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Mental health and resilience-promoting strategies associated with *El Niño* Southern Oscillation (ENSO) in the north coast of Peru

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I, Elaine C. Flores Ramos, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been clearly indicated in the thesis.

Abstract

Cyclic environmental events, such as the *El Niño* Southern Oscillation (ENSO / *El Niño*) phenomenon may add to the development or worsening of mental disorders and may have a negative psychosocial impact. Little is known of the effects of *El Niño* on the mental health of residents from historically vulnerable zones, such as the northern coast of Peru. Community-based strategies, such as those based in theories of Social Capital (SC), may increase mutual cooperation and lower the risk for mental disorders, increasing post-disaster resilience. Using a mixed-methods approach this thesis aimed to understand the effects of *El Niño*-related events on mental health of affected residents of Tumbes, Peru, explore their perceptions on their mental well-being and identify resilience strategies that would help them to overcome future *El Niño* events. First, through a systematic review I identified quasi- experimental studies, randomised controlled trials and pilot studies that evaluated interventions with SC components to improve mental health outcomes. Second, I explored whether time trends of mild depression rates changed by exposure to the *El Niño* 2015-2016 event, through a secondary data analysis. After adjusting for an a priori set of confounders I linked individual and ecological-level data, from participants of a three-year pragmatic stepped-wedge cluster randomized-trial conducted in Tumbes. Finally, through qualitative research methods, I explored the perceived effect of the occurrence of the *El Niño* events of 2015-2016 and 2017 on residents' mental well-being, the individual and community responses, availability and access to support systems and community resilience strategies. I found that communities with chronic exposure to *El Niño* events may not have a high prevalence of a mental disorder, such as depression, but they are affected from prior trauma, through relived personal disturbing experiences, relentless distress associated to scarcity, hopelessness related to authorities' neglect and lack of community resilience. I recommend that policy should include a two-level (individual and community) approach, with greater emphasis on psychosocial and community empowerment support, nested within and alongside structural interventions that improve survivors' social and material reconstruction of their livelihoods and fragmented social bonds.

Table of Contents

List of Figures

List of Tables

7. LIST OF APPENDICES

A List of variables included in the Quantitative component

B Dissemination events: Conference presentations and posters

C Ethical clearance approval certificates

Ethical approval Salt substitution Trial (SALT) (Spanish)

Ethical approval Quantitative Project Secondary Analysis (English)

Ethical approval Qualitative Fieldwork (English and Spanish)

DIRESA administrative approval to the project (Spanish)

SIDISI UPCH Submission form (Spanish)

D Systematic Review Search strategy

E Salt substitution trial PHQ-9 scale (Spanish)

F Protocol for qualitative component- fieldwork activities (Spanish)

G Qualitative component - Participant information Sheet (English)

H Qualitative component – Consent form for participants (English)

I Qualitative component – Informed Consent form – Interviews (Spanish)

J Qualitative component – Informed Consent form – Focus groups (Spanish)

K Qualitative study topic guides (English) - IDIs - Residents

L Qualitative study topic guides (English) - IDIs – Authorities

M Qualitative study topic guides (English) – Focus Group Discussions

N Participant information leaflets - mental health and disasters

O Standard Operating Procedures - Distress Protocol for Qualitative procedures participants

P Public Engagement activity: "Life between water and Sand". Carapongo project

Q Data Management Plan

R Table S1 - Reported damage related to flooding and heavy rain related to *El Niño* among study trial villages

S Flowchart of participants in the SALT trial. (Bernabe-Ortiz Et al. Nature Medicine, vol 26, Mar2020, 374-378)

T Sensitivity analysis: a) Time trends depression prevalence across study assessments by village PHQ9≥10 (Figure and Stata output)

b) Time trends of depression prevalence across study assessments by sex (PHQ9≥10) (Figure and Stata output)

c) Exclusion of village number 6 - impact on persons to assess changes in depression prevalence trends.

U Qualitative analysis table: Descriptive broad study topics, subtopics, and findings subthemes

Qualitative analysis thematic map: Subthemes and Interrelated pathways

List of acronyms

95% CI	95% Confidence Intervals
CMD	Common Mental Disorders
CSG – Tumbes	Research Centre for Global Health - Tumbes province
CENEPRED	Peruvian National Centre for Disaster Prevention
CSMC	"Centro de Salud Mental Comunitario" - Community Mental Health Centres (CMHC)
CI	Confidence Interval (also IC – Interval of Confidence)
CRONICAS	Research Centre of Excellence in Chronic Diseases
DIRESA TUMBES	Direction of Regional Health in Tumbes
DUICT – UPCH	Dirección Universitaria de Investigación e Información Científico Técnica - UPCH
EAP	Economically Active Population
EIP	Economically Inactive Population
ENSO	"El Niño" Southern Oscillation ("*El Niño*")
ESSALUD	Seguro Social de Salud – Peruvian social security
FGD	Focus Group Discussion
GBP	Great Britain Pound
GCP	Good Clinical Practice
GP	General Practitioner
HICs	High income countries
IDI	In-depth interview
INDECI	Instituto Nacional de Defensa Civil
INSM	Peruvian National Institute of Mental health
LMICs	Low- and Middle-Income Countries
LSHTM	London School of Hygiene and Tropical Medicine
MDG	Millennium Development Goals
MICs	Middle-Income Countries
MhGAP	Mental Health Gap Action Program
MINAM	Peruvian Ministry of Environment
MINSA	Peruvian Ministry of Health

MoH	Ministry of Health
NGO	Non-governmental organization
NOAA	National Oceanic and Atmospheric Administration
OR	Odds ratio (aOR adjusted odds ratio)
ONI	Oceanic Niño Index
PEN	Peruvian soles
PHQ-9	Patient Health Questionnaire (9-item)
PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analysis
SALT Trial	A cluster randomized stepped wedge implementation trial using a salt substitute to reduce blood pressure in Tumbes region
SENAMHI	Servicio Nacional de Meteorología e Hidrología del Perú / Peruvian Environmental Authority
SES	Socio-Economic Status
SIS	Seguro Integral de Salud (Governmental Health Insurance)
SPPE	Social Psychiatry and Psychiatric Epidemiology Journal
Social Capital	Intangible and tangible goods & their interrelationships, marked by reciprocity, trust, and cooperation a community's mutual benefit.
SUSALUD	Superintendencia Nacional de Salud - Perú
UPCH	Universidad Peruana Cayetano Heredia
WHO	World Health Organization
WHO STEP	World Health Organization Stepwise approach to Surveillance

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1 CHAPTER 1. Introduction

1.1 Burden of Mental health and Mental Disorders

Mental, neurological and substance abuse disorders are one of the main causes of the overall disease burden worldwide (World Health Organization, 2011, Vos et al., 2015). This burden is growing continuously in all age groups, and accounts for 13% of the global burden of disease. They significantly contribute more to disability rates than any physical health condition globally, both in high-income countries and low- and middle-income countries (LMICs) (Whiteford et al., 2015). They account for more than one quarter (25.3%) of disability-adjusted life years or DALYs in LICs and more than one third (33.5%) in MICs (Whiteford et al., 2015) and can be extremely costly to the individual, their households, their communities and health care systems (Insel, 2008). They often have a chronic-recurrent course despite treatment (Leon et al., 2005) and rank among the most substantial causes of death worldwide (Walker et al., 2015). The treatment gap for these disorders is huge: it has been estimated between 76 and 85% of persons with common and severe mental conditions in LMICs do not access treatment. Depression is a common mental disorder, considered the 3rd contributor to this burden, representing 4.3% of it (World Health Organization, 2018).

The scaling up of cost-effective interventions and research to diminish this burden is urgently required (Whiteford et al., 2015).

1.2 Mental health impacts of environmental disasters

As has been largely documented, natural and man-made disasters challenge an individual's ability to adapt, posing an additional risk for adverse mental health outcomes (Davidson and McFarlane, 2006). The development of these disorders is associated with the level of exposure, unique factors of vulnerable groups within the affected communities, as well as secondary stressors (Kessler et al., 2012, Pietrzak et al., 2012) which will contribute to determine the nature and amount of mental morbidity. Worse

outcomes are more likely to occur for disasters in LMICs, especially those that are associated with substantial community destruction.

A systematic review (Fernandez et al., 2015) conducted by Fernandez, Black and collaborators, performed a global search of literature on published studies from the year 1994 to 2014, finally including 83 studies (the complete reference list of the papers included in the review can be found in the main published report). The aim of this review examined the associated factors and the direct or indirect consequences of heavy rain and flooding on mental health. The limitations of this review were the paucity of longitudinal studies and the lack of confounding controls, which precludes reaching strong conclusions. Nevertheless, this review examined the most frequent natural disaster occurring globally, and identified the following elements related to mental health impacts:

Depression

People from flood-affected areas experienced an increase in depression symptomatology across all age groups. People in flooded areas were also more depressed than those in non-affected zones. Some studies did not find this pattern in older adults (Bei et al., 2013). For example, depression symptoms were found to be eight times higher among people with flooded homes (Azuma et al., 2014).

Post-traumatic stress disorder (PTSD)

Significant increase in incident cases in the flood-affected areas, when compared with prevalence before the flood, and when comparing affected and non-affected areas (North et al., 2004, Alderman et al., 2013).

Anxiety

Groups exposed to flooding events showed higher levels of anxiety when compared with non-exposed groups (Wind et al., 2013).

Psychological Wellbeing/ Psychosocial distress

Overall psychological health and mental health-related quality of life was significantly worse in affected areas compared to non-affected areas.

Increase in tobacco, alcohol, and other substance use

Two studies found an increase in (self-reported) use of tobacco and alcohol. Another study found alcohol abuse in males related with flood-related job-loss or disruption.

The mapped elements identified in this Systematic Review of literature can be grouped into the following categories:

Flood-related factors

Level of exposure, extent of losses or threat/harm were associated with higher levels of mental health-related problems .

Secondary stressors

Such as: financial losses due to the flood (Bei et al., 2013, Paranjothy et al., 2011), problems with insurers, high level of disruption to daily routines - including temporary or permanent loss of employment or loss of services – were associated with higher levels of mental health problems.

Social resources of the affected people

Different studies have found an inverse association between social support and the development of mental disorders after environmental disasters. Kaniasty and Norris (Kaniasty, 2004) found that at 6 to 12 months after a disaster or catastrophe occur, social support was a protective factor for mental disorders. At the midpoints of the four waves of their study (12 and 18 months), both processes (e.g. social support and distress) emerged as causal paths between the impact of the disaster and mental disorder. Finally, in the last phase of the assessment (18 and 24 months), it seems that the social selection mechanisms explained the results (e.g. those with PTSD had less social support).

Coping factors of the affected people

Several studies (Wind and Komproe, 2012, Bich TH, 2011, Clemens et al., 2013, Smith et al., 2000) found that positive and proactive behaviours were associated with better mental wellbeing in the development of mental disorders after a flood.

Health-related factors

Having poor mental health status before the flood (Ginexi et al., 2000, Felton et al., 2013), using psychiatric drugs, as well as existing physical health problems (Tunstall et al., 2006, Mason et al., 2010), were associated with worse post-event mental health .

Individual factors

There is contradictory evidence regarding the effect of gender and age. Some papers found poorer mental health in females following floods (Bokszczanin, 2007, Liu et al., 2006), others did not find a relationship with gender. This would probably be related to the variables included in the analysis models e.g. as confounders (Beyhun et al., 2019). One study also found that adult males had more alcohol-related problems (Peek-Asa et al., 2012). Some authors found a protective effect of having older age (Tyler and Hoyt, 2000), others found an increase in the risk of mental disorders in older adults (Telles et al., 2009) and other papers did not find a relationship with age (Tobin and Ollenburger, 1996). This may be because not all older adults are in the same position regarding their health status or have the same social support or resources surrounding them. Socioeconomic status has an inverse association with poor mental health outcomes after exposure to floods, as does education level (Ginexi et al., 2000, Collins et al., 2013, Jones EC, 2011).

Long term effect of the event

There is little evidence on the medium- or long-term impact of flood events on mental health, however, the few studies that assessed affected people between 6 months (French et al., 2019) and two years after the disaster found a sustained direct association of flood exposure and higher levels of depression, PTSD symptoms, psychological distress and poorer adjustment.

Provision of relief measures

Some studies found a small but protective effect of the presence of disaster-management strategies: preparedness, acute response and recovery and long-term support, including provision of mental health services and social capital-based community responses and

provision of public health advice through regular media releases and the setting up of a health and mental health hotline.

Despite this, little evidence has been reported (Ahern et al., 2005) on public health interventions (Hajat S., 2005, North and Pfefferbaum, 2013) such as management of mental health impacts, or evidence focused on vulnerable groups. There were no studies on the effectiveness of preventive public health measures, including the implementation and integration of early warning systems.

1.3 *"El Niño"* Southern Oscillation (ENSO)

ENSO is an ocean-atmospheric phenomenon which emerges as a manifestation of the increase in Sea Surface Temperature (SST) due to the movement of large quantities of warm water from the western to the equatorial Pacific Ocean, caused by changes in atmospheric pressure (Kovats et al., 2003, NOAA / National Weather Service, 2017). The ENSO cycle affects atmosphere and weather patterns and its effects depend strongly on location and season. The main threat comes from reduced rainfall and drought in some regions, but it can also cause heavy rainfall and flooding in others, making it a complex phenomenon. The ENSO operational definition is based on the Oceanic Niño Index (ONI)[1] which uses mean SST departures of 0.5°C or more for at least 5 consecutive overlapping three-monthly periods ((NCEP), 2016, Kovats et al., 2003). The spatial distribution and severity of impacts associated with ENSO depend on the type (location of the maximum SST anomaly) and strength (magnitude of the SST anomaly) of the event (Hirons and Klingaman, 2015). An *El Niño* event is consistently associated with heavy rainfall and flooding on the west coast of South America.

There are concerns that *El Niño* events will become more frequent and more intense due to global climate change[2] (McMichael et al., 2006, Timmermann et al., 1999). It has been estimated, for the coastal areas of Latin America that more than 4 million inhabitants will be exposed to flooding from relative sea-level rise by the end of the century in relationship

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[1] The Oceanic Niño Index (ONI), a measure of the departure from normal sea surface temperature in the east-central Pacific Ocean, is the standard means by which each La Niña episode is determined, gauged, and forecast (NOAA)

[2] C*limate Change* refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods (Intergovernmental Panel on Climate Change (IPCC)

to the current climate emergency (Reguero et al., 2015). The economic development of upper-middle income countries, as in Latin America and the Caribbean region, has come with an increase of their contribution on global carbon dioxide (CO_2) emissions. According to 2016 data from the Global Carbon Project, UN Population division and World Bank income groups, it was estimated that the region contributed to 12% of emissions, with a population representing the 9% globally (Ritchie, 2018). The contributions from *El Niño* events would substantially increase this environmental threat in several Pacific-coast countries and sooner than previously anticipated (Ward et al., 2014).. The health risk posed by *El Niño* threatens to continue increasing and represents an involuntary exposure and a large health inequity that must be addressed and its negative effects prevented as a significant global health risk (Commission;, 2009).

El Niño in Peru

In Peru, *El Niño* events lead to an increase in the SST alongside the Peruvian coast, with greater intensity in the north (Sanabria et al., 2018). This causes increased evaporation, leading to heavy rain west of the Andes, which will in turn cause floods and "huaycos" (landslides). An *El Niño* event will have several consequences (Servicio Nacional de Meteorología e Hidrología del Perú – SENAMHI, 2017) in different sectors related to the economy of the country: health, agriculture, fishery, buildings and infrastructure, industry, among others.

According to historical registries (some of them relying on dubious sources), during the past five centuries there have been at least 120 *El Niño* events (Quinn et al., 1987, Diaz et al., 2000). This phenomenon is a known event for generations of Peruvian residents (Comité Técnico del Estudio Nacional del Fenómeno El Niño (ENFEN), 2012) however, current and future developments are likely to be worse than previous ones and with unprecedented consequences. Also, the expected adaptation that the Peruvian residents should have on the occurrence of these events do not correspond with infrastructural preparedness across the high-risk areas (Servicio Nacional de Meteorología e Hidrología del Perú – SENAMHI, 2017) or relief measures implementation.

The *El Niño* event of 2015-2016 (L'Heureux, 2016) affected more than 30,000 people in the northernmost department of Tumbes, who suffered damage to their homes and workplaces (Popular;, 2016). The water and sewers distribution system collapsed and more than 70 kilometres of road networks and bridges were damaged (Rodriguez, 2016, Popular;, 2016). This was followed months later by an unexpected *coastal*[3] *El Niño* event of 2017 which quickly developed in January 2017 (Fraser, 2017). And, despite the extensive preparations that were just built and cleaned in place months earlier, this last event produced extensive and destructive damages across several departments in Peru that were comparable to those *El Niño* events occurring between 1982-83 and 1997-98 which are broadly considered the most destructive in the Peruvian records (French Adam and Mechler Reinhard, 2017). A recurrent issue in this and prior *El Niño* occurrences is the lack of coordinated efforts between local authorities, the lack of delivery of an effective response to the floods and the lack of implementation of preventive plans for environmental-related disasters (Rodriguez, 2016, French Adam and Mechler Reinhard, 2017). Despite the historical effects of previous *El Niño* events the communities continue to live in the same damage-prone zones, as they were never relocated by the local or regional authorities and due to economic reasons, they are not able to do it themselves (Chinchay, 2015).

The Peruvian MINSA (MoH) approach to post-disaster mental health has lately created and implemented "brigade relief campaigns". After a disaster has been notified, trained professionals travel to the post-disaster area and support the affected communities for a few days, providing clinical consultations and mental health emergency relief and then, leave the disaster zone (Machuca et al., 2010, Ministerio de Salud del Perú, 2015a). There is no reported data in reference to the impact or effect of these brigades on mental disorders in disaster-affected communities, nor their reach and coverage.

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[3] The event labelled "coastal" *El Niño* of the year 2017 – was an unexpected local phenomenon, affecting the coasts of Ecuador and Peru.

1.4 Community ties and social capital

Social capital (SC) is something difficult to directly observe and measure in both the individual and the group, but it has an inherent cohesive force that enables collective action within populations (Putnam, 1995, Henderson and Whiteford, 2003).

The definitions of SC highlight it as a useful resource for the public: "Social capital represents the characteristics of social organization, networks, rules, and trust that facilitate coordination and cooperation for mutual benefit" (Krishna and Shrader, 2000, Putnam, 1995). The complex nature of this construct was classified in sets of components: "Social capital is multifaceted and has two main components: a structural component that reflects the nature and intensity of an individual's participation in community networks; and a cognitive component, which refers to the perceived quality of an individual's social relationships (Grootaert et al., 2004).

Structural and cognitive attributes of SC can be estimated with quantitative tools (Kawachi et al., 2008). These attributes can be summarized as: "Structural (participatory) social capital refers to relationships, networks, membership, organizations, associations and institutions that may link groups or individuals together. Cognitive (perceived) social capital refers to values, norms, attitudes, beliefs, civic responsibility, altruism and reciprocity within a community" (Ehsan and De Silva, 2015b).

There is no universal measurement for SC, due to its multidimensional component and collective factors. It can be measured both at the individual and at the socio-ecological level (McKenzie and Harpham, 2006, Kawachi et al., 1999). There is almost universal agreement that community characteristics ought to be distinguished from individual characteristics, and measured at the community level, (Lochner et al., 1999, Grootaert et al., 2004) however there is ongoing debate over the most valid way to achieve this. Community factors, cultural differences and neighbourhood characteristics, should be considered among other variables (Subramanian et al., 2003, Folland, 2007).

1.5 Social capital and resilience related to environmental-related disasters

A highlighted, central element in the literature reviews on vulnerabilities and management of environmental and climate-related disasters, is the goal to create less vulnerable, more resilient individuals, societies and communities, strengthening the mechanisms that promote their adaptation capacities (Norris et al., 2008). SC has significant influence on the adaptation capacity of local communities to unforeseeable detrimental events, such as climate change impacts (Caldwell and Boyd, 2009, Pelling and High, 2005, Adger, 2003, Codjoe et al., 2016) and other environmental disasters (Cox and Perry, 2011, Dussaillant and Guzman, 2014, West et al., 2013, Koh Howard and Cadigan Rebeca, 2008, Kaniasty, 2012, López-Marrero, 2010).

The positive impact of SC in communities' adaptation to climate change would strengthen the communities' trust bond with local authorities and improve coordination of preventive and reconstructive efforts (Jones et al., 2014, Farhoudian et al., 2013, Henderson and Hildreth, 2011) with social support measures (Lowe et al., 2010, He et al., 2013) to diminish the damage of an environmental disaster.

