caste

1. What are the impacts of Water Scarcity?
2. Due to hawapani bigriyera (climate change) what diseases are contracted by us?
3. What are the impacts of alcoholism?
4. What are the problems faced due to drought?

Photovoice assignments – Bahun Caste

1. What are the problems in monsoon season?
2. What are the causes of stress?
3. What are the problems to grow vegetables in the winter?
Even if people criticize, we will not get angry with that person rather we will share what we have learnt.

किसी गर्याँ कुरा मन मै कुहारला, रामा कुरा आँक्ना गाउँलाई, साथीहरुलाई भन्नौला...
References


Bartlett, R., et al. (2010). Climate change impacts and adaptation in Nepal, IWM.


Department of Hydrology and Meterology – Nepal (2013). Website accessed on
April 27, 2014:
http://www.dhm.gov.np/meteorological-station


Field, C. B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea,

Füssel, H.-M. (2010). "How inequitable is the global distribution of responsibility,
capability, and vulnerability to climate change: A comprehensive indicator-

Gautam, M. R. T., Govinda R.; Acharya, Kumud. (2013). "Climate change in the

Gentle, P., & Maraseni, T. N. (2012). Climate change, poverty and livelihoods:
adaptation practices by rural mountain communities in Nepal. Environmental
Science & Policy, 21, 24-34.

Ain of 1854.

Rural Australians: An Analysis of the Household, Income and Labour
Dynamics in Australia (HILDA) Longitudinal Dataset. Fisheries and Forestry.


on health in Nunavut, Canada." Arctic: 89-97.

risk perceptions: coastal versus agricultural areas of Hunter Valley, NSW.”
Regional Environmental Change.

EcoHealth, 3(4), 245-254.