The community's needs must also be alleviated with governmental support. In a mixed-methods systematic review (Kamara, 2018) that assessed 19 studies in southern Africa it was found that poverty alleviation policies were important in strengthening resilience and well-being outcomes in post-disaster contexts, among other factors.

In studies conducted at eight months and three years' post-earthquake in the south coast of Peru, participants highlighted that a disaster will damage already weakened social fabric and community networks, with worse results in impoverished locations (Flores et al., 2014, Cairo et al., 2010). The priorities identified were issues at interpersonal level, concerns for the security of vulnerable groups and difficulties in organising work in networks within the communities (Cueto et al., 2015). Finally, the participants had a weak perception of interdependence among the members of the community, which made the generation of initiatives of collective social action even more difficult. Similar findings

of lack of articulated collective work and distrust were obtained in a previous qualitative study conducted in several villages in the north coast of Peru, through interviews and group discussions (La Barrera et al., 2012), where it was found that "the social fragmentation at this level was strongly evidenced when a collective effort was required to deal with a natural disaster".

1.6 Rationale

In the Peruvian north coast, strong *El Niño* Southern Oscillation ("*El Niño*") events have direct and indirect effects on communities established in vulnerable areas. Intense rain periods lead to floods, landslides, damage to homes and crops losses, as well as several other challenging effects such as health risks, the social erosion of communities and the development of mental disorders. These impacts (e.g. losses, injuries, illnesses, displacements, among others) carry an emotional toll that must be addressed. Peru has a notable fragmented and unequal health care system, which do not guarantee healthcare access for all of its citizens (Soto, 2019, Oscar Cetrángolo et al., 2013). Current efforts to change this situation will still take time to fully implement and scale up across all the nation (Cosavalente-Vidarte et al., 2019). Also, most of *El Niño*-related research has neglected the possible impact on the mental health of the affected communities. Furthermore, it is known that in areas of poverty and low enforcement of preventive health and preventive policies, *El Niño*-related effects will heavily affect a community's livelihood. Vulnerable populations suffer a worse emotional impact as a result of these losses and illnesses: the elderly, those with diminished health or previous chronic conditions, the disabled and mentally ill, people with low resources and those living in chronic disaster-prone areas such as coastlines and rivers. In the north coast of Peru, people at risk may experience an accumulated detrimental effect to their individual wellbeing and mental health. Despite this, there is little evidence of the temporal association that *El Niño* may pose to the mental health outcomes in this region. Also, there has been very little study of the mechanisms of individual and community response that a population historically affected by cyclical environmental events have in relationship to resilience and social capital components. This literature gap needs to be addressed from a multidisciplinary perspective, with a mixed-methods approach.

1.7   The Peruvian Context

Mental disorders represent a significant burden for the Peruvian population. In the 2012 Mental health national epidemiological survey conducted by the Peruvian National Institute of Mental health (INSM), approximately 12% of the Peruvian population (roughly 4.8 million people) had a significant mental health problem that required provision of services. Of these, only 15 to 25% were able to get treatment from the available health services. Across the three regions of Peru, it was reported that a quarter of the adult population have suffered a mental and neurological disorder at any point of their lives, with depression being the most prevalent condition. Among Peruvian children, it is estimated that 20% have a mental disorder. Mental and neurological disorders represent the leading cause of burden of disease nationally (17.5%) (Ministerio de Salud del Perú, 2018a) and the chronic conditions with highest economic impact in Peru (World Bank Group, 2018). It was estimated by 2018 that more than 4.5 million of Peruvians may have a mental disorder, and by 2021, this number would increase to near 6 million (Defensoría del Pueblo., 2018).

A government-led investigation conducted in Lima in 2005 found that health centre staff showed significant prejudice towards the treatment of patients with mental disorders (Saavedra, 2012). There was also a huge availability gap of basic treatment at national level: "Antidepressants and antipsychotics were available in about two thirds of hospitals and in less than 20% of health centres and small health clinics. Another four classes of psychotropic medications (lithium, hypnotics and sedatives, psychostimulants/ADHD, and anti-dementia drugs) were only available in hospitals and not in health centres or small health clinics". Finally, only 5% of hospitals had enough supply to meet annual demand. Integration of mental health services into primary health care has still not been implemented in Peru, due to several factors related to a lack of political will, underfunding for the sector, management disorganization and lack of trained human resources (Miranda et al., 2017). A brief pilot study conducted in Lima in early 2016 over 9 weeks, assessed a digital screening tool to be used in primary care health centres and health workers found the tool feasible and useful. However, several barriers were also identified, including the staff's lack of time to engage in the process, work overload and insufficient mental health staff to do a referral for identified cases (Diez-Canseco et al., 2018).

27

Moreover, a small cross-sectional study among general physicians (n=111) in a province on the north coast of Peru found that most (83.8%) General Practitioners (GPs) had a low level of knowledge on how to treat major depression. None of the GPs had a high level of knowledge on this topic, and only 20.7% had received updated training on mental health in the last 4 years (Olivera et al., 2016).

In recent years, demand for mental health services at the INSM tripled from 16,973 appointments in 2012 to 40,449 in 2015 (Instituto Nacional de Salud Mental, 2015). Additionally, provision of and access to mental health services in Peru have been reported as precarious (APRODEH, 2004, 21;, 2015). This situation was much worse in the regions, as the three main psychiatric hospitals that exist in Peru are located in its capital city. Most specialized mental health staff were concentrated in these three hospitals, where a biomedical treatment approach towards mental disorders is followed. This scarce offer is reflected in the mental health expenditures of the Peruvian Ministry of Health (MoH) MINSA, which until recent years represented roughly the 0.27% of the total health budget (World Health Organization, 2011). Also, 98% of the budget allocated to mental health was spent at the tertiary level in these three in-patient specialized facilities, and hardly any in community mental health services. Moreover, more than 85% of the total of 700 of practicing psychiatrists in Peru, were working in Lima, and 50% of those worked either in the private sector or in the three psychiatric hospitals (Castillo, 2014).

Several international initiatives issued in the past decades aimed to reform mental health services and promote their incorporation into integrated primary care services with a community-based approach and human rights protection (World Health Organization, 1978). Following this lead, Peruvian mental health services did an important and much-required reform in 2013.

The stated goals in the year 2006 mental health plan (Ministerial Resolution 993-2006-MINSA dated 6 October 2006) aimed to shift services and resources from mental health hospitals to community mental health facilities and integrate provision into primary care services. In 2013, the Peruvian mental health reform inaugurated 21 community mental health centres (CMHC) after establishing Law N° 29889 (that modifies article N° 11 of the Peruvian General Act). This law aimed to increase the mental health services provision nationally, explicitly guaranteeing the rights of people with mental disorders,

ensuring the availability of free and universal access to treatment nationally for every citizen, at primary care level of the health-care system (Soto B, 2015). It is expected that the existent primary health facilities (reported in 2011 as 8,137 nationally) can be trained to incorporate and implement mental health programmes into their routine services in the coming years, as it has not happened until present day. By 2015, 23 CMHCs were created in six Peruvian regions, and it is expected that this number reaches 312 CMHC by 2021 (Ministerio de Salud del Perú, 2015b). Addiction day hospital units, psychosocial rehabilitation centres, work rehabilitation centres, and safe homes and residencies are also planned to be implemented (Ministerio de Salud del Perú, 2018c). By mid-2019, the community-based mental health care network included 133 CMHCs and 22 mental health and addiction hospitalization units (Fernandez C., 2019). Suitable data that allows us to quantify the impact of these facilities towards closing the treatment gap and decreasing the stigma on mental disorders locally has not yet been released, as the implementation of this reform is still ongoing (Ministerio de Salud del Perú, 2011). A recent qualitative study (Arriola-Vigo et al., 2019) conducted with healthcare staff of CMHCs and policy-makers involved in the Peruvian mental health reform, found highly variable perceptions and findings on their perception of this reform. Challenges were related to lack of consistent training and unequal distribution of resources across the CMHCs.

1.7.1 Social determinant factors and mental health in Peru

Informal employment and subemployment in Peru are a significant problem: almost 73% of the adult workforce is employed informally, on a part-time basis, without benefits or a steady income (Pan-American Health Organization - PAHO, 2017b). The illiteracy rate, reported in 2017 (Instituto Nacional de Estadística e Informática, 2018a) was almost 6% in all the country, ranging from 3.6% in urban cities to 14.8% in rural areas Nationally, 20.5% of the population was reported living in poverty in 2018, and 2.8%, in extreme poverty.

According to the World Mental Health Survey Initiative (WMHSI) conducted in 2005 in 4 main cities of Peru, only 9.7% of those with any mental disorder received appropriate treatment (Piazza and Fiestas, 2015). People with lower education levels had less access

to minimally adequate treatment (OR=0.1, 95% CI=0.0, 0.5) and the group with substance use disorders had the lowest access to treatment in the preceding 12 months (12.7%). Lack of resources, distrust in the ability of physicians to treat their problems and sociocultural barriers contribute to this situation: myths, prejudices and folkloric beliefs will burden the patient with the idea that they should be able to solve the issue by him or herself. This was given as the main reason for not seeking mental health support by 59-68% of patients across different studies (Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2013, Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2007a, Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2002).

High risk factors for mental disorders in Peru are associated with levels of stress related to family, economic and work situations. Other contributing factors include having less family integration and support, less participation in religious activities, less trust in community leaders and social relationships, less feelings of being protected by local authorities and less satisfaction with economic conditions, among others (Saavedra, 2012).

1.7.2 Environmental, disasters and other stressors in Peru

Peru is a country exposed to recurrent natural and man-made hazards. These can be loosely classified in those:

a. *Related to internal geodynamics*, such as earthquakes, tsunamis and volcanoes, location near or between two tectonic plates (the South American plate and the Nazca plate). Peru is located in the area called "Pacific Ring of Fire", characterized by high seismic activity, where approximately 80% of the seismic movements of the world occur, resulting in a constant exposure of its population to earthquakes, tsunamis and volcanic activity;

b. *Hazards of climatic origin.* Its location in the tropical zone and subtropical area of the western coast of South America determines its exposure to environmental changes that in

many cases generate disasters, such as floods, droughts, frosts or cold spells, *El Niño* and *La Niña* phenomena, and the recent "coastal *El Niño"* event.

Additionally, Peru is also exposed to:

c. *External geodynamic events*, such as mass movements (landslides, *huaycos* or mudslides, rock falls) due to its uneven territory and the current high rate of deforestation process, which situates Peru in the 7th position by deforestation rate globally (Rosales, 2019).

The Peruvian population is also exposed to health hazards (including transmittable diseases such as Dengue, Zika, etc.) human-related hazards, such as urban and forest fires, various disasters related to mining, oil extraction and other manufacturing activities. Finally, due to the presence of the Andes Mountain range, the Peruvian territory is characterized by having three defined geographical areas - coast, mountains, and jungle - presenting a diverse range of microclimates that will be specifically affected by a disruption of the environmental balance.

Also, the socioeconomic living conditions of the population increase their vulnerabilities to these environmental threats. It is projected that by the year 2021, 66% of the Peruvian population will be classified as highly vulnerable to disasters (Ministerio de Economia del Peru - MEF, 2017).

Therefore, the Peruvian population, due to the constant, cumulative exposure to traumatic events, has a significant and unique vulnerability to develop mental disorders related to disasters due to its location, its vulnerability to climatic events and its history of social conflicts and internal violence (Pedersen et al., 2008, Suarez, 2013, Espinoza et al., 2015, Laplante and Holguin, 2006).

The main factors that have impacted the Peruvian population's mental health can be summarised as:

1. The *long-lasting effects of the internal armed conflict* over two decades (1980-2000) (Ministerio de Salud del Perú, 2018a) in which 69,280 persons were killed or missing (Castellon et al., 2005, Comision de la Verdad y Reconciliacion - CVR, 2003). Ayacucho, the region that was most affected by the internal conflict violence reported that 50% of the population had a mental disorder in any point during their lives (Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2004);

2. The extended *gender violence and exclusion* of minorities in Peruvian society, which are especially high for women: 65.4% of women had experienced intimate partner violence, almost 40% had been victims of psychological violence and 6.5%, of sexual violence (Instituto Nacional de Estadística e Informática, 2017b, UNPFA, 2018); and,

3. The generalized and institutionalized *corruption*, that has kept Peru (until now) in a protracted political crisis: the country is reportedly among the 50 most corrupt countries of the world and is currently following advances and setbacks in several trials involving every level of the government, including former presidents, judges, regional governors, mayors and congressmen and political parties across all institutions and sectors (Pari, 2017, Rotberg, 2019, Ortiz A., 2019). In 2019, almost all former Peruvian presidents from the last four decades were either under investigation, detained or on trial due to corruption accusations and illegal acts during their tenure (Zarate A. and Casey N., 2019, CNN en español, 2019).

In such an extended crisis, the demands of the population for mental health, protection and social justice are hardly even heard and rarely included in legislation and implementation processes. The demands are still disorganized, and the Peruvian society distrust their authorities and usually expect very little from them. Except for a few examples of sustained protests for political demands against corruption, the other demands have not had an echo at regional or national levels (BBC News Mundo, 2019).

El Niño is perceived as a main disruptive event in Peru (Bayer et al., 2014), however, little research has been aimed towards its possible effect on the mental health of affected communities. According to the Peruvian Ministry of Environment (MINAM), 46% of the

national territory of Peru falls in the high to very high vulnerability condition, and 36.2% of the population (almost 10 million people) live in these areas (Kuroiwa Horiuchi, 2011). In most post-disaster cases, Peruvian communities usually face a grim situation, as the majority of residents of the affected zones will almost entirely rely on the scarce governmental support to reconstruct their livelihoods, which can take several weeks to even years until complete recovery can be reached (Camacho Angel, 2015). Recent legislation addressing this topic (Law No. 29664 dated February 2011) created the National System for Disaster Risk Management (SINAGERD) and the National Centre for Disaster Prevention (CENEPRED), but this has not been accompanied by rapid relief measures for the affected communities, as some recent examples from Peruvian media have shown (Telesur TV, 2016, Republica;, 2016). Mental health support is almost never mentioned as a main objective of these relief campaigns.

In addition, corruption of public officials and private organizations authorities is perceived to be high (Presidencia del Consejo de Ministros, 2012). International reports on corruption places Peru 116th out of 140 countries according to its public institutional strength (Schwab Klaus, 2016). Several corruption and scams scandals arose after disasters related to the reconstruction efforts of the affected communities, further weakening the already low levels of trust distressed residents have in their local authorities (Comercio;, 2013, Elhawary S and Castillo G, 2008, Republica;, 2012, Instituto Nacional de Salud Mental, 2006).

In 2017 a local *El Niño Costero* heavily affected the northern coast of Peru (Pan-American Health Organization - PAHO, 2017a). More than two years after the event, the affected communities of survivors continued to live precariously (Redaccion Peru 21, 2019) and without complete reconstruction (Alegria Luis, 2019, Zapata Ralph, 2019b), lacking access to basic services and at high risk for transmittable and chronic diseases (Zapata Ralph, 2019a).

In this challenging context, residents will cyclically face environmental stressors coupled with a lack of adequate mental health services and no organized community support network. It is therefore, necessary to explore evidence-based replicable and community-

based interventions that can boost SC and that can be adapted and implemented in different settings to reinforce mental health jointly with recovery, resilience capacity and community well-being.

2 Chapter 2. Aims and Objectives

The main aim of this thesis is to understand the effects of *El Niño*-related events on the mental health[4] of the residents of Tumbes, Peru, as well as to explore their perceptions of their mental well-being and possible resilience strategies related to Social Capital theory that would help them to overcome future *El Niño* events.

2.1 Mixed methods Justification

The overall methodology of this thesis is underpinned by a mixed-methods approach. The recent *El Niño* events in Peru, and the challenges of conducting rigorous empirical research in post-disaster areas, prevents to have enough evidence of the proposed hypothesis. There is emerging data on the prevalence of floods and disaster exposure and mental disorders among affected communities. However, little is known about the effects of repeated disasters (and those whose intensity unexpectedly increased) and mental disorders in affected communities undergoing complex social contexts transitions. Also, while there is growing evidence on the effects of environmental-related disasters from research conducted in other settings, the mechanisms underlying the response factors at individual and community level remain unexplored in Peruvian settings.

This mixed-methods approach allows the gathering of "multiple ways of seeing and hearing" (Greene, 2007) and is particularly useful to explore phenomena in an under-researched population or context, as is the case of this thesis, aiming to assess *what* is the impact that the affected communities by *El Niño* face, and explore *how* this phenomenon is perceived.

In regards of qualitative research methods, it is, according to Uwe Flick, "*approaching the world(s) 'out there'…it intends to understand, describe, and sometimes explain social phenomena 'from the inside' in a number of different ways*" (Flick, 2009). A main difference from a laboratory-based study from a qualitative study is that "*qualitative researchers are interested in accessing experiences, interactions and documents in their*

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[4] Mental health is: "... a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community". (WHO – World Health Organization)

natural context and in a way that gives room to the particularities of them and the materials in which they are studied". This would mean that for data collection, qualitative researchers require to physically travel to the contexts they want to assess (Flick, 2017).

As this thesis aims to describe in detail the perceptions of the residents and authorities of Tumbes in relationship to the 2015-2016 and 2017 *El Niño* events, a qualitative component, with primary data collection was included for this project. A protocol for this component, detailing fieldwork procedures and tools to be used was created in Spanish for its presentation to the local ethics committee in Peru (Appendix F).

Through the combination of both qualitative and quantitative methods I expect to provide a foundation test to a hypothesis which is based not only on existing theory and previous research, but also on the perceptions, opinions, and lived experiences of affected communities at different levels. Finally, as presented in the Discussion chapter 7, there is an analysis of the ways in which the qualitative and quantitative findings interact with each other to contribute to a better understanding of the problem, considering the specific context. This thesis uses a mixed-method framework to achieve four overarching objectives:

1. To systematically review current evidence globally to search and identify interventions that employed Social Capital theory components, and that assessed mental health outcomes.

2. To determine whether there is an association between the presence of *El Niño* and the depression scores assessed in the Salt substitution trial in the northern coast of Peru, through an appropriate panel longitudinal analysis.

3. To estimate the effect of differential exposure to *El Niño* related flooding and heavy rains on depression in the same trial through multilevel regression models.

4. To evaluate the perceptions of *El Niño* event' effects on the mental wellbeing, individual and community responses, availability of support systems and possible community resilience strategies of the residents affected by *El Niño* in the northern coast of Peru through in-depth qualitative research.

Research for this thesis was conducted with Peruvian residents of Tumbes, a region that is frequently affected by *El Niño* and whose demographic and economic characteristics are similar to other LMICs. These population groups, who live among underserved conditions, an informal work system and political chaos, are in the highest risk for the effects of *El Niño*, fuelled by the current climate emergency. The potentially severe and long-lasting impact on the affected communities' mental health and social fabric of current and future generations make the need for research-driven evidence development imperative. While responsive strategies by authorities have been in general insufficient and uncoordinated for past emergencies, rigorous research on the mechanisms and the ways these responses have been perceived and integrated by the affected public and vulnerable groups remains scarce.

Therefore, the ultimate aim of this thesis is to contribute to a theoretical foundation for future development of community-based intervention programs in groups at high-risk and affected by environmental-related disasters. This research also aims to highlight the urgent need to shift from the current individual, biomedical focus of the trauma-focused psychopathology of disasters to an ecological, social perspective of the community processes influencing the mental health outcomes of affected residents of high-risk areas.

2.2 Structure of the thesis

This PhD thesis consists of seven chapters, including three stand-alone papers as required by the Research paper style PhD at the London School of Hygiene and Tropical Medicine.

Chapter 1. Introduction. provides background to the research problem and its importance. It provides an overview of the existing literature relevant to the research questions that it addresses, including the mental health impacts of disasters as floods,

landslides and heavy rain, especially including those occurring among vulnerable groups, the related effects of *El Niño* Southern Oscillation ("*El Niño*") phenomena in the northern coast of Peru, and Social Capital as an inherent factor operating at both the individual and community levels, and finally, possible measures related to the Social Capital theory that may increase post-disaster resilience in affected communities.

Chapter 2. Aims and Objectives. describes the aims, objectives, study design justification and structure of this PhD thesis.

Chapter 3. Overview of Thesis Methodology. This chapter describes the conceptual model, base hypothesis and setting for the thesis. It also provides a description of the methodological approaches and the outcomes used in both the quantitative and qualitative components of the study. Finally, the chapter discusses the ethical aspects of this thesis as well as the role of the candidate in relationship to all the stages of the research design, implementation, analysis, and writing-up.

Chapter 4. PhD Paper A presents a systematic review of the existing literature on the effect of social capital-based interventions on mental health outcomes, searching among controlled, quasi-experimental and pilot studies conducted on adults globally. Seven relevant interventions were found, with heterogeneous study designs. Measurements with positive outcomes at the individual and ecological level on different outcomes such as wellbeing, depression, anxiety disorder and PTSD were found in four of these studies, both at the end of the intervention and at the first follow-up assessment. However, across the studies with positive outcomes, extended effects could not be confirmed in longer follow-up assessments. Based on these findings, it is recommended that a mixed-design intervention, with both individual and ecological level components is adapted, tested, and preliminarily piloted for its efficacy in increasing social capital and improving mental health among its participants.

Chapter 5. PhD Paper B presents a multi-level longitudinal secondary quantitative data analysis assessing associations between the general population's exposure to *El Niño* effects, environmental factors, destruction of houses, crops losses, personal damage and

mild depression cases. Results did not show that greater exposure to *El Niño* effects was directly associated with poorer mental health. Having a previous diagnosis of a mental disorder, chronic background disorders, low or no income, and not having access to health insurance was associated with the risk of developing depression during longitudinal assessments.

Chapter 6. PhD Paper C presents findings from the qualitative component of the thesis examining the impact of *El Niño* and its related effects on psychosocial issues, access to support and aid, resilience, and community social capital. A thematic approach analysis was applied to a sample of health and civil authorities and residents from highly affected and less affected areas. A complex, interconnected narrative of suffering, distrust and helplessness among the survivors was found, as well as different opinions on the degree of impact of *El Niño*.

Chapter 7. Discussion. In this final chapter is presented the synthesis of results of eight findings across the three papers, its discussion and implications for policy, practice, and future research. Finally, the dissemination of results that have been done until present date and the ones that are planned, and the overall conclusions of this thesis.

Figure 2.1 Structure of Thesis

Chapter I. Introduction	•Overview of literature underlying this thesis. •Background of research topics and Peruvian Context •Research problem statement and Rationale
Chapter II. Aim / Objectives	•Thesis aim, objectives, justification of study design •Thesis structure
Chapter III. Methodology	• Overview of methodological approaches and Study Context • Overview of Data Collection, Fieldwork, Ethical Considerations
Chapter IV. PhD Paper A	•Systematic Review on effect of social capital-based interventions on mental health outcomes, among controlled, quasi-experimental and pilot studies conducted in adults, globally (n= 7)
Chapter V. PhD Paper B	• Multi-level longitudinal secondary quantitative analysis assessed associations between the exposure to *El Niño* effects, damages on crops, households, communities and mild depression cases (n=2,376)
Chapter VI. PhD Paper C	• Qualitative study of the perceived effects of *El Niño* effects on effects on psychosocial issues, access to support and aid, resilience and community social capital (n=51)
Chapter VII. Discussion	•Synthesis of findings •Implications for policy, practice, and research •Conclusions
Appendices	• Dissemination of results •Ethical approvals • Data collection instruments

3 CHAPTER 3. Methodology overview

3.1 Conceptual model of the mental health impact of El Niño

The association between mental disorders and diverse environmental disasters is well documented (Davidson and McFarlane, 2006, Feng et al., 2007, Foa et al., 2006). However, the design of a protective intervention cannot be fitted into a standardized solution (Kessler et al., 2012). Also, additional factors such as geographic location and access to resources that promote recovery will also interact with this vulnerability (Gruebner et al., 2015). SC plays a role in the incidence and prevalence of mental illness (McKenzie et al., 2002b, Wind and Komproe, 2012). As an inherent resource within and among communities and individuals, it may be an interesting arena to be used as a protective intervention for people affected by environmental stressors and disasters. The proposed protective effect of SC on the development of mental disorders may take place at both the individual and ecologic levels. At the personal level, SC may provide individuals with inherent resources, such as a sense of belonging, purpose, security, self-esteem, and equity, enabling them to cope better with adverse circumstances. These resources – which are beneficial psychological states – may result in greater motivation for self-care, lower exposure to stressors, improved coping mechanisms, and reduced perceived impact of stressful events. All of these in turn lead to diminished exposure to chronic psychological stress (Flores et al., 2014, De Silva et al., 2007, Kawachi, 2001). At the ecological level, SC may aid in the reduction of poverty, lessening poverty's impact and promoting community-level efficacy. These factors may potentially lead to increased adoption of healthy behaviours and control of risky behaviours in the community, as well as improved access to general and mental-health related information and services (Kawachi, 2001, Ellaway et al., 2001).

For social and mental health scientists, the association and interaction of the SC construct with the development of mental disorders is still under discussion. A model developed by Trudy Harpham and Kwame McKenzie (McKenzie and Harpham, 2006) illustrates the factors that play a role in this association.

In this proposed model, SC and mental illness are both considered single entities.

Figure 3.1 pathway from psychological balance in mental health service use
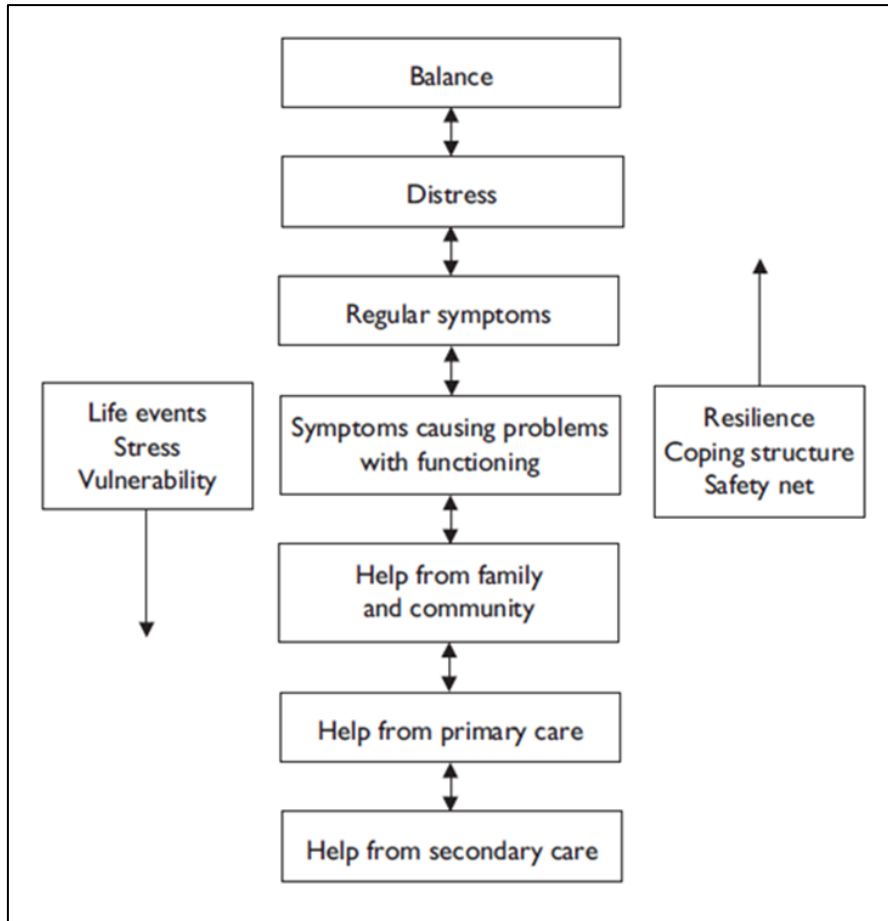
(*Obtained from Chapter 3 of the book "Social Capital and Mental Health" from McKenzie and Harpham*).

Areas in which residents have low SC, would also have factors that will potentially impact the proportion of people with a "balanced psychological state" in their community. According to this model, most of the time the individuals are in "psychological balance". The interaction between an individual's risk and protective factors determine to what extent this "balance" is altered. The person may become distressed "if the risk factors outweigh the protective factors that are available". And this would lead the person to search and appeal to other protective factors which may exist, in an effort to restore the system back to balance. In the case when the risk factors still outweigh the protective

ones, the distress will further progress and may lead to the development of a symptomatic mental condition. Then, these symptoms and the condition would head to a further appeal or call for coping resources and structures, in an attempt to overcome the problem, continuing this cycle. Then, both group of factors, those related to the individual vulnerability, and those risk factors at community level, as well as the risk factors that are promoting distress, may determine the development of mental disorders.

Harpham and McKenzie consider the following risk factors: those inherent to personal vulnerability for a mental condition (such as genetic susceptibility, personality traits, and upbringing factors), those related to acute life events and chronic stress. The protective factors included in the model are resilience-promoting factors, social safety/support nets and other resources for coping. Both risk and protective factors are considered interrelated and it is the balance between the risk and protective factors the one that predicts an individual's progress through increasing levels of distress.

The authors also consider the influence of the ecological risk factors in the process, despite working at a different level, mentioning that the individual processes and factors would influence directly on an individual person, while ecological processes would bring changes to the group environment and the context in which the risk factors operate. An additional level of complexity can be later considered for the cases of mental illnesses with completely biological aetiologies, such as purely genetic illnesses, as some could argue that no level of social or societal risk factors would be important.

Regarding the level of SC across a community, the authors consider that the effect of a high level of social capital would be beneficial, e.g. by preventing social isolation of individuals, encouraging active community engagement and also offering places where conflicts can be understood and managed. The Bridging SC component allows interaction among other communities, and those communities with high levels of it, would allow better coordination among communities, better conflict management and also obtain better resources, by allowing them to apply pressure on local authorities. Those communities in areas with higher levels of social efficacy may be better at protecting their Structural SC component, such as social and health services (e.g. through better organization to fight budget cuts, preventing schools or hospitals closures) and they may be more able to unite in pressure groups, and appropriate social organizations, accessible to all their members. And in times of crisis or disasters, such communities would be more

able to unite, to protect and support their members. Areas with less social capital, would have a relative absence of societal safety nets and in turn would lack the types of social support with a buffer role that would prevent the development of mental disorders facing those challenges. There is evidence that social and community ties allow better knowledge sharing and better communication among members (Habibov and Afandi, 2017, Howard et al., 2017). There are differences across mental disorder rates across socially isolated individuals residing in more cohesive communities and those living in less cohesive communities (Kawachi, 2001)

Another factor related to SC, distrust, was found significantly associated with age-adjusted mortality rates (Kawachi et al., 2004). Apart from the potentially injurious effects and anxiety produced by having to continually reassess one's environment in a distrustful community, higher levels of physical illness were reported to lead to higher levels of mental illness, as people try to cope psychologically to an external situation. The prejudicial effects of social disorganization, poorer informal community surveillance and low enforcement of norms by the authorities across the civil population, could lead to increased rates of crime, substance abuse and domestic violence, which in turn would increase the incidence of mental illness across groups(Elliot I, 2016).

The final model (Figure 3.2 - obtained from Chapter 3 of the book "Social Capital and Mental Health" from McKenzie and Harpham) illustrates the transition from having a vulnerability status to becoming mentally ill or from having an asymptomatic condition to the development of an incident illness, and then it becoming a chronic or prevalent condition. The model shows the influence of social factors on the vulnerability of the population, as well as its progression towards mental illness. The right-hand side of the figure shows the impact that SC has on individuals and communities, while the left-hand side shows the impact of SC on governance.

Figure 3.2 composite mechanism linking individual, community and vertical impacts on individual pathway balance to illness
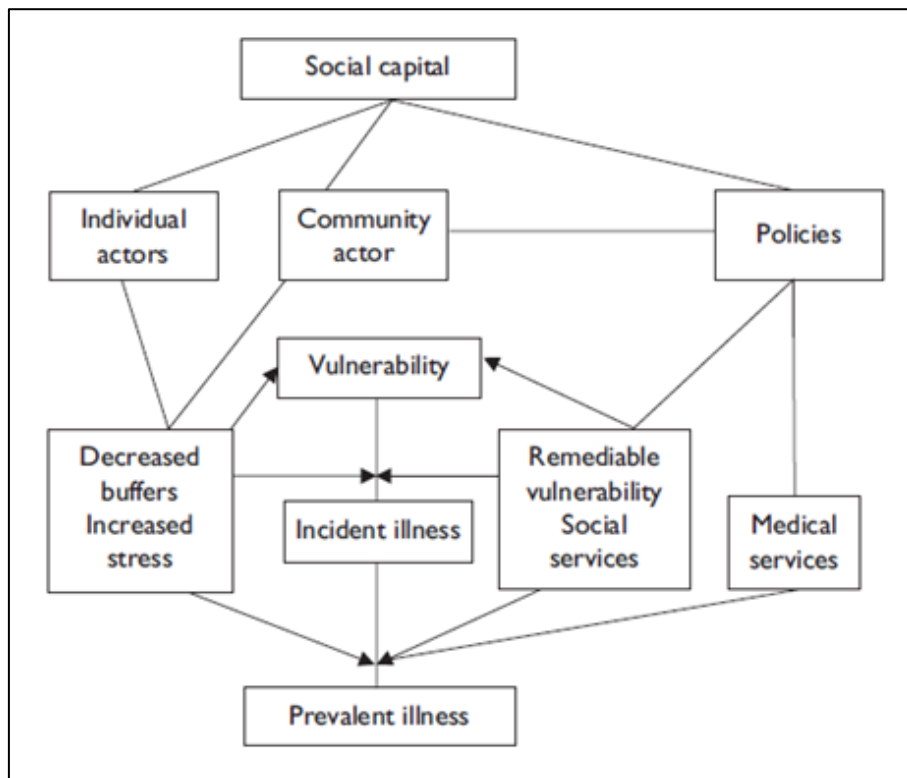
Figure 3.2 obtained from Chapter 3 of the book "Social Capital and Mental Health" from McKenzie and Harpham)

Poor mental health is associated with poor physical health (Naylor C, 2012), community and negative economic impact (Morgan et al., 2007, Butterworth et al., 2012), and can lead to impaired social/ economic development with consequent poverty and loss and decreased human capital (Payne, 2012, Boardman, 2011, Murali and Oyebode, 2004) and social capital (Elliot I, 2016, Kawachi, 2001).

In the past two decades there has been active research into how SC can be best employed as a protective or beneficial factor for mental health and psychological well-being, among other health-related factors.

The "social psychology of participation" has been established (Campbell et al., 2004) as the process involved in the functioning of community participation, with three factors: Social Capital, Social Identity and Social Representation. There is strong evidence that social relationships, group memberships and social identities related to them provide a

beneficial impact by protecting different population's mental health and providing psychological well-being (Jetten et al., 2012, Lipman et al., 2007, Sartorius, 2003, Sixsmith and Boneham, 2007, Theurer and Wister, 2010, Yetim and Yetim, 2014, Haslam et al., 2009, Cruwys et al., 2013). The complex associations of Social Capital, psychological well-being, health determinants (Nyqvist et al., 2014, Hyyppä, 2010) and contextual factors remain under ongoing investigation by social researchers (Campbell, 2011, Cattell, 2001, Mendolia et al., 2015, Blair et al., 2014, Cook et al., 2015). The main obstacle to determining a stronger causal association for Social Capital and mental health has been the scarcity of controlled, prospective studies on this topic (De Silva et al., 2005, McKenzie, 2008, McKENZIE et al., 2002a). A high level of Social Capital within a community has been proven to be a beneficial, supportive attribute for its members. (Calvo et al., 2012, Henderson and Whiteford, 2003, McKenzie and Harpham, 2006, Kawachi et al., 2008, Subramanian et al., 2005a, McKenzie, 2008, Borgonovi, 2010, Bjørnskov, 2003).

Due to feasibility issues, only a small number of experimental studies have successfully shown an association between the external building or strengthening of Social Capital and improved health outcomes. Some of these examples are: the intervention conducted by Brune and Bossert in post-conflict communities in Nicaragua (Brune and Bossert, 2009); the intergenerational social interactions of elderly volunteers and school children in the U.S.A; (Glass et al., 2004) and a South African trial that combined microfinance and training in partner violence and HIV infection for the participants, showing an increase in both of the main dimensions of Social Capital after two years of the intervention (Pronyk et al., 2008). A few other studies obtained preliminary results that could potentially be extrapolated to a general adult population or larger communities (Farquhar et al., 2005, Snoxell et al., 2006, Lai, 2014).

3.1.1 Hypothesized Causal Pathway

Psychological distress can directly be caused by the experience of being in the disaster or indirectly during the reconstruction process. Beginning with the simple model adapted from Lock et al. (Lock S et al., 2012) that proposes the development of mental disorders

by the associated effects of *El Niño* of flooding and heavy rain we can take into account the following stressors, grouped as:

 1. Primary stressors are those directly related or consequent to the event itself. This has been defined as: "…the stress inherent in particular major incidents, disasters and emergencies and arising directly from those events" (NHS, 2009). These may be experiences that are related directly to people's involvement in the event, such as for example watching someone being killed, or fearing for one's life and the safety of others.

2. *Secondary stressors* are factors that also impact the affected individual and were indirectly caused or worsened by the *El Niño* effects, such as work and economic losses, health related factors, family and social stressors and breakdowns, among others.

3. Finally, we need to consider the inherent *vulnerability factors* of the affected individuals and communities, such as exposed people living in poverty and vulnerable groups, and the ongoing social, development and environmental contexts.

An initial causal analytical diagram was developed (Figure 3.23). Where depression related to *El Niño* effects (extreme precipitations and flooding) and direct impacts (such as damage to houses and loss of crops) in affected communities may also be influenced by previous theorical and concomitant factors based at individual and ecological level (Please refer to section 1.2 of this thesis for all related factors).

The vulnerable groups nested in the affected communities in the Peruvian setting will also be more likely to live and/or work in flooding-prone areas. We are considering some theoretically associated baseline sociodemographic factors (such as being a woman, being elderly, unmarried, widowed or divorced, low-resourced, and having a low education level) as having a possible association with the development of distress and depression. Having previous mental illnesses (such as having a baseline diagnosis of depression), baseline chronic co-morbidities, permanent disability, and lack of access to health services are also being considered, as potential confounders in this model.

They may be associated with the development of depression in non-*El Niño* periods, and may confer an additional risk when the related effects and impacts of *El Niño* take place. The non-affected people from the study setting may work or live in areas that have less risk for experiencing floods such as the safeguarded zones (e.g. shielded houses and secured developed crop areas) which are located in higher lands and will therefore be more expensive to acquire. In the same way, if *El Niño* effects and impacts result in a loss of livelihood and earnings for the affected person, this factor will inflict an additional risk for development of depression.

Some factors can be expected to act as mediators between *El Niño* and the development of depression, such as a consequent increase in the use of alcohol, loss of income or assets and sleep disturbances or abnormal sleep, which can be foreseen in a post *El Niño* context. Then, the expected impacts of *El Niño* components may promote the development of depression through the following pathways:

- Worsened local, economic, social, and environmental factors compared with a pre-*El Niño* context.
- Damage to agriculture, households, and communities.
- Worsened physical health.
- Worsened economic status by loss of livelihoods and poverty.

The exposure to adversity then, may cause situational forms of psychosocial distress which may manifest in more profound mental disorders if there is no further community support or there is loss of Social Capital.

Figure 3.3 Causal Analytic Diagram Main Hypothesis

People with Higher levels of exposure to ENSO-related heavy rains and flooding would experience higher levels of depression

Occupation

Disability Status

Gender   Age   Education

Baseline poverty (Income & assets)   Marital status

Post-ENSO tobacco & alcohol use

Post-ENSO poverty (Income & assets)

El Niño-related heavy rains and flooding

Access to health system   Pre-disaster depression score (PHQ-9)

Precipitations level (categorized)

ENSO-related crops losses

ENSO related houses damages

Depression scores (PHQ-9)

Chronic co-morbidity (HTN, diabetes, etc.)

Post-ENSO absence physical activity

Post-ENSO sleep pattern

Legend: Outcome   Main exposure   Potential confounder   Potential mediator   Hypothesized causal Association   Association

49

3.2 Study Context

3.2.1 Overview of the study setting

The research for this PhD took place in Tumbes Department, which is in the north western coastal region of Peru, on the border with the neighbouring country of Ecuador.

Figure 3.4 Map of Peru and Tumbes department

Source: Google maps, 2018

The study area (hereafter referred to as "Tumbes") is a department of 4,669.2 km^2 (Instituto Nacional de Estadística e Informática, 2017c). It has a predominant warm and semi-tropical climate, and a large extension of mangroves. Its populated territory ranges in altitudes between 5 to 134 meters above sea level (Servicio Nacional Áreas Naturales Protegidas por el Estado, 2015).

Tumbes is a remote area, situated 1,271 kilometres to the north of Lima, the Peruvian capital. The Tumbes department is under the administration of the Regional Government of Tumbes, and divided into 3 provinces (Tumbes, Contralmirante Villar and Zarumilla), which are sub-divided into 13 administrative districts.

Figure 3.5 Map of the Provinces of Tumbes department.
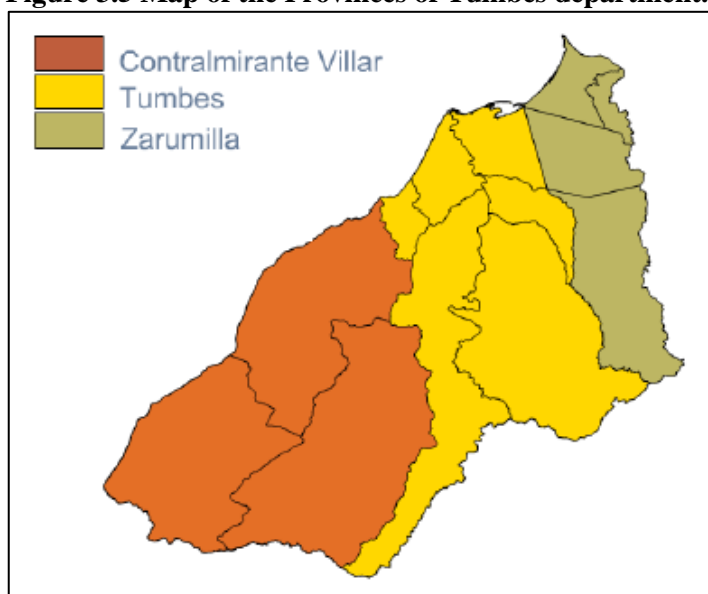
Source: Municipalidad de Tumbes, 2018

Six of these districts are in *Tumbes* province, which also includes the department capital, which is Tumbes district. The remaining districts are Corrales, La Cruz, Pampas de Hospital, San Jacinto, and San Juan de la Virgen. Three districts are in *Contralmirante Villar* province: Zorritos, Casitas and Canoas de Punta Sal. The last four districts are in *Zarumilla* province: Zarumilla, Aguas Verdes, Matapalo and Papayal.

Population

The most populated province is Tumbes, having almost 8.3 times the number of inhabitants than Contralmirante Villar, and 3 times the number of Zarumilla

province' residents (Instituto Nacional de Estadística e Informática, 2016e). As of June 2017 (Instituto Nacional de Estadística e Informática, 2017a) the total population of Tumbes department was 243,362 (131,821 males and 111,541 females). The estimated projected number of adults between 20 and 69 years for June 2017 was 154,615. For the 2015-2020 five-year period, the Tumbes population can expect to have an average life expectancy of 75.0 years (72.1 years for females, 78.0 years for males) (Instituto Nacional de Estadística e Informática, 2017a).

Tumbes' inhabitants are comprised of a large 'mestizo' – mixed European and Amerindian ancestry – population. According to national statistics, almost 95% of the population lives in an "urban" zone (Instituto Nacional de Estadística e Informática, 2017a). This has increased from 78.8% in 1981 to 94.8% in 2014. However, due to the availability of basic services, life characteristics and health risks in these areas (as detailed in the following paragraphs), these zones are better described as semi-urban areas (Antonio Bernabé-Ortiz, 2016, Taype-Rondan et al., 2017). The semi-urban area of Tumbes consists of 107 villages of varying size with an approximate total population of 80,000 persons (Bernabe-Ortiz et al., 2014).

Economic activities

Traditionally an agricultural and fishing landscape, Tumbes has become intermixed with rapidly growing urban and semi-urban sectors. However, the agricultural and livestock industry remains the main economic activity for Tumbes, with rice being the main agricultural product, followed by banana, lemon, cacao, corn, among others (Ministerio de Agricultura, 2008). In 2012, there were 8,134 agricultural producers in Tumbes. From them, 7,234 farmers (89%) had no technical or professional background. Their distribution among the provinces varied: 61% were in Tumbes province, 28% in Zarumilla and 12% in Contralmirante Villar. Regarding farming land ownership, 76% own the land

they work, which, in the majority of cases (60%) has an extension between 0.5 and 2.9 Acres (Instituto Nacional de Estadística e Informática, 2012).

The Economically Active Population (EAC) are those in Tumbes who have reached the age to work (14 years old and above) who are currently working or unemployed but actively searching for a job. Until 2015 the EAC in Tumbes comprised of 140,606 people. Of these, 87,602 were males and 53,004 were females and almost 95% resided in the urban area of Tumbes (Instituto Nacional de Estadística e Informática, 2015b). The remaining 50,000 Tumbes residents were in the Economically Inactive Population (EIP) group. In the EAC group 75.8% were aged 25 to 59 years old; 15.8% 14 to 24 years old and 8.4% were at least 60 years old (Instituto Nacional de Estadística e Informática, 2016c). Among the EAC group there were 4,500 persons (3.2%) who were not employed in any activity. However, despite the low numbers of unemployed people, the majority of the EAC (74.1%) are employed in informal activities of subsistence (subemployment), and only 17.5% can be considered as formal employees (Instituto Nacional de Estadística e Informática, 2016c).

The minimum monthly wage considered for 2016 and 2017 in Tumbes was 850 PEN (Peruvian Soles), which roughly equals to 193 GBP (Great Britain Pound) (Ministerio de Trabajo y Promoción del Empleo, 2017). The average monthly family income in Tumbes department in 2016 was reported to be 1,255.5 PEN (284 GBP), and the basic monthly market basket for the coastal region is estimated as 375 PEN (85 GBP) (Instituto Nacional de Estadística e Informática, 2016c).

Access to basic needs and poverty

The poverty prevalence in Tumbes department ranges from 9.83 to 12.57% (Instituto Nacional de Estadística e Informática, 2016b). It was also reported in 2016 that 28.6% of the population had at least one basic need unmet, through living in inadequate housing, in overcrowded conditions, without access to basic

services, having children from 6 to 12 years old without education access or living in a household with high economic dependence (defined as a household where either had 1. A head of household without primary education or 2. Four or more unemployed family members) (Instituto Nacional de Estadística e Informática, 2016a). Also, 44% of all households have at least one member who received food vouchers from governmental support programs. This percentage rises to 67.7% when only considering the poor households (Instituto Nacional de Estadística e Informática, 2016c).

In 2016, 58% of houses were built with stones, mud, thatch and other rudimentary materials (Instituto Nacional de Estadística e Informática, 2016a) and 40% had earthen floor (Instituto Nacional de Estadística e Informática, 2016c). The access to basic services is also limited in this region: an estimated 38% of houses lacked public water supply and between 32 and 39% did not have access to the public waste drainage system (Instituto Nacional de Estadística e Informática, 2016a). In contrast, access to electricity was much higher, ranging between 83.4 - 97.4% comparing rural and urban houses (Instituto Nacional de Estadística e Informática, 2016a) and roughly 90% of households have cell phone access (Instituto Nacional de Estadística e Informática, 2015c).

The distribution of poverty, inadequate housing and access to basic services and communication varies markedly among the districts that comprise Tumbes department. In Tumbes district (where the capital of the department is located) 19.5% homes were deemed unfit for living, 14.7% were without running water and 22.6% lacked toilets and sewerage access. In Casitas district, 57.9% of homes were unfit for living in and 99.8% had no toilets or sewerage access.

Regarding means of communication (telephone, cell phone, internet, or cable), the lack of access in the province ranged from 2.9% in Zorritos district to 12.9% in Papayal district. Regarding ownership of domestic assets, at least 76.3% of households in Tumbes department had access to a radio or sound system, 92.2%

had a television set, 10.5% had a telephone landline (7.7% less than in 2009), 93.7% had one member with a mobile telephone (16.4% more than in 2009) and 29.6% owned a computer (11.9% more than in 2009, but 4% less than the year before), 22% had access to internet (18.3% more than in 2009) and 53.2% had access to Cable service (34% more than in 2009) (Instituto Nacional de Estadística e Informática, 2016c).

Education

In 2015, the district with poorest education was Matapalo, where illiteracy was 8.1% and 63.4% of adults (aged over 15) had not finished high school. By comparison, in Tumbes district illiteracy was 2.4% and 38.2% of adults had not finished high school. The average percentage of people older than 15 years old that have not finished high school was 50.3%, (Instituto Nacional de Estadística e Informática, 2017a). The average number of years of study completed by Tumbes's residents over 15 years old in 2016 was 9.9 years among males and 9.8 years among females (Instituto Nacional de Estadística e Informática, 2016c). 12% of the population older than 15 years old attained a university-level education (Instituto Nacional de Estadística e Informática, 2016c).

Social context and violence

Regarding violence and social problems, in 2016 Tumbes department urban residents reported the lowest insecurity perception (64.8%) in comparison to the 90.4% average reported among similar coastal departments (Instituto Nacional de Estadística e Informática, 2016d). Also, the percentage of urban residents of 15 years old and older who were victim of a criminal or theft event was reported to be 17.6%, much lower than the national average of 28.8% (Instituto Nacional de Estadística e Informática, 2016d).

There is an important lack of registry of intimate partner-related violence in Peru, similar to other low- and middle-income countries of the Latin American region.

In Tumbes department in 2016, there were 2,339 reported formal complaints of intimate partner-related violence. This number represents an increase of almost 61% compared to 2015 (Ministerio del Interior, 2016). According to a 2016 national survey, 68.7% of women in Tumbes department had experienced any type of violence from their husband or partner: physical (31.3%), sexual (6.7%), psychological or verbal (64.5%) (Instituto Nacional de Estadística e Informática, 2016a).

Disability

In 2007 in Tumbes it was reported among the 50,005 censed households with inhabitants' present, 4,970 of them had at least one family member with any disability. Most of them (45% or 2,256 households) reported a disability related to visual impairment (Instituto Nacional de Estadística e Informática, 2018b). Other forms of disability (e.g. related to deafness, mobility) were much less reported, possibly because the residents related those more to the "usual" ageing process.

The first specialized survey about disability was conducted in Peru in 2012, and it was found that nationally 17.5% of urban households had at least one family member living with a disability (17.5% in urban areas, 14.3% in rural ones). This distribution is more frequent in the group over 65 years old (50.4%) (Instituto Nacional de Estadística e Informática, 2014). These numbers reflect a large underestimation of self-report on other disabilities based on estimates from other LMICs.

Religion

The dominant religion in Tumbes at the time of the census of 2007 was Catholicism (84%), followed by evangelical Protestantism (12%). A minority percentage (2%) were members or followed other religions, and 2% were not a member of any religion (Instituto Nacional de Estadística e Informática, 2018b).

High-risk areas and environmental conditions

Peru has more than fifty percent of its population (15.6 million people, in 2015) living in areas with high and very high risk of natural disaster recurrence and of these, more than 5 million people are considered to be within vulnerable groups for environmental hazards (toddlers from 0 to 5 years old, children of 6 to 11 years old, elderly of 60 years old and older, and women within fertile age groups, between 15 and 49 years old) (Instituto Nacional de Defensa Civil, 2015).

Tumbes department has 10 of 13 districts considered as having a high risk of recurrence of natural disasters, and within these, 93% of its population (120,191 residents) are classified as part of a vulnerable group and at risk of disasters (Instituto Nacional de Estadística e Informática, 2015a).

The mean annual temperature of Tumbes reported in 2015 was 27.2 degrees Celsius. This corresponds to 1.2 degrees higher than 2014 and 2.1 degrees higher than 2013 (Servicio Nacional de Meteorología e Hidrología, 2015). It can reach 40 degrees during strong environmental events, such as the "*El Niño*" events.

The "El Niño" Southern Oscillation – ENSO / El Niño in Tumbes

The *El Niño* is considered the main disruptive environmental phenomenon which historically affects the Peruvian north coast. It is expected to occur cyclically every 5-10 years. The most recent *El Niño* event (from December 2015 until June

2016) was considered a strong *El Niño* according to its precipitation volume (Sanabria et al., 2018, Popular;, 2016, Rodriguez, 2016). It was followed by a local unexpected "*coastal El Niño"* event, from December 2016 until May 2017, which caused floods, landslides and unexpected damages (Servicio Nacional de Meteorología e Hidrología del Perú – SENAMHI, 2017, Chávez Cresta, 2018).

Tumbes department high-risk areas in association with extreme weather events, a reduced river basin capacity and ecosystem vulnerability as result of environmental degradation, will lead to flash-floods and landslides. In addition, due to its location in a semi-tropical climate region, Tumbes has its rainy season from the months of January to March each year. With the growth of rivers, some localities within Tumbes region can become isolated, as well as suffer damage to public and private infrastructures, increased health risks of the population by the presence of insects, deficient basic sanitation and excreta disposal and diminished access to clean water, among other factors.

A recent study (Hernández-Vásquez A, 2016), conducted in four departments of the north coast of Peru assessed the vulnerability of health facilities in case of flooding related to *El Niño*. Tumbes was predicted to be the most affected region, as 37.5% of its hospitals and health centres are within the mapped risk zones (Figure 3.6).

Figure 3.6 Tumbes Map of vulnerability to flooding of health facilities.
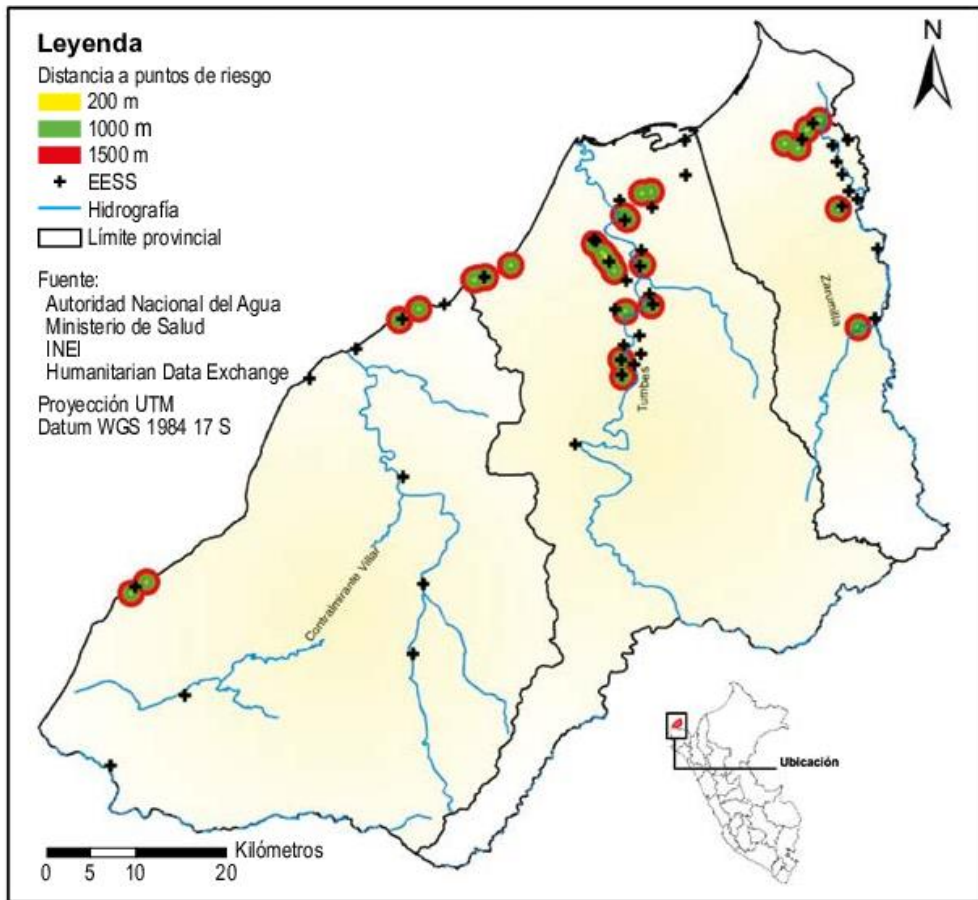
Figure 3.6 Source: Hernández-Vásquez A A-HH, Bendezú-Quispe G, Díaz-Seijas D, Vilcarromero S, Rubilar-González J, Gutiérrez-Lagos E. Potencial vulnerabilidad frente a inundaciones, de los establecimientos de salud públicos de cuatro regiones del norte del Perú. Rev Peru Med Exp Salud Publica. 2016;33(1):92-9.

Economic impact of El Niño in Tumbes

The economic losses that an *El Niño* event causes can be measured through agricultural losses. The agricultural and livestock work surface is 228,48 square kilometres (0.04% of all Tumbes department) (Instituto Nacional de Estadística e Informática, 2015c). In 2014, the three main products of Tumbes were rice (142,953 metric tons), banana (85,046 metric tons) and organic banana (26,730 metric tons). In 2015, 12.9% of the rice crop, 38.3% of the banana and 36.1% of the organic banana crop was lost because of the *El Niño* event. In contrast, other

products such as lemon reported an increase in their production. Regarding livestock, all ovine, porcine, caprine, bovine and dairy products had reported losses, except poultry and egg production, which had slight increases in production (Dirección Regional de Agricultura Tumbes, 2016). According to the latest reports available of *El Niño* event, 1,100 acres of cultivated lands were destroyed in 2015 and only 160 acres in 2016 (Instituto Nacional de Estadística e Informática, 2017a).

Health facilities and resources in Tumbes

Per the National Health Superintendence (SUSALUD) 2017 reports, Tumbes department health services include 63 government-run health facilities. These include three secondary hospitals: one hospital (JAMO II) level II-2 and two hospitals of level II-1 (JAMO I and EsSalud hospital "Carlos Alberto Cortez Jimenez"). These hospitals have in-patient facilities, major specialties (such as internal medicine, obstetrics, general surgery, and paediatrics), emergency services, in-patient and out-patient services. Only JAMO II has all specialties, ambulatory services, and psychiatry consultations. Even though this hospital was built from 2011 to 2014 (to replace JAMO I built in 1963), it has serious structural deficiencies, and it has recently been declared in emergency, is currently uninhabitable and is only offering minimum health services (Vignolo, 2018) among corruption scandals (Rodriguez, 2018). There are also twenty primary health centres without in-patient facilities and 40 basic health stations run by itinerant general physicians and other health professionals (Instituto Nacional de Estadística e Informática, 2017c).

Combined, and in full operation, the hospitals can provide 500 beds for the Tumbes department's population (Ministerio de Salud del Perú, 2016). All of these institutions are managed under the Ministry of Health (MoH) budget, except one of the hospitals and 3 health centres, which are run by EsSalud (Peruvian social security) and provide health services only to the EsSalud

insured population (Seguro Social de Salud, 2016). The MoH facilities are under the DIRESA's (Regional Direction of health in Tumbes) administration, operating under the Regional Government of Tumbes (Ministerio de Salud del Perú, 2008). All health facilities under the DIRESA are currently organized in micro-networks, which constitute the network of health services in Tumbes, which end in JAMO–II-2 regional hospital for medical referrals.

There are 4 heads of micro-networks overseeing 42 health centres and health stations:

1. *Zarumilla*, with 3 health centres (Aguas Verdes, Papayal and Matapalo) and 7 basic health stations or "*postas*" in its network.

2. *Pampa Grande*, with 2 health centres (Pampa de Hospital and San Juan de la Virgen) and 7 basic health stations in its network.

3. Corrales, with 2 health centres (San Jacinto and La Cruz)

4. Zorritos, with 1 health centre (Cañaveral)

The head of the micro-network, despite being categorized as level I-4, does not offer basic specialties such as paediatrics and obstetrics/gynaecology (Dirección Regional de Salud - Gobierno Regional de Tumbes, 2017).

In reference to health staff, in 2016 there were 204 physicians (1,179 habitants per physician) (Colegio Medico del Peru, 2016), 488 midwives (Colegio de Obstetras, 2016) and 544 nurses (Colegio de Enfermeros del Perú, 2017).

Figure 3.7 Main entrance to the Regional Hospital of Tumbes

Photo credit: Diario Correo, 2017

Figure 3.8 Main entrance DIRESA (Dirección Regional de salud) Tumbes

Photo credit: Google Maps, 2018

Figure 3.9 Main entrance Micro-network Centro de Salud de Zorritos

Photo credit: Diario Correo, 2017

Figure 3.10 Main entrance Centro de salud Pampa Grande

Photo credit: Diario Correo, 2017

Distances to Health facilities

The population living in semi-rural areas spend an average of between 14 to 44 minutes (traveling by foot) and 12 to 19 minutes using any motorized means (motorcycle, car, bus or minivan) to reach the nearest health centre (Instituto Nacional de Estadística e Informática, 2017c).

Insurance and Access to health services

Regarding access to health services, 76.5% of the Tumbes population have at least one form of health insurance whilst 23.5% of the population are uninsured. Of those insured, 21.9% are affiliated to EsSalud, the Peruvian social security and 62.2% to SIS – the integral health service, which is provided through the MoH to the poorest residents. Almost 2.8% of the population have other types of health access and insurance (including private insurance, military and police health services) (Instituto Nacional de Estadística e Informática, 2016c). However, SIS insurance is in serious economic debt to the health facilities and suffering from a lack of cover and financing since 2016 (Redacción Economía, 2018, Martinez, 2017), failing to provide adequate treatment to the most vulnerable groups. With few exceptions, those insured with SIS are only able to access MoH centres/ health stations, and not the regional hospitals (Seguro Integral de Salud, 2016).

Mental Health services Overview

In 2012 law N°29889 was issued, ensuring the rights of the population with mental health disorders. This law modified the article 11 of the General law of health (26842) which was the main law regulating health in Peru since 1997. Three years later, the regulations of the law 29889 (D.S N° 033-2015-SA) were issued, implementing (by June 2018) 31 Centres of Community Mental Health (CMHC) which are expected to increase in number until 2021 (Ministerio de

Salud del Perú, 2018b). However, despite the political will, the implementation of the community-based services has been far from smooth: the first CMHC of Tumbes, called Centro de atención rápida (CAR) opened on September 2018, in the shantytown *Campo amor,* in *Zarumilla* district in an adapted shipping container, with a total professional staff of 4 psychologists and one GP. Nevertheless, in June 2019 the 'Defensoría del Pueblo (Human Rights Ombudsman)' denounced that the centre's facilities were inappropriate to provide admissions and lacked basic services or security.

 The Mental Health Directorate is a relatively new body, administratively part of the Ministry of Health and created in 2016 with the Supreme Decree N°007-2016-SA under law N°27658, which aimed to modernize the Government's public administration. This direction is currently working towards the expansion of mental health community services, but there is still no available information on its impact, effect, or on its evaluation process.

 In Peru, in 2016 there were 57,922 mental health-related admissions, which reflects a 36% increase in comparison to 2015, and 3.4 times more than the numbers reported in 2012 (Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2016). Despite the existing treatment gap for persons requiring mental health services, it has been reported (Castillo-Martell, 2019) that, through the implementation of 29 Community Mental Health Centres in 2018 there was the provision of more appointments (244,000 vs. 246,000) and clinical consultations (46,000 vs. 48,000) than the three national psychiatric hospitals, but using 11% of the funding and 43% of specialized staff. Per

Mental Health resources in Tumbes

Tumbes department has a distribution of 1.4 psychiatrists per 100,000 and 1.0 psychologists per 10,000 residents (Equipo Tecnico DSM, 2016). Tumbes department is staffed by 2 psychiatrists (in JAMO-II hospital). There are no

certified private mental health services or specialized clinics that offer appointments or counselling; there is also no information on the exact number of psychologists, nurses specialized in mental services or counsellors available to the population, and in which type of institutions.

Mental health offer related to disasters and El Niño

After the latest coastal *El Niño* event, the Ministry of Health issued resolution RM Nº 110-2017 in February 2017 to form "mental health brigades in contexts of emergency and disasters" (Economica;, 2017, Garcia-Funegra, 2017). This has followed the resolution Nº009-2004-SA also from the Ministry of health, describing the plan of prevention and offer of health care in emergencies and disasters, which has launched several manuals and programs plans which follow the individual psychological aid relief (Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2010). The short-term health brigades were temporarily available teams managed under the DIRESA and they reached a limited number of places of Tumbes department when emergencies occurred. However, there is not much information available from the Ministry of Health detailing the support they provided, the exact areas that were visited or other operative outcomes.

The current mental health brigades were implemented after 1st April 2017 (Minsa;, 2017) and were focused on 1) assessing resources of the communities they visited (such as health staff and services available to the population in the period pre-and after the event took place) and 2) providing quick psychological assessments and counselling for affected people for up to a week. Services were offered in temporary tents or in government run facilities such as schools or in health clinics.

In Tumbes, as the available regional resources were exhausted by the last *El Niño* event, MINSA mobilized 24 brigades with volunteers from Lima (most of them psychologists and psychiatry residents in training). Due to the shortage of staff or trained fieldwork voluntary personnel, the brigades were only able to stay 1

or 2 days in selected villages. The brigades did not provide additional consultations or direct referrals or follow up appointments. The number of disorders that were treated by these brigades is unknown, as is the kind or quantity of medications that were administered or if specific psychotherapy interventions were used. Overall, there are no available statistics reporting the number of localities visited, or specific numbers of patients with mental disorders treated or the impact or effect of these brigades.

Most of *El Niño* -related research has neglected the possible impact that this event may have on the mental health of affected communities. Those communities who live in the vulnerable zones historically affected by *El Niño* are often unable to diminish the environmental hazards that surround their living and working areas and may experience an accumulated detrimental effect to their individual well-being and their community's mental health.

3.3   Quantitative research

The objectives of the quantitative research component were:

• To describe the time trends of adult mild depression scores between April 2014 and March 2017 across the six localities of *SALT* trial.

• To compare the time trends of adult depression scores of SALT trial participants by locality and external environmental and impact variables.

• To compare the time trends of adult mild depression scores by age, gender, socioeconomic status, education level, marital status, occupation, disability, and lifestyle factors (tobacco and alcohol consumption, physical activity, and sleep patterns) through time.

• To evaluate the association between *El Niño* -related effects and adult mild depression scores in the sample.

• To assess the potential effect-modifying role of poverty, use of alcohol and abnormal sleep pattern in the association between *El Niño* events and adult mild depression scores in the study sample.

3.3.1 Quantitative data collection

In order to evaluate the association between *El Niño* events and mental health among adults in the northern coast of Peru, we conducted a secondary analysis of the data from the *SALT* trial. This is a stepped-wedge cluster randomized trial which collected repeated measurements on depression scores since April 2014 to March 2017 in 6 localities.

The assessments were registered before, during and after the 2015-2016 declared *El Niño* event in a representative sample from Tumbes department. This sample has been identified as potentially the only representative cohort sample from this region which has retrieved repeated assessments involving this period.

Figure 3.11 Map of Tumbes with quantitative data collection location circled (localities of the Salt Substitution Trial - SALT study)

Source: Own adaptation

(Salt substitution trial) "SALT" trial

The study entitled: "Launching a salt substitute to reduce blood pressure at the population level: a cluster randomized stepped wedge trial in Peru" (SALT) was sponsored by the National Heart, Lung and Blood Institute (NHLBI) and it is a joint effort between local research centres affiliated with Universidad Peruana Cayetano Heredia (UPCH) Non-communicable disease centre (Centro de Excelencia en Enfermedades Crónicas - CRONICAS), the Centro de Salud Global Tumbes (CSG-Tumbes) and Johns Hopkins Bloomberg School of Public

Health. Its main objective was to implement and assess the population-level impact of a salt substitute intervention on blood pressure and to determine the cost-effectiveness of this implementation strategy.

The sample involved adults of both sexes living in semi-urban areas of Tumbes. The salt substitute employed in the trial was potassium chloride and the study involved formative research and a pilot trial with clinical and survey assessments every five months for three years, until the 7th study assessment, in March 2017. The study team initially engaged with authorities and leaders from the selected villages and gave an initial presentation and explanation of the study at the before beginning the research activities of SALT trial. Then, residents aged +18 years were contacted by the study staff to engage for individual informed consent. Participants with a history of terminal or severe chronic kidney disease (on any form of dialysis) or those taking digoxin or potassium-sparing diuretics (for heart disease) were excluded from the study. Full details of this trial protocol and methods have been published elsewhere (Bernabe-Ortiz et al., 2014).

Data from the SALT trial was obtained thanks to Dr. Antonio-Bernabe Ortiz and Dr. J. Jaime Miranda, Principal Investigators of this study, who agreed to share the mental health outcomes and related assessments of the participants for this thesis analysis.

Methods

The *SALT* Trial implemented its intervention at the village level but assessed its outcome of interest (systolic and diastolic blood pressure levels) at individual level. It finalized its 7th study assessment in March 2017. This stepped wedge cluster randomized trial aims to evaluate the effects of the use of a SALT substitute in Tumbes, a severely affected department by *El Niño* in the northern Peruvian coast. The study population consists of 2,376 adults living in 1,173 houses located in 6 localities in Tumbes department located in 4 districts. As part of the trial, longitudinal data on depression scores has been collected with a translated and validated version of the Patient Health Questionnaire (PHQ-9) in

seven time points, every 5 months, between April 2014 and March 2017. For this project, we will evaluate the time trends of the association between *El Niño* -related effects during *El Niño* and non-*El Niño* periods and the depression scores assessed in the study sample.

Primary study Measurement

Depression scores were measured using the validated Spanish version of the Patient Health Questionnaire 9 (PHQ-9). The PHQ-9 is a widely used validated instrument for diagnosing depression and its severity. Current mild depressive episodes will be defined as a score of 5 or more. This a commonly accepted cut-off point (Manea et al., 2012) which previous studies have used to indicate mild depression. Categorized depression scores will be used as the outcome for the analysis.

Secondary study Measurements

These study assessments have been collected using the WHO Step Wise adapted survey (Riley et al., 2016) and the short set of questions for disability from the Washington Group (Madans et al., 2011)

1. Baseline (initial) assessment: The data includes information at the individual level for: socio-demographic characteristics (gender, age, marital status, education level, socioeconomic status, occupation status and disability status), access to health services, lifestyle (use of tobacco, alcohol, absence of physical activity), disturbance in sleep patterns and chronic co-morbidities (hypertension, diabetes, cerebrovascular events, etc.).

2. Follow-up (each 5 months) assessments: Absence of physical activity, use of alcohol and tobacco, disturbances in sleep patterns, access to health services and chronic co-morbidities.

The complete list of variables and their operationalization are included in the Appendices section (Appendix A List of variables to be included in the Quantitative component analytical model)

Collection of SALT trial data

The *SALT* fieldwork team approached each household in the selected villages, documented the responses and clinical assessments in study-specific collection sheets and transported them back to the study site of CSG-Tumbes, for data entry and upload to the secure UPCH server. Data entry began in April 2014 and was completed in June 2016. All registries were double entered by at least two trained data entry clerks. Inconsistencies were solved by reviewing the registers, and corrections were applied when required. Spot checks were also made by the study Data Manager, after which all inconsistences and queries were resolved. Missing records were listed and discussed among the study staff. At least two attempts were made to retrieve missing information from the participants. All data was cleaned and standardized by one experienced study team member. After I received the anonymized, cleaned data from the study data managers I applied edit checks in Stata version 15. These included checks for missing data, integrity and duplication of ID numbers, validity of dates, and completeness of variable information. I went back to the study team to confirm the information when uncertainty or missing records were identified.

External Variables data collection

To be able to define periods where an "*El Niño*" event was present and caused damage at a population level, the following external variables covering the

period April 2014 to April 2017 and representative for Tumbes department were collected.

1. *Environmental Variables:*

a. The Peruvian environmental agency SENAMHI (Servicio Nacional de Meteorología e Hidrología del Perú) was contacted and a formal request to use the data collected by their monitoring stations in Tumbes was sent in June 2017 with the support of UPCH. Daily measurements of the following variables representative of Tumbes department were used: precipitation volume (mm), air temperature (°C), relative mean humidity (%). SENAMHI standard levels for thresholds (Servicio Nacional de Meteorología e Hidrología del Perú – SENAMHI, 2014) were used to define and characterize extreme and over-the limit measurements compatible with *El Niño* periods in their daily registries.

b. NOAA (National Oceanic and Atmospheric Administration), a scientific agency from the United States of America, which registers the oceans and atmospheric conditions has their data publicly available, however, it must be extracted manually from its website. The daily measurements collected by automatic buoys and ships of US Navy of the Superficial Sea Temperature (SST) in the area closest to Tumbes and Ecuador coastal line were obtained. Also, these daily measurements were contrasted with the records that SENAMHI keeps with public access. Any discrepancies among the records of these two agencies were solved using the SENAMHI registry, as the NOAA ships are in movement and not all buoys keep daily records.

2. *Disaster Variables*

The information on the impact of the "*El Niño*" event was obtained through the Peruvian entity in charge of disasters registry INDECI (Peruvian national Institute of Disaster and Civilian defence). The data was obtained through a

direct request to the statistics chairperson of INDECI in Lima, who collected daily reports of damage for the Tumbes districts. These included the number of households collapsed and damaged by extreme rain, flooding and landslides emergencies reported in each Tumbes district, and the number of persons affected and damaged from the same type of events (Instituto Nacional de Defensa Civil, 2017).

3. Economic losses Variables

Local data from the Peruvian Ministry of Agriculture (Peruvian Ministry of agriculture, 2017) reports of damage was obtained through a direct request to the chairperson for Tumbes department. A tri-monthly registry of Tumbes hectares of cultivated areas and metric tons of crops lost to extreme rain, flooding and landslides emergencies reports by district was obtained.

To be able to link together and merge these external datasets with the SALT trial data, the visit date of each subject (recorded as month and year) was used, and all daily registries were transformed into mean monthly values.

3.3.2 Statistical analysis methods

All statistical analyses were conducted in Stata 15 (StataCorp LP, Texas, USA). Descriptive and exploratory analyses were performed using tabulations and graphic methods, to verify the entered data and detect atypical values. Then, the variables of interest were described using measures of central tendency (mean, median, etc.) and dispersion (standard deviation, interquartile ranges, etc.). A longitudinal analysis and appropriate panel data were used for the assessment of depression scores from baseline to the end of follow-up measurements. Trends were compared with the presence of the *El Niño event*, defined through standard meteorological data registries (obtained through the Peruvian environmental

institute SENAMHI*) and any differences by locality exposure level were also explored. Both individual-level analysis using a generalized linear regression model (GLM) and a multi-level analysis were conducted.

The time periods related to *El Niño* effects were defined as non- *El Niño* and *El Niño* periods, referring to the periods where *El Niño* was operationally defined and reported by NOAA using the Southern Oscillation Index and the Oceanic Niño Index. Also, *El Niño* probably related effects were delimited using local Peruvian environmental authority daily registries for Tumbes, categorizing the climatologic variables as within normal limits according to historic registries, or out of limits, and compatible with weather anomalies for Tumbes department localities. The 6 study localities were categorized according to the INDECI and CENEPRED reports, as "affected" or "no affected" by *El Niño*, according to the extreme precipitation's registries, affected households and buildings of local institutions, and number of emergencies reports related to *El Niño* registered during an *El Niño* defined period.

Ratios of the rates of depression cases per person-time at risk were calculated in the highly affected areas in comparison to the low or non-affected areas per month of the defined *El Niño* and non- *El Niño* periods. In the regression models, pre-existing differences and any trends no considered in the defined time-periods were controlled and compared using appropriate longitudinal and panel statistic resources, also comparing results stratified by sociodemographic, house and family characteristics, lifestyles assessments, among other selected factors.

3.4 Qualitative research

The objectives of the qualitative research component were:

- To explore how Tumbes residents' livelihoods and mental well-being were affected by *El Niño* events and how was their individual and community response to this event.

- To explore their perceptions of availability and access to support systems that are implemented in Tumbes, in relationship to the occurrence of *El Niño*.

- To explore their thoughts on the possible strategies that would help to strengthen their existing community ties and enhance their resilience upon future *El Niño* events.

- To examine the views of representatives of regional and local authorities of Tumbes regarding the same topics.

3.4.1 Qualitative data collection (Overview)

Data collection for the qualitative component of the thesis was conducted in seven localities of the northern region of Tumbes in June 2016 (Figure 1.12): Zorritos, Pampa Grande, Pechichal, Pampas de Hospital, El Rodeo, Zarumilla and Tumbes urban area. Focus group discussions (FGD) and semi-structured In-depth interviews (IDIs) were planned and conducted with residents affected by *El Niño* events and with the local authorities, representatives of Tumbes institutions (from different public sectors).

The data collection activities followed three specific Topic Guides: for IDIs with residents, IDIs with authorities and FGDs with residents. Please refer to Topic Guides in Appendix section- Appendix K, L and M). During the qualitative component project, I conducted daily debriefings with my mentor, NT to monitor the progress of data collection and to quickly identify any concerns pertaining participant welfare.

Figure 3.12 Map of Tumbes with qualitative data collection location
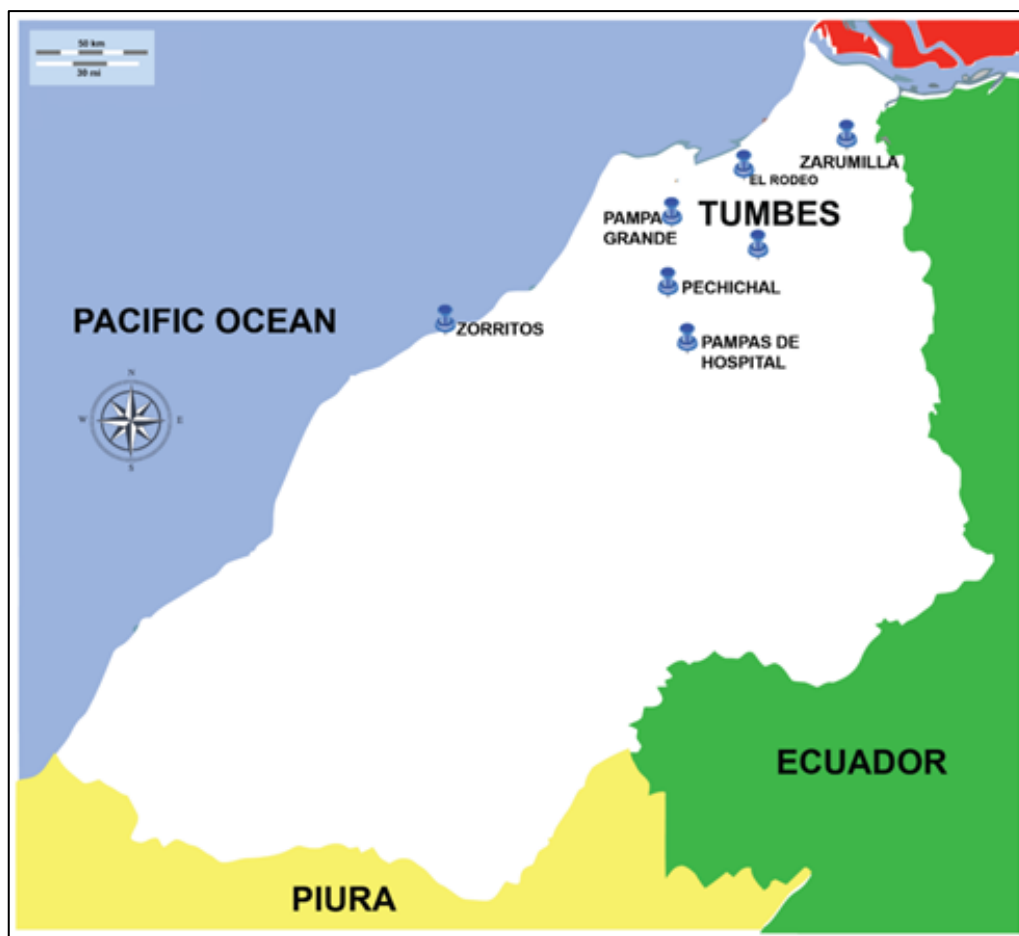
Source: Own adaptation

Please refer to more details regarding the qualitative component data collection methodology in Chapter 6 of this thesis.

It was estimated that a minimum of 3 FGDs and 10-12 IDIs would be needed from at least three different locations across Tumbes department, categorized by the level of heavy rains and flooding related to latest *El Niño* events to promote diversity among participants. The final sampling number was left open and would depend on when theoretical saturation is reached. We employed purposeful sampling. We created and gave out a participant information sheet (Appendix G) and written informed consent was obtained from all the participants (Appendix H, I and J). FGDs was conducted for each stakeholder type separately and was planned to include 5-7 participants. IDIs were used for in-depth exploration of sensitive issues from selected participants.

The FGDs were planned to engage participants to share their life experiences with the effects of *El Niño* in their communities and focus on participant opinions of the individual and community response to *El Niño* events. The FGDs facilitator also asked about:

- Their perspectives on the availability and access to support systems that are already in place in Tumbes area, which may diminish detrimental impacts of *El Niño* on their mental health.
- Their perceptions on possible strategies that would help them to strengthen their community ties and enhance their resilience upon future *El Niño* events to gain understanding on this topic; and
- The views of local authorities and Institution's representatives on the same issues.

Each FGDs was planned to last between 1-1.5 hours. The IDIs and FGDs were conducted in Spanish and digitally audio recorded. The audio-recordings were transcribed and coded in Spanish. The codes and quotes were then translated into English for the analysis and reporting. All qualitative data collection activities were held in private locations, convenient for study participants.

Please refer to more details regarding the qualitative component methodology in Chapter 6 of this thesis.

3.4.2 Data collection and analysis

The IDIs were analysed trying to identify themes and relationships between themes to answer the proposed aim and objectives. After multiple readings, the initial set of themes were identified and transformed into codes. Coding was carried out using the NVivo software program (NVivo qualitative data analysis Software; QSR International Pty Ltd. Version 11).

Please refer to more details regarding the qualitative component methodology in Chapter 6 of this thesis.

3.5 Ethics

Consent to enter the qualitative study was independently sought from each participant. A verbal explanation of the study was given, and an information leaflet offered, with appropriate length given for consideration. Signed consent was obtained and recorded using a form in compliance with GCP guidelines (Appendices G, H, I and J). The participant's right to refuse without giving reasons was respected during all stages of participation.

Data entry clerks who entered the *SALT* data were experienced and trained in the study data confidentiality. I have not accessed to any raw identifiable survey data and clinical assessments documentation; however, I have completed a research in ethics certificate through the Collaborative Institutional Training Initiative and I also hold training in data confidentiality and protection to human subjects in research.

Ethical approval for the quantitative component *SALT* trial was obtained from UPCH and John Hopkins University ethical review boards. Also, the LSHTM ethical committee reviewed and approved the secondary analysis project. Regarding the qualitative component, ethical approval applications were sent to Ethics Committees at UPCH and LSHTM. Permission to conduct the qualitative phase of this project was granted. (see Appendix C for all the ethical clearance certifications). The ethical approvals of all UPCH-related studies require a previous registration in the University Direction of Research and Scientific Technical Information (Dirección Universitaria de Investigación e Información Científico Técnica (DUICT) in the SIDISI internal system (see Appendix C for the SIDISI UPCH submission form)

3.6   Role of the candidate

When my PhD studies began, in 2016, Peru was closely following the day-to-day weather reports released by environmental agencies. These were not as strong as the initial projections for the announced phenomena in other coastal areas of the Pacific Ocean. When the topic gained a bigger recognition after the occurrence of the 2017 *El Niño Costero* effects on almost all of the Peruvian coast departments, several questions were raised during the emergency status regarding the unequal support received by the survivors. I was interested in exploring the ways and the factors related to the affected communities' perceptions at both individual and community levels of those affected by *El Niño* were related, how were their responses and how was the community support structures when they were no longer under the media spotlight and the first respondents and relief brigades abandoned the disaster zone. Due to the PhD timelines and the availability of support staff for data collection, the fieldwork activities were set for 2-3 months after *El Niño Costero's* main effects took place. However, and in parallel to my PhD activities, I applied to conduct a public engagement activity with another population who was affected by the same phenomenon: the communities of Carapongo, located in the outskirts of

Lima. I obtained funding and conducted public engagement activities during December 2017 and January 2018 (Appendix P) on resilience and mental wellbeing. These activities allowed me to gain a broader perspective on my PhD thesis topic.

For my PhD studies, I contributed to the overall concept, framing of the research questions and overall design of this study, arranged access to the quantitative data for secondary analysis and confirmed it would be available during my PhD studies period.

I prepared ethical review applications, including ethical clearance for the secondary data analysis and the qualitative fieldwork.

I conceived the idea for the systematic review (paper A), carried out the literature searches, appraised the quality of the literature, analysed the included studies, and wrote the review. Other co-authors provided contributions to the work: Angela Bayer (AB) appraised the quality of a subset of the included articles, while Daniela Fuhr (DF) contributed to the design of the quality appraisal tool. Victoria Simms (VS) contributed to the discussion and both DF, Andres Lescano (AGL) and Nicki Thorogood (NT) reviewed and contributed to the manuscript.

The quantitative work that forms this PhD thesis made use of data generated by the Salt substitution trial (*SALT*) conducted by CRONICAS-UPCH. Although I was not responsible for the design, data collection or management of the field surveys, I observed the *SALT* activities during one of my field trips to Tumbes on March 2017, and I spoke several times with the study site and the project's principal investigator to gather more details.

I designed and carried out the statistical analyses, with guidance from my principal supervisor at LSHTM and very useful recommendations from my colleague and friend Andres Carnero. I attended advanced statistical and

multilevel modelling modules which gave me initial training on the application of various statistical techniques to the *SALT* datasets including linking them with environmental databases, and guidance on the selection of variables.

For the qualitative component of this PhD, I designed the data collection tools, wrote the study protocols, and constructed the sampling frame, working closely with my qualitative supervisor (NT) and advisors and local scientists at LSHTM. I travelled twice to Tumbes (during March-April 2017 and June 2017) in preparation for and to conduct the qualitative fieldwork. During this time, I contacted, coordinated with and temporally hired local fieldwork staff, who were affiliated with CSG-Tumbes UPCH (Ricardo Gamboa, Claudio Muro, Percy McQueen, Luz Maria Moyano, Ruth Atto Espinoza, Sergio Mimbela) and held debriefing discussions with them on local logistics and approaches. I recruited health officials and Institutional representatives with assistance of local colleagues of the public health sector, who made the initial introductions on my behalf. I recruited residents of the affected communities for with the support of CSG-Tumbes staff, interviewed these participants and transcribed, coded and analysed these interviews and focus group discussions. I conceived the ideas together with NT for the qualitative paper presented in this thesis. I carried out the analyses, with assistance from NT, who gave extensive guidance on qualitative analysis methods.

Fieldwork training

I have been trained in qualitative methodologies, in a 4-month intensive module taken during my master's degree in Epidemiology Research in Lima, Peru (2011). Also, since the beginning of my PhD studies, in 2016, I been trained in several qualitative methods, fieldwork strategies, data collection, data management (the Data Management Plan for this thesis is included in Appendix Q) and short refresher courses on conducting qualitative projects. I have previous

experience and training in informed consent process, interviewing techniques such as probing and use of non-verbal listening skills.

PhD Funding

I was awarded a partial graduate studentship by Dr. Andres Lescano of Emerge-UPCH which covered my 1ˢᵗ and 2ⁿᵈ research degree year tuition fees, the writing period fees, my 1ˢᵗ year annual stipend, and partial travel costs from London to Tumbes, Peru for data collection of the qualitative component's fieldwork. I self-funded my 3ʳᵈ research degree year tuition fees, my 2ⁿᵈ to 4ᵗʰ years' annual stipend and the remaining fieldwork costs corresponding to my two visits to Tumbes.

Collaborations

The participants for the qualitative component were enrolled with the support of the research staff of the Centro de Salud Global-Tumbes (CSG-Tumbes), a research centre member of Universidad Peruana Cayetano Heredia (UPCH). These institutions are two leading health research organizations in Peru and South America, with several years of research experience. UPCH is a private, non-profit university established in 1961 and is at the forefront of health sciences research and education in Peru (Universidad Peruana Cayetano Heredia - UPCH, 2019). UPCH has been awarded grants from the NIH Fogarty International Centre and other NIH centres, as well as the Wellcome Trust, the World Health Organization, the European Community, and regional and national funds. It is the most productive health research institution in Peru(MBA America Economia, 2019), concentrating the bigger number of collaborations with foreign institutions, forming the core of network of research collaboration with local and international partners. The CSG-Tumbes is an UPCH-affiliated research centre located in Tumbes, directed by Dr. Hector H. García, leader of the Cysticercosis Working Group, a highly productive collaboration for over 20

years. This group has received more than $18 million in grant support from the Gates Foundation, also serves on the faculties of UPCH and John Hopkins School of Public Health and conducts epidemiological research at the National Institute for Neurological Sciences.

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RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

SECTION A – Student Details

Student ID Number	lsh1509548	Title	Dr
First Name(s)	Elaine Catherine		
Surname/Family Name	Flores		
Thesis Title	Mental health and resilience-promoting strategies associated with El Niño Southern Oscillation (ENSO) in the north coast of Peru		
Primary Supervisor	Victoria Simms		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

SECTION B – Paper already published

Where was the work published?	Soc Psychiatry Psychiatr Epidemiol		
When was the work published?	February 2018		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion	N/A		
Have you retained the copyright for the work?*	No	Was the work subject to academic peer review?	Yes

*If yes, please attach evidence of retention. If no, or if the work is being included in its published format, please attach evidence of permission from the copyright holder (publisher or other author) to include this work.

SECTION C – Prepared for publication, but not yet published

Where is the work intended to be published?	
Please list the paper's authors in the intended authorship order:	

Stage of publication	Choose an item.

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I was the lead author of this paper, and was responsible for the study design, title/abstract screening, full text screening, data extraction, synthesis of results and the writing of the manuscript. AMB conducted title/abstract screening, full text screening and provided comments on the draft manuscript. DCF, AGL , NT and VS advised on the design of the study and the presentation of the results, and provided feedback on the draft manuscript. Both DF and VS provided guidance throughout the process of study design, screening, data extraction, synthesis and writing, and also and also gave detailed comments and feedback on earlier drafts.

SECTION E

Student Signature	Elaine C. Flores
Date	29 Jan 2020

Supervisor Signature	Victoria Simms
Date	29 Jan 2020

86

Mental health impact of social capital interventions: a systematic review

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Abstract

Purpose—Mental disorders are a major contributor to the global burden of disease and disability, and can be extremely costly at both individual and community level. Social capital, (SC) defined as an individual's social relationships and participation in community networks, may lower the risk of mental disorders while increasing resilience capacity, adaptation and recovery. SC interventions may be a cost-effective way of preventing and ameliorating these conditions. However, the impact of these SC interventions on mental health still needs research.

Methods—We conducted a systematic review of SC-based interventions to investigate their effect on mental health outcomes from controlled, quasi-experimental studies or pilot trials. We searched twelve academic databases, three clinical trials registries, hand-searched references and contacted field experts. Studies' quality was assessed with the Cochrane Risk of Bias tools for randomized and non-randomized studies.

Results—Seven studies were included in the review, published between 2006 and 2016. There was substantial heterogeneity in the definitions of both SC and mental disorders among the studies, preventing us from calculating pooled effect sizes. The interventions included community engagement and educative programs, cognitive processing therapy and sociotherapy for trauma survivors, and neighbourhood projects.

Conclusions—There are paucity of SC interventions investigating the effect on mental health outcomes. This study showed that both SC scores and mental health outcomes improved over time but there was little evidence of benefit compared to control groups in the long term. Further high-quality trials are needed, especially among adverse populations to assess sustainability of effect.

4 CHAPTER 4. *PhD Paper A*. "Mental health impact of social capital interventions: A systematic review"

4.1 Abstract

Background: Common Mental disorders (CMDs) cause significant disability globally and can be extremely costly to the individual, their families, and their societies. Social capital (SC), which measures the quality and quantity of social relationships in a community, may be a protective psychosocial factor. It may lower the risk of mental disorders while increasing resilience capacity, adaptation, and recovery. Interventions based in the SC theory may be a cost-effective way of preventing and ameliorating these conditions. However, their impact on mental health still needs research.

Methodology: We designed a comprehensive search strategy and conducted a systematic review to retrieve controlled, quasi-experimental and pilot studies that evaluated a SC-based intervention linked to a quantifiable mental health outcome. We searched twelve academic databases, three clinical trials registries, hand-searched references, and contacted field experts. No language, country or publication date restrictions were considered for this search. Studies' quality was assessed with the Cochrane Risk of Bias tools for randomized and non-randomized studies.

Results: Seven studies were included in the review, all published in English language, between 2006 and 2016. There was substantial heterogeneity in the definitions of both SC and mental disorders among the studies, preventing us from calculating pooled effect sizes. The interventions included community engagement and educative programs, cognitive processing therapy and sociotherapy for trauma survivors, and neighbourhood projects.

Conclusions: There are scarce SC interventions investigating the effect on mental health outcomes. This study showed that both SC scores and mental health outcomes improved over time but there was little evidence of benefit compared to control groups in the long term. Further high-quality trials are needed, especially among adverse populations to assess sustainability of effect.

4.2 Background

Common mental disorders (CMDs), comprising depression, anxiety and substance use disorders are one of the main causes of the global burden of disease (Vos et al., 2015). They cause significant disability globally, directly accounting to 7.4% of disability-adjusted life years and 22.9% of all years lived with disability, in high, middle- and low-income countries (Whiteford et al., 2015) and can be extremely costly to the individual, their families, their communities and health systems (Insel, 2008). They often have a chronic-recurrent course despite accessing treatment (Leon et al., 2005). Even with the existing cost-effective interventions in mental health, there is limited implementation and a lack of human resources to effectively reach most deprived areas, where services for prevention and recovery are still required (Whiteford et al., 2015).

Poor mental health is associated with poorer physical health (Naylor C, 2012), negative community and economic impact (Morgan et al., 2007), can lead to impaired economic development (Lund et al., 2011) and decreased Social Capital (SC) (Kawachi, 2001).

SC is a complex construct with distinct components, and can be understood as an inherent cohesive force that enables collective action within populations (Putnam, 1995, Henderson and Whiteford, 2003). The definition of SC used since 1995 highlights it as an invaluable resource for the public as it "represents the characteristics of social organization, networks, rules, and trust that facilitate coordination and cooperation for mutual benefit" (Putnam, 1995). The nature of

this construct was classified in sets of components: "SC is multifaceted and has two main components. The structural component which "reflects the nature and intensity of an individual's participation in community networks; and the cognitive component which refers to the perceived quality of an individual's social relationships" (Grootaert et al., 2004). For measurement purposes, its components have been classified in attributes that can be assessed with quantitative tools (Kawachi et al., 2008). "Structural (participatory) SC refers to relationships, networks, membership, organizations, associations and institutions that may link groups or individuals together. Cognitive (perceived) SC refers to values, norms, attitudes, beliefs, civic responsibility, altruism and reciprocity within a community" (Ehsan and De Silva, 2015b). There is still no universal measurement for SC due to its multidimensional composition and collective factors. It can be measured both at the individual and ecological level (McKenzie and Harpham, 2006).

Social Capital and Mental Health

The "social psychology of participation" has been established (Campbell et al., 2004) as the process involved in the functioning of community participation, with three factors: SC, social identity and social representation. There is strong evidence that show how social relationships, group memberships and social identities provide a beneficial impact, by protecting population' mental health while having an impact on psychological well-being (Jetten et al., 2012, Sixsmith and Boneham, 2007, Haslam et al., 2009, Cruwys et al., 2013). Still, the complex association of SC, well-being, health determinants (Nyqvist et al., 2014) and contextual factors remain under investigation by researchers (Campbell, 2011, Mendolia et al., 2015, Blair et al., 2014, Cook et al., 2015). The main obstacle to determining a causal relationship between SC and mental health has been the lack of controlled, prospective studies (De Silva et al., 2005, McKenzie, 2008). A high level of SC within a community has been shown to be a beneficial, supportive attribute for its members in the majority of cases

(Henderson and Whiteford, 2003, Kawachi et al., 2008, McKenzie and Harpham, 2006, McKenzie, 2008, Calvo et al., 2012, Subramanian et al., 2005b). However, only a small number of experimental studies have successfully shown that strengthening of SC leads to improvement in health outcomes (Brune and Bossert, 2009, Glass et al., 2004, Pronyk et al., 2008). A few studies obtained preliminary results that cannot be readily extrapolated to the general adult population or larger communities (Farquhar et al., 2005, Snoxell et al., 2006). In addition to these examples, the available experimental studies of SC manipulation with associated mental health outcomes is even scarcer, despite the evidence of beneficial protective results obtained through longitudinal and cross-sectional studies (De Silva et al., 2007, Flores et al., 2014, Le et al., 2013). Particularly in low- and middle-income countries, where between 76 and 85% of mental disorders remain untreated (Patel V et al., 2014) there is a need of interventions to prevent mental disorders and to build resilience that can be administered at the community level. A recent systematic review recommended the development of interventions aimed at improving SC and considered it as a cost-effective way of preventing common mental disorders, and indicated that initiatives focusing on increasing the cognitive component of SC can act as a protective factor against the development of mental disorders in the long term (Ehsan and De Silva, 2015b). This is especially important in the context of poverty, (Kawachi, 2001, Domínguez and Arford, 2010) structural conflict, humanitarian crisis (Im and Rosenberg, 2016) or disasters (Mar López Marrero, 2009, Stain et al., 2011, Wind and Komproe, 2012, Xin et al., 2013). SC may have a significant influence on the capacity of local communities to adapt to sudden environmental events such as flooding, drought, the ongoing climate change effects (Caldwell and Boyd, 2009, Pelling and High, 2005, Adger, 2003) or other environmental disasters (Cox and Perry, 2011, West et al., 2013, Koh Howard and Cadigan Rebeca, 2008). SC can strengthen the trust between communities and local authorities, enabling better coordination of preventive and reconstructive efforts (Jones et al., 2014, Henderson and Hildreth, 2011) with social support measures (Lowe et al., 2010). Challenging contexts need

replicable and community-based interventions that boost SC, and which can be adapted and implemented in different settings to reinforce good mental health and improve recovery, resilience capacity and community well-being.

However, there are currently few longitudinal, controlled studies of high-quality SC interventions. Some of the existing studies have heterogeneous designs and outcomes, and some obtained conflicting results (Avdeenko A and Gilligan M, 2014, Souza and Grundy, 2007). Previous systematic reviews on SC and mental health outcomes in the general population applied heterogeneous SC measures. In addition, the evidence which was obtained was mainly from high-income countries and many types of study designs were considered. One systematic review, published in 2015 by Ehsan AM and De Silva (Ehsan and De Silva, 2015b) focused its search on quantitative studies examining the direct association between SC and common mental disorders in adults, and included 31 cross-sectional and 8 cohort studies. They found conclusive evidence of the direction of the association between the different SC types and common mental disorders. However, their focus was not on controlled designs in SC interventions, and the search dates (up to July 2014) justify a more up-to-date review. Another previous systematic review, by Nyqvist et al, published in 2013 (Nyqvist et al., 2013) searched for quantitative studies of SC and mental well-being in older adults specifically, and included 11 studies. All of them were cross-sectional, and no mental health outcomes were considered. A more recent systematic review, published in July 2017 by Coll-Planas et al, (Coll-Planas et al., 2017) searched for the impact of SC interventions on health outcomes in older populations. Although it did not focus only on mental health assessments and the included population were older than 65 years old, their results support the positive potential of SC interventions on population's mental health. These results highlight the need for additional research, as despite the positive findings obtained so far, they do not allow us to unravel the complex associations between SC and mental health, as the included studies in these reviews were not exclusively prospective, or experimental. Most of the published literature currently available on this topic consists of cross-sectional studies, which do not

allow us to establish causality. Based on current recommendations, there is enough evidence to support the use of SC interventions related to mental health protection, but most of it will be based in observational studies. This will be the first systematic review to explicitly evaluate the impact of SC-based interventions on mental health outcomes among the adult general population. In this context, we conducted a systematic review of the literature of controlled, quasi-experimental or pilot studies that attempted to build or strengthen SC components with an intervention that will also improve mental health outcomes in adults, in order to review and assess their nature and effectiveness. This information will be useful for the design or adaptation of future SC interventions aimed at preventing and ameliorating mental disorders.

4.3 Methodology

This review was written in accordance with the PRISMA guidelines (Moher et al., 2015). The aim of this review was to identify controlled studies, including quasi-experimental and pilot trials which assessed the effects of a SC intervention on mental health outcomes in an adult population in any setting. With the support of a librarian and a Cochrane collaborator, a comprehensive search strategy (Appendix 7.3) was developed with search terms tailored to 12 academic databases: *CENTRAL* (from 1966 onwards The Cochrane Library July 2017), *MEDLINE* (1946 to July Week- 1 2017), *EMBASE* (1980 to 11 Jul 2017), *PsycInfo* (1806 to July 2017 Week-1), *Global Health* (1910 to 2017 Week-26), *Social Science Citation Index* (1970 to July 2017), *Sociofile* (from 1974 onwards 19 July 2017), *World Bank e-library* (1978 - 2017), *LILACS* (1981 - 2017), *Health Management Information Consortium* (1979 – 2017), *IBSS – PROQUEST* (1987 – 2017) and *CAB Abstracts* (1910 – 2017). Additionally, the WHO International Clinical Trials Registry Platform, The EU Clinical Trials Registry and the US Clinical Trials Register were searched. Reference lists of all relevant retrieved articles were hand-searched, including study protocols, meta-analyses, and systematic reviews. Finally, corresponding authors from

other systematic reviews were contacted to obtain suggestions for additional articles. No language restrictions were applied for this search.

Considering the different definitions used to describe SC and its multi-dimensional nature, we employed a wide range of terms to ensure the inclusion of all relevant studies, such as "social organization", "social cohesion", "community (or neighbourhood) participation" or "social networks". As per the inclusion and exclusion criteria (Table 4.1) papers were also included which classified Mental and behavioural disorders as defined in ICD-10 (F-cat) (World Health Organization, 1992) or DSM-5 (American Psychiatric Association, 2013) respectively, and had to be measured using a validated tool.

Table 4.1 systematic review inclusion and exclusion criteria

	Included	Excluded
Study design	Any controlled evaluations Quasi-experimental evaluations Pilot evaluations	All other study designs Systematic reviews
Population	General adult population	Interventions directed at children and adolescents. Upper cut-off points for population group = 18 years.
	HIC and LAMIC	None
Definition of social capital	The definition to be considered in the systematic review is: "Social capital represents the characteristics of social organization, networks, rules, and trust that facilitate coordination and cooperation for mutual benefit" (Krishna	-On the objectives of this study, all other definitions of social capital that do not consider the defined components of this sociological construct will excluded. -Other sociological definitions that do not fully

	and Shrader, 2000) and (Putnam, 1995). And, "Social capital is multifaceted and has two main components: a structural component that reflects the nature and intensity of an individual's participation in community networks; and a cognitive component, which refers to the perceived quality of an individual's social relationships (Grootaert et al., 2004). Referring to this definition, studies will be included in which social capital is measured both at the individual and at ecological level, comprising at least these two main components and all related dimensions.	address social capital definition and components (i.e. social networks).
Definition of mental illness	Mental and behavioural disorders classified in ICD-10 (F-cat) or DSM-V respectively, measured using a validated tool in adult general population.	
Intervention	Interventions in social capital will be considered for inclusion in this systematic review if they comply with the following definitions: "Any intervention which seeks to either create or increase the group connection and/or cooperation within and	-Any social capital intervention that does not state that at least one of its purposes is linked to prevention or treatment of any mental distress or mental disorders among their participants.

	between community members, with the intention of strengthening the social connection that elicits mutual feelings of trust, reciprocity, and recognition of shared identity and/or increases access to shared information and resources within and between its members for mutual benefits". Also, it should be clearly stated in the research report that at least one of the social capital interventions aims is associated or linked to any mental health outcome, either to prevent or treat this outcome and that is measured either at the individual or ecological level.	-Interventions in which the objectives limit to provide training and research (e.g. interviewing people) only. -Mutual aid or support groups in which members are encouraged to discuss their problems with each other only (i.e. no intervention is conducted). Mutual support is a process by which persons voluntarily come together to help each other address common problems or shared concerns (Davidson, 2006). -Studies are excluded if social capital interventions are studied as "add-ons" only (i.e. add-ons to other treatment). -Studies are excluded if results only rely in retrospective self-reported survey measures without bias acknowledged (i.e. social desirability bias) or triangulation with results from other sources. (Avdeenko A and Gilligan M, 2014)
Outcome	**Primary outcomes:** - Change in Social capital levels (i.e. change in social capital scores or change in the proportion of those assessed as having high or	

	low social capital in both) measured with validated tools	
	Secondary outcomes: -Change in mental health outcomes, severity (i.e. change in e.g. depression scores or change in proportion diagnosed with a mental disorder), assessed using a validated tool. -Change in social functioning skills (e.g. improved coping skills, social functioning, self-esteem) in service users -Change in pro-social behaviours, social density networks or social cohesion programs aiming for community mutual beneficial in-service users - Any other secondary outcomes like quality of life, or hope →Studies will be included if the primary outcome or any secondary outcomes are included.	
Control Group	Any comparison group including treatment as usual and observational data collection.	

Study selection

ECF screened the titles and abstracts of all retrieved articles and those from additional sources, and initially assessed them against the outlined inclusion and

exclusion criteria of this review. Additionally, 20% of the studies were independently double screened by a trained external second reviewer. Both reviewers selected and agreed on the articles to be assessed in full text. Any disagreements on the selection after full-text review were solved by a third external reviewer. All selected studies had to include a SC-based intervention that complies with the components and dimensions of the following definition: "Any intervention which seeks to either create or increase group connection, and/or cooperation within and between community members, with the intention of strengthening the social connection that elicits mutual feelings of trust, reciprocity, and recognition of shared identity and/or increases access to shared information and resources within and between its members for mutual benefits". The quality of the selected studies was evaluated by using the Cochrane Collaboration's tools for assessing risk of bias in randomized and non-randomized studies (Higgins et al., 2011, Sterne JAC, 2014, Ryan R, 2016). Risk of bias for other study designs was assessed both at the design (e.g. allocation concealment) and outcome assessment level (e.g. loss of follow-up of participants). The studies were too heterogeneous to enable a meta-analysis; therefore, a narrative synthesis is presented here.

4.4 Results

Figure 4.1 presents a flow chart of the eligibility process for this review. Ultimately, 7 studies were included in the review. All the studies measured SC components in adults and followed them up to see whether their initial assessment changed over time, in addition to mental health, well-being and additional health outcomes. The shortest follow-up period was 2 months and the longest was 42 months, with an average of 12.5 months. Six studies assessed individual SC, while only one quasi-experimental study assessed it at the ecologic level.

Figure 4.1 Systematic Review Study selection flow chart


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┌─────────────────────┐   ┌─────────────────────┐
│ 25,659 studies      │   │ 12 studies identified│
│ identified from     │   │ from author's       │
│ database search     │   │ contact             │
└─────────────────────┘   └─────────────────────┘
           │                         │
           └───────────┬─────────────┘
                       ▼
          ┌─────────────────────┐
          │ 22,125 studies      │
          │ identified after    │
          │ records             │
          │ deduplication       │
          └─────────────────────┘
                       │
                       ▼
          ┌─────────────────────┐        ┌─────────────────────┐
          │ 22,125 studies      │───────▶│ 17,700 studies      │
          │ single-screened     │        │ excluded            │
          │ for I/E criteria    │        └─────────────────────┘
          └─────────────────────┘
                       │
                       ▼
          ┌─────────────────────┐        ┌─────────────────────┐
          │ 4,425               │───────▶│ 4395 studies        │
          │ Titles/abstracts    │        │ excluded            │
          │ double-screened     │        └─────────────────────┘
          └─────────────────────┘
                       │
                       ▼
          ┌─────────────────────┐        ┌──────────────────────────┐
          │ 30 Full text        │───────▶│ 23 studies excluded:     │
          │ studies double-     │        │   14: Study design       │
          │ screened            │        │   16: No SC outcomes     │
          └─────────────────────┘        │   10: No Mental health   │
                       │                  │   outcomes               │
                       │                  │   1: Full text not       │
                       │                  │   available              │
                       ▼                  └──────────────────────────┘
          ┌─────────────────────┐        ┌──────────────────────────┐
          │ 5 additional Full   │───────▶│ 5 studies excluded:      │
          │ text studies        │        │   4: Study design        │
          │ included after      │        │   2: No SC outcomes      │
          │ hand search of      │        └──────────────────────────┘
          │ full text articles  │
          └─────────────────────┘
                       │
                       ▼
          ┌─────────────────────┐
          │ 7 studies           │
          │ included            │
          └─────────────────────┘
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Intervention effect on cognitive and structural social capital

Five studies conducted in USA, UK, Australia and Japan measured the cognitive components of SC or proxies at the individual level, with mixed results: one quasi-experimental study (Verduin et al., 2014) found no statistically significant change in cognitive SC at the end of the intervention (after 3 months) and at follow-up (at 8 months). A cluster-randomized controlled trial (Phillips et al., 2014) found a statistically significant difference and improvement in the collective efficacy proxy at the end of its follow-up period (after 42 months). A non-randomized pilot study (Haslam et al., 2016) did not find a sustainable effect of increase of cognitive SC proxies' measurements at the 6 month follow-up. A small randomized control trial (Saito et al., 2012) found a significant positive effect on the assessed proxy at the 6-month follow-up. Finally, a quasi-experimental study, conducted in a specific aboriginal population in Australia found significant differences in cognitive SC proxies, which persisted at the 18-month follow-up assessment (Sun and Buys, 2016).

Regarding the structural component of SC, six studies that measured SC or associated proxies at individual level also found mixed results. A randomized controlled trial (Hall et al., 2014) which only assessed structural SC in women survivors of sexual violence found a significant difference in SC scores measured between the two allocation arms at 6 months follow-up. The small randomized trial (Saito et al., 2012) with the same follow-up period, found significant differences in some of their measured indicators, but did not obtain significant differences in other related indicators (as social network scores) at follow-up. From the other studies, a non-randomized pilot (Haslam et al., 2016) and a large cluster-randomized trial (Phillips et al., 2014) did not find significant differences in their assessed structural SC proxies at follow-up.

Finally, one quasi-experimental study, conducted in post-conflict population, found a significant positive effect in its structural SC proxy assessment at 8-month follow-up.

An ecological SC intervention (Semenza et al., 2007) which had the shortest follow–up period among the included studies, found a significant positive effect for both components of SC at 2 months follow-up.

Effect on mental health outcomes

Mental health outcomes and measurement tools reported in the included studies were also heterogeneous: two studies (Haslam et al., 2016, Hall et al., 2014) measured depression and anxiety symptoms among other outcomes, three assessed mental well-being (Phillips et al., 2014, Saito et al., 2012, Semenza et al., 2007) another measured mental health risks and well-being as well as resilience, and one study evaluated self-reported mental health scores. Six of the seven included studies obtained positive mental health results post-intervention and at the follow-up assessment. Only one study (Phillips et al., 2014) did not find significantly different improvement in mental health outcomes among participants in the intervention group (Table 4.2, Table 4.3).

Table 4.2 General characteristics of studies included in the review (n=7)

Author, date, country	Design	Population (Age), Sample	Intervention	Control group
Hall, J. 2014, DRC	RCT	Survivors of sexual violence. Women (≥ 18), N=405	Locally adapted Cognitive Processing Therapy (CPT) delivered by trained psychosocial assistants: 1-hour individual session and 11 weekly 2-hour group sessions (6-8 people).	Individual support services
Haslam, C. 2016, Australia	Non-Randomized pilot	Socially isolated and affective disturbed persons. Adults (≥ 18), N=158	G4H program: Manualized 5-module-pilot (60-75min each, 5-8 people) delivered: 4 weekly sessions (Schooling, Scoping, Sourcing, Scaffolding) one booster session after 1 month (Sustaining).	TAU
Phillips, G. 2014, UK	Cluster RT	Deprived urban communities. Adults (≥ 16), N=3986	Well London program: multicomponent, community engagement program for improving mental well-being and health-related behaviours. Phase 1: 14 interlinked projects developed and delivered in 20 deprived neighbourhoods (coproduction approach). Projects focused on health and social outcomes, ecological improvement of local environment, cultural activities, and improvement of employment / training opportunities.	TAU

102

Saito, T. 2012, Japan	RCT	Relocated within last 2 years in the study city. Older Adults (66-84), N=63	Group-based educational, cognitive, and social support program designed to prevent social isolation by improving community knowledge and networking. Four 2-h sessions, bi-weekly at a public facility, involving social acquaintance of participants and staff, focus group discussions, awareness of own needs and interests, individual meetings with community gatekeepers, and a city sightseeing tour of city's public facilities and historical places.	Waiting list
Semenza, J. 2006, USA	Quasi-experimental	Low- and middle-income urban communities. Adults (≥ 21), N=409	Community development strategy, followed by social activities to promote bonding and SC. Subsequently, development of community-design 3 neighbourhood group projects, through workshops with oversight & support of related professionals, municipality, and organizations.	No control group
Sun, J. 2016, Australia	Quasi experimental	Aboriginal & Islander people with a mental health condition or chronic risk factor. Adults (≥ 18), N=235	"Voices United for Harmony", community-based singing activity intervention conducted and coordinated through local aboriginal Community Controlled Health Services (CCHSs) representatives. Weekly group rehearsal sessions for 2h with 15-min break for social interaction and encouragement to individually rehearse at home.	Waiting list

Author	Type	Population	Intervention	Control
Verduin, F. 2014, Rwanda	Quasi-experimental	Post-conflict survivors. Adults (≥ 16) N=200	Sociotherapy programme aiming to promote SC. Forty-five simultaneously run, mixed working groups guided by trained community leaders. Meetings followed six phases of sociotherapy: Safety, Trust, Care, Respect, Rules and Memories. Intervention employed debates, exchange of experiences and coping strategies among participants, exercises, games, and mutual practical support. Trauma symptoms were addressed through psychoeducation and advice. Fifteen weekly meetings, 3 hours each.	TAU

Note: SC = Social Capital; TAU = Treatment as usual

Table 4.3 Social Capital (SC) and Mental Health (MH) (n=7)

Author	Indicator of SC & scale(s) used	MH outcomes & scale(s) used	Statistical analysis / Key findings	Implications & remarks

| Hall, J. 2014 | Structural SC (social inclusion, group memberships & participation, group engagement degree, financial & instrumental support network size, emotional support seeking) measured through selected items from the "Integrated Questionnaire for the Measurement of SC". | Depression, anxiety & PTSD symptoms. Tools: Hopkins Symptom Checklist-25 and16-item Harvard trauma questionnaire | Multilinear regression models / Small to medium effect size differences for 2 study outcomes: CPT intervention increased group membership and participation at 6-month FU (B = 1.11 (p<.05; d = 0.22) and emotional support seeking after the intervention compared to control (B=0.31 (p<.05; d = 0.37) | Increased involvement in community groups and greater support seeking are potentially important improvements in the lives of sexual violence survivors. Intervention may work by changing negative thoughts and avoidance behaviours, providing a safe space that encourages the survivors to open to each other, and providing a foundation from which social networks for survivors can be expanded. Assessment of SC structural component. |

| Haslam, C. 2016 | Cognitive SC proxies: social connectedness, group identification; structural SC proxy: Group memberships. Assessed with Roberts UCLA Loneliness Scale (RULS-8); Social Adjustment Scale; Four-Item measure of Social Identification (FISI) | Depression, anxiety, stress, life satisfaction, self-esteem. Tools: Depression, Anxiety and Stress Scale-21 (DASS-21); Social Phobia Inventory (mini-SPIN); Satisfaction with life scale; Single-item measure of self-esteem. | Paired t tests (Cohen's d) for repeated measures / Between T1 (start) and T2 (completion, at 2 months): average depression score reduced from "moderate" to "mild" (p<.05), and average anxiety & stress scores from "severe" to "moderate" (both p<.001). Improvements: Social anxiety, life satisfaction, self-esteem, social functioning, and loneliness (effect sizes 0.29–0.86). Between T3 and T2 (6-month FU): sustained improvement from T1 for depression, anxiety, stress, and self-esteem (p<.01). Outcomes sustained at 6-month FU | Pilot psychological intervention to address major health problems in social isolation. The intervention may help to overcome these challenges by building social identifications. Delivered either as a stand-alone program or as an adjunct to other forms of psychotherapy. Additionally, the program can potentially address wider social problems that often exacerbate clinical presentations. |

| Phillips, G. 2014 | Social integration, collective efficacy, social networks, social support. Tools: questions from the office for national statistics' SC harmonized question set. Additional questions on help / support (practical, financial, emotional) from the SHARP study (Scotland's housing and regeneration project) | Mental well-being. Tools: GHQ-12 score; Warwick Edinburgh mental well-being scale and HOPE scale | Multilinear regression models / Primary outcomes were not significantly different in Intervention neighbourhoods compared to controls. A secondary social outcome ("proportion of residents thinking that people living in their neighbourhood pulled together") showed statistically significant difference compared to controls: higher in intervention neighbourhoods (RR: 1.92; 95% CI 1.12 to 3.29). | Findings do not provide evidence supporting that the intervention improved health behaviours, well-being, and social outcomes. Low participation rates and population attrition rates likely compromised any impact of the intervention, as well as a potential influence of imprecise estimation of outcomes and sampling bias. Authors recommend better feasibility strategies before future implementations; new methods to understand longitudinally the different pathways residents take through such interventions and their outcomes, and new theories of change that apply to each pathway. |

Saito, J. 2012	Social support (emotional and instrumental support), social networks, frequency of participation in group activities (neighbourhood or commercial organizations, hobbies, or religious groups, etc.). Familiarity with city-provided formal services	Subjective well-being, affective dimension of depressive status in elderly and loneliness. Tools: LSI-A scale; GDS and AOK loneliness scale.	Linear Mixed Models / The intervention had a significant positive effect on subjective well-being (p = 0.039), social support (p = 0.013), and familiarity with services scores (p = 0.008), and had a significant negative effect in loneliness (p = 0.011) at 6 months FU.	Results suggest that programs aimed at preventing social isolation may be effective when they are tailored to the specific needs of the individual, utilize existing community resources and target people with shared similar experiences.
Semenza, J. 2006	Sense of community, social interaction, perceived control, and neighbourhood participation. Tool: SC assessment tool (Krishna et al)	Depression and well-being. Tool: CESD-11 and SF-36	Multivariate analysis of variance / Improvements in sense of community (F= 3.97; p=0.01); SC (F= 1.71; p= 0.04) and depression (F= 1.95; p= 0.03)	Results showed evidence that participants in the intervention improved their social interaction building, SC, neighbourhood capacity and health outcomes. It also empowered them to design and create the development of public places within their own community.

Sun, J. 2016	Social connectedness: measured by a 10-question scale (Lee, RM. et al.) and social support, measured by 8 items related to the perception of quality and quantity of friendship networks & feelings of trust for local community (McCubbin HI, et al.)	MH and emotional well-being; resilience and physical and psychological benefits of intervention participation. Tools: MH and psychological distress scale (Schlesinger, CM. et al), brief resilience scale (Smith, BW. et al) and singing-related QoL scale (Clift S, et al)	Generalized linear model and structural equation model / At 18-month FU: reduction from 54.8% at baseline vs. 38.3% at FU in the proportion of adults in the intervention group classified as depressed ($p < 0.02$). Improvements in the singing-related QoL scores (OR 0.85, ($p = 0.02$), singing-related social & emotional well-being (OR 0.78, $p = 0.03$), and resilience (OR 0.71, $p < .001$) were negatively related to psychological distress in the intervention group.	Aboriginal and Torres strait islander participants significantly improved their perceptions about the health benefits of singing and improved their resilience scores, reflecting an increase in their perceived ability to cope with stressful events and better manage MH conditions. There was a subsequent significant reduction in the proportion of people who experienced psychological distress.

| Verduin, F. 2014 | Cognitive SC, social support, and civic participation. Tool: short version of the Adapted SC assessment tool, (Short A-SCAT) | Screening of CMDs. Tool: validated version of the self- reporting questionnaire (WHO) and SRQ-20 | Factorial analysis and latent growth models / Significant effect of sociotherapy on both linear change in MH (-0.38, $p < 0.05$) & civic participation (-0.41, $p < 0.05$). Although MH and CP were correlated at baseline (-0.26, $p < 0.05$), linear changes over time were not significantly correlated (0.21). | The study hints at the possibility to foster one element of SC: civic participation, and to simultaneously impact MH. Identification of pathways of influence may contribute to the designing of psychosocial interventions that effectively promote recovery in war-affected populations. |

Note: SC = Social Capital; MH = Mental Health; CPT = Cognitive Perception Therapy; FU = Follow-up; PTSD = Post Traumatic Stress Disorder; QoL = Quality of Life

Quality Assessment of Included studies

Generally, studies were of high to moderate quality, presenting a high risk of bias in at least one domain in the Cochrane Risk of Bias Assessment tool (Figure 1.1, Figure 1.2). All seven studies failed to specify whether outcome assessment occurred under blinded circumstances, and five did not report whether the participants or staff related to the intervention were blind to the group allocation. Due to ethical reasons and community decision, there was self-allocation in one of the quasi-experimental studies (Sun and Buys, 2016). In five studies, it was unclear whether the method used to conceal the allocation to treatment groups prevented either participants or investigators from foreseeing the allocation, and two studies had a high risk of bias in the same category. Finally, for three studies an uncertain risk of bias was assigned due to incomplete outcome data and the unknown impact of high attrition rates reported by the authors.

Figure 4.2 Risk of Bias graph - Percentages across all included studies
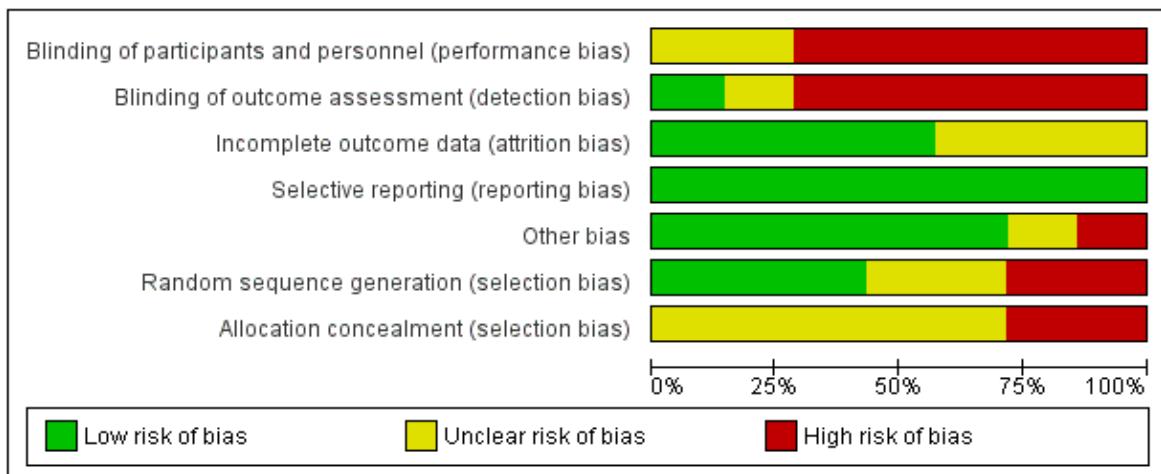
Figure 4.3 Risk of Bias - Summary of included studies

4.5 Discussion

This review cannot provide enough evidence that SC interventions for adult populations should be recommended as a preventive measure for mental disorders at the individual or ecological level, despite promising results obtained in most of the included studies. In addition, in cases where the intervention was delivered as a stand-alone procedure, there is not enough evidence that the positive effects on mental health outcomes are sustained in the medium or long term (Semenza et al., 2007) Unfortunately, the lack of suitable comparable studies restricted a more detailed comparability across studies. Despite these findings, four studies (Hall et al., 2014, Saito et al., 2012, Sun and Buys, 2016, Haslam et al., 2016) obtained significant results for both SC and mental health outcomes, which were sustained at the follow-up period. Recommendations should be cautious regarding their external validity, as other studies obtained conflicting results (Phillips et al., 2014, Verduin et al., 2014). These interventions, if replicated in larger controlled randomized trials with allocation blinding for participants or research staff may provide stronger evidence for public health policies. Two studies conducted in Africa included special populations (Verduin et al., 2014, Hall et al., 2014) (survivors of sexual violence and post-conflict survivors) and their interventions were locally and culturally adapted. Similarly, these interventions may not be readily generalizable to other settings without proper validation and adaption. Another study in Australia (Haslam et al., 2016) was targeted at socially isolated and affectively disturbed adults in an urban setting, which will also limit its generalizability for other population groups.

Referring to the available literature, we cannot assume that all interventions that strengthen or build SC in different settings will automatically translate into improved community well-being and better health outcomes (Graeff, 2008). The influence of additional contextual factors should be considered as they may negatively influence the expected effect of social capital in different communities. This is especially important when developing new interventions. Some studies in low- and middle-income countries found that, SC has a marginal role in the explanatory mechanisms for poor mental health compared to other contextual factors like violence or poverty (Harpham et al., 2004, Mitchell and LaGory, 2002). Also, in the study conducted by

Wolf et al (Wolf J et al., 2010) the expected positive effect in adaptation readiness to an environmental hazard of SC in the affected community was not found, therefore, additional explanatory factors should be taken into account for future research undertaken in similar settings.

SC is a complex construct and made up of multiple dimensions and components, therefore, its measurement tool must be culturally adapted to be appropriate for different settings and populations. The interdependence of the social components between and within communities will assign a different weight, influence, and importance to each component, comparing their assessments in different regions or cultural settings. Two of the included studies of this review, should be highlighted for their interesting designs, and some of their design components should be considered for future research. The first was a quasi-experimental study in the USA (Semenza et al., 2007) which emphasized community participation in the decision to build selected elements that the residents desired or needed in their neighbourhoods, while providing opportunities for participant's discussion and expert's consultancy, coupled with volunteer work. Secondly, a pilot trial in Australia (Haslam et al., 2016) aimed to develop a social identity map for self-reported socially isolated participants. It was a short but intensive program that successfully promoted cognitive components of social capital in a small group of participants. Both studies showed positive change in SC components and improved mental health scores. These studies are good examples on the feasible delivery of social capital-based interventions at both the individual and ecological level. Taking into complex and changing environments especially in deprived communities, we believe that a successful approach to building or strengthening social capital and ameliorating negative mental health outcomes would require two separate approaches at two different levels: Firstly, the participants will need to reach self-awareness of their own social mapping and assess their own useful resources and secondly should aim for improvement of their social ties and tangible changes in an ecological setting. A past systematic review has also highlighted the need to have evidence from mixed-methods studies in order to obtain more information of the temporal and spatial meanings assigned to key terms of SC (Almedom, 2005). Our study has several limitations that should be considered when evaluating its findings. Five out of seven

studies were conducted in high income countries, so their results may not be generalizable to other low- and middle-income settings. Studies were not comparable in their outcome measurements and used different scales or tools for mental health and SC, which prevented us from calculating a pooled effect size. Also, ECF single-screened all identified studies and double screening occurred in 20% of the originally identified references only and we cannot exclude the possibility that our search strategies missed eligible trials.

Despite these limitations, this review is the first to identify SC-based controlled interventions which have both an effect on mental health outcomes and in the building or strengthening of SC components. We believe this topic is important and has promising evidence to be considered as an add-on component in a complex intervention that provides mental health support as well as fostering community engagement. Community engagement is a recognized tool for improving health and well-being while reducing health inequalities, particularly exposed groups and communities that do not have well-organized networks and organizations [208, 209]. There is dearth of evidence, therefore this review highlights the need to develop SC based interventions which influence mental health outcomes in controlled, high quality studies. This would especially benefit communities which require the building or re-building of local assets, re-organization and strengthening of partnerships in locations affected by adversity such as environmental disasters and other contextual hardships that pose a higher risk for mental health disorders and where the social capital fabric as a useful resource has been or will be potentially affected.

4.6   Conclusions

SC-based interventions show promising beneficial results on mental health (Ehsan and De Silva, 2015b, McKenzie and Harpham, 2006, Coll-Planas et al., 2017, Kawachi and Berkman, 2001) Its potential still needs to be confirmed by robust trial designs with appropriate allocation concealment, double blinding of participants to ensure generalization of these results. It would also be desirable to standardize the

SC definitions and measurements, to allow better outcome evaluations and comparisons in the mental health research field. Finally, considering implementation and delivery of complex SC interventions, future studies need to consider additional measures to motivate participants' adherence to the study and follow-up assessments, to prevent high attrition rates and loss to follow-up reported in some studies.

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RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

<u>SECTION A – Student Details</u>

Student ID Number	lsh1509548	Title	Dr
First Name(s)	Elaine Catherine		
Surname/Family Name	Flores Ramos		
Thesis Title	Mental health and resilience-promoting strategies associated with El Niño Southern Oscillation (ENSO) in the north coast of Peru		
Primary Supervisor	Victoria Simms		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

<u>SECTION B – Paper already published</u>

Where was the work published?			
When was the work published?			
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*	Choose an item.	Was the work subject to academic peer review?	Choose an item.

*If yes, please attach evidence of retention. If no, or if the work is being included in its published format, please attach evidence of permission from the copyright holder (publisher or other author) to include this work.

<u>SECTION C – Prepared for publication, but not yet published</u>

Where is the work intended to be published?	PLOS ONE Journal
Please list the paper's authors in the intended authorship order:	Elaine C. Flores, Daniela C. Fuhr, Antonio Bernabé-Ortiz, J. Jaime Miranda, Nicki Thorogood, Victoria Simms

Stage of publication	Not yet submitted

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I was the lead author of this paper, and was responsible for the study design, linkage of SALT data with publicly available environmental and impact data, data analysis, and the writing of the manuscript. DCF and VS advised on the design of the study and the presentation of the results, and offered feedback on the draft manuscript. DCF, VS, ABO, JJM and NT provided guidance throughout the process of study design, analysis, and writing, and also gave detailed comments and feedback on initial drafts.

SECTION E

Student Signature	Elaine C. Flores
Date	29 Jan 2020

Supervisor Signature	Victoria Simms
Date	29 Jan 2020

118

5 CHAPTER 5. *PhD Paper B.* "Mental health impact of "El Niño" related effects on affected residents in the northern coast of Peru"

5.1 Abstract

Background: Environmental-related disasters contribute to the vulnerability associated with mental disorders. Recent *El Niño* phenomena brought intense rain, flooding, and landslides. We aimed to explore whether depression time trends were associated with exposure to *El Niño*, adjusting for setting and confounders. Finally, we assessed the effect-modifying roles of poverty, alcohol use and abnormal sleep.

Methods: A secondary data analysis, linking individual and ecological-level data was conducted, using participant-level data from a three-year pragmatic stepped-wedge cluster-randomized-trial in Tumbes, Peru. Each participant was evaluated at baseline, and every five months in six follow-up visits. Mild depression cases were defined as a PHQ-9 score ≥5. We explored the proposed association with flooding using a two-stage mixed-effects logistic regression models.

Results: We included longitudinal data from 2,376 adults. The baseline depression prevalence (10·8% males, 21·2% females) decreased across the study visits to: 2·5% and 4·5% respectively. In the multivariable multi-level adjusted model, depression was associated with and lacking health insurance (aOR = 1.45, 95%CI: 1.05-1.99), having a baseline co-morbidity (aOR = 2.02, 95%CI: 1.62-2.52), a baseline depression diagnosis (aOR = 14.22, 95%CI: 9.71-20.83), no income (aOR = 1.46, 95%CI: 1.20-1.78) and abnormal sleep patterns (aOR = 7.51, 95%CI: 6.24-9.03). Hours of watching television had a protective effect (aOR = 0.69, 95%CI: 0.56-0.84). There was no evidence for effect-modifying roles.

Conclusions: Our findings do not support the hypothesis that *El Niño* affected depression rates on study participants. The inclusion of mild depression cases,

spontaneous remission, milder-than-expected *El Niño* effects, possible unmeasured local resilience-promoting factors, and a sustained marketing campaign to facilitate the study intervention adoption may have influenced these findings.

5.2 Background

The environmental phenomenon labelled *El Niño* refers to an abnormal warming of sea surface temperature (SST) in the equatorial Pacific Ocean (NOAA / National Weather Service, 2017). An *El Niño* event is defined when there is an increase of at least 0.5°C in mean SST, over a five-month period (Servicio Nacional de Meteorología e Hidrología del Perú – SENAMHI, 2014). It leads to periodic extreme weather irregularities, and its related effects can cause natural disasters such as floods, landslides and intense precipitation in the surrounding coastal areas (Kovats et al., 2003).

For many residents of low-and middle income countries, there will be an unequal exposure to risk and vulnerability among population groups (Cannon T., 2004). For example, residents of high-risk areas and in informal settlements (Haddad et al., 2015, Ungar, 2007, Levy et al., 2015). These vulnerable communities can be affected in two ways: firstly, by destroying their livelihoods thereby increasing their social disadvantage, resource depletion and marginalization, and secondly by exposing them to health risks through poor housing and dysfunctional health systems that will impact their wellbeing and (Bankoff et al., 2004) therefore, increasing their psychosocial distress (Stanke C, 2012, Fernandez et al., 2015).

The relationship between common mental disorders including depression, anxiety, Post traumatic stress disorder and substance abuse, and the occurrence of disasters such as flooding, is well-known (Davidson and McFarlane, 2006).

The primary stressors are directly related to the impact of the disaster itself (such as the level of exposure, level of losses, level of threat or harm), and are followed by secondary stressors that continue or are consequences of the primary ones, which indirectly add to the disaster's negative impact (as economic and work losses, health-related repercussions, family and social stressors, among others). These stressors, coupled with the different vulnerabilities that a person has even before a disaster

takes place, such as being in age groups extremes, having chronic co-morbidity conditions or diminished health, being under-resourced and living in disaster-prone areas like near coastlines and rivers beds, can negatively affect the mental well-being in the post-disaster stages and during the recovery and rebuilding phases (Fernandez et al., 2015, Stanke C, 2012, Kessler et al., 2012, Lock S et al., 2012).

The majority of those affected by a natural disaster will experience distress response issues, which can be overcome when individual, family and community resilience measures are in place (Karhina et al., 2016, Pietrzak et al., 2012, West et al., 2013, Henderson and Whiteford, 2003, Wind et al., 2011, Wind and Komproe, 2012). However, in a significant proportion of people this recovery process may be impaired even after the stressors are removed and symptoms compatible with mental disorders arise and can persist for several years (Davidson and McFarlane, 2006, Foa et al., 2006), placing a significant burden on the affected individuals, their communities and society (Walker et al., 2015, Whiteford et al., 2015).

There is evidence that climate change will increase the frequency and the impact of cyclical events such as *El Niño* phenomenon (McMichael et al., 2006, Timmermann et al., 1999, Ward et al., 2014). These effects will be disproportionally worse on developing countries(Patz JA, 2007), where large populations live in poverty and there is less enforcement of preventive public policies. They will also have a disproportionate impact on vulnerable groups, such as: the elderly, children, those with chronic conditions or diminished health, as well as low-resource residents living in disaster-prone areas, such as near coastlines and riverbeds.

Historically, the northern coastline of Peru, has suffered extensive damage from *El Niño* through severe flooding and heavy rainfall. The most severe *El Niño* episode on record, in 1997 and 1998, and left a heavy toll in the memories of Tumbes residents, that has lasted for decades (Bayer et al., 2014).

The latest *El Niño* phenomenon in 2015 and 2016 was classified as "strong" according to its rainfall (Sanabria et al., 2018, Hirons and Klingaman, 2015) and it was followed by an unexpected and violent local "*El Niño costero*" (coastal *El Niño)* event during February and April of 2017 (Ramírez and Briones, 2017, Venkateswaran, 2017). It heavily affected the northern coast and several coastline departments of Peru, especially vulnerable groups. Due to the protracted history of

social conflicts (Suarez, 2013) and corruption scandals among national and local authorities (Goldenberg S., 2018), there is a chronic lack of implementation of infrastructural prevention plans or health protection projects in the face of disasters (Camacho Angel, 2015). In addition, Peru's health systems and food distribution networks are disorganized, not coordinated and are markedly vulnerable to external stressors, as environmental disasters(Hernández-Vásquez A, 2016).

Locally, ten of Tumbes' thirteen administrative districts are considered to have a high risk of recurrence of natural disasters, and 93% of its population are classified at high risk of disasters (Instituto Nacional de Estadística e Informática, 2015a).

Despite all this, *El Niño* related effects and their association with common mental disorders have not yet been fully researched and there is little evidence of the effect of *El Niño* on mental health in the Peruvian coastal regions.

Due to the recurrent and extended nature of *El Niño*, it is important to have a better understanding of the possible extended adverse effects on the affected communities' mental health.

In this context, we hypothesized that vulnerable communities affected by *El Niño* related effects might experience an accumulated negative effect to their individual mental health, measured through depression scores before, during and post-*El Niño* using data collected by an implementation study conducted by CRONICAS - UPCH (Bernabe-Ortiz et al., 2014) in six villages of Tumbes region, over a three-year period.

Based on previously identified theoretically related variables between flooding events and mental disorders (presented in detail in section 1.2 of this thesis) (Lock S et al., 2012, Fernandez et al., 2015, Butler et al., 2018) a conceptual framework was developed to show the relationship between *El Niño* effects and depression. (Figure 3.4)

Primary exposures, defined as extreme precipitation and flooding events (*El Niño* effects) may directly impact the communities and individuals through house damage, affected persons and crop losses, increasing psychosocial distress and depression symptoms, measured through PHQ-9 scores. This outcome may be mediated by alcohol use, impoverishment, and sleep disturbances in the periods related to*El Niño*.

Based in the literature of the impact of floods and heavy rain on mental health, the following baseline socio demographic factors are risk factors for the development of distress and depression (Fernandez et al., 2015, Clemens et al., 2013, Collins et al., 2013, Ginexi et al., 2000, Mason et al., 2010, North et al., 2004, Telles et al., 2009): being a woman, being elderly, unmarried, widowed or divorced, low-resourced, and having low levels of education. Having a previous mental illness, chronic co-morbidities (hypertension, diabetes, or cardiovascular disease), a health-related disability and lack of registration or insurance to health services are considered as potential confounders in this diagram. these variables may be associated with the development of depression outside of E*l Niño* defined periods and may confer an additional risk when the related effects and impacts of *El Niño* take place.

Our objectives were the following:

- To explore whether time trends of depression scores changed significantly across Tumbes localities and by their levels of exposure to *El Niño* related flooding and heavy rains

- To assess if there were significant differences between the time trends of affected Tumbes residents' depression scores by their age group, gender, sociodemographic variables, (e.g. socioeconomic status, education level, marital status, access to health services) co-morbidity background, disability and lifestyle factors (consumption of alcohol, tobacco, physical activity and sleep patterns).

- To assess the potential effect-modifying role of poverty, use of alcohol and abnormal sleep pattern in the possible association between exposure to *El Niño* and depression scores over time.

5.3 Methods

Study Setting

Tumbes, a sea level region in the Peruvian north-western coast, has a warm and semi-tropical climate, a population of 243,362 people, and an illiteracy range of 2.4% to 8.1% (Instituto Nacional de Estadística e Informática, 2017a). In 2016, 76.5% had any sort of health insurance however, the majority were affiliated through "SIS", the governmental program for low-resource residents, reportedly underfunded and inadequate (Redacción Economía, 2018). At least 12.6% are poor, and at least 28.6% had one basic need unmet. Almost 38% of houses lacked water supply and 39% lacked sewage drainage system. However, 83.4 - 97.4%, accessed electricity, and roughly 90% had cell phones. In 2016, 58% of houses were built with stones, mud, thatch and other rudimentary materials and 40% had earthen floor (Instituto Nacional de Estadística e Informática, 2016c).

The study area consists of 107 villages of different sizes in the semi-urban Tumbes, with about 80,000 persons. According to the reported (Bernabe-Ortiz et al., 2020) methods used in SALT trial "The semi-urban area of the region, with approximately 100 villages of varying sizes and approximately 80,000 inhabitants, was the area chosen for the study. Mid-sized villages with 350–700 individuals (~130–250 households) were initially selected for the study. Of the 20 villages available with these characteristics, 6 were randomly selected. Sufficient distance between them was also ensured (that is, a median of 14 km (interquartile range 7.1–17.1) between them) to avoid contamination by verifying the selection of villages on the map".

Study design

This is a secondary analysis linking ecological and individual-level data of the longitudinal depression assessments of a pragmatic stepped-wedge cluster-randomised controlled trial of a low-sodium salt substitute to reduce blood pressure levels. Full details of the trial and methods have been published elsewhere (Bernabe-Ortiz et al., 2014, Bernabe-Ortiz et al., 2020)

124

Sites and participants

Six villages were randomly selected in Tumbes department (Figure 3.2) from a total of 20 eligible villages. Men and women aged 18+ years, residents for at least six months in the study villages, identified by the latest available census data, were asked for consent to participate. All participants complied with the inclusion/exclusion criteria of the trial.

Main outcome variable – depression

The trial intervention was introduced progressively from April 2014 to March 2017, with study assessments scheduled every five months after the baseline visit. Longitudinal depression scores were measured with a validated version of the Patient Health Questionnaire-9 (PHQ-9) (Appendix E) . Mild depression cases were defined with a score of ≥5 (42) (Baader M et al., 2012).

The PHQ-9 is a widely used screening instrument for depression (Brettschneider et al., 2017, Searle et al., 2017), This is a commonly accepted cut-off point (Manea et al., 2012) which previous studies have used to indicate mild depression cases. Moreover, the validity of the invariance measurements among Peruvian population groups with the PHQ-9 have been assessed recently (Villarreal-Zegarra et al., 2019).

Independent main exposure variables - El Niño impact

Damage due to heavy rain and flooding related to El Niño episodes during the study period was estimated using official environmental and damage reports. Using the visit date (month and year) of each study participant visit, we estimated mean monthly values at district and village level for each variable.

Daily environmental regional assessments as: the precipitation volume (mm), air temperature (°C), relative mean humidity (%) and superficial sea temperature SST (°C), routinely collected by the Peruvian National Meteorology and Hydrology

Service (SENAMHI) were transformed to mean values per month. SENAMHI thresholds levels were used to define over-the-limit measurements consistent with *El Niño* periods.

The daily reports of *El Niño* event-related damage (number of houses destroyed, collapsed and damaged and number of persons injured, affected/damaged), routinely collected by the Peruvian National Institute of Disaster and Civilian Defence (INDECI) in each municipality, and were divided evenly for each village monthly during the trial period. Finally, the tri-monthly registries of cultivated hectares and metric tons of crops lost to *El Niño* event, were collected ad hoc by the Regional Direction of Agriculture of Tumbes (DRAT) at district level and were also evenly divided for each village per month.

Secondary exposures

Disability status was identified using the Washington Group (WG) Short Set of questions on disability (The Washington Group (WG), 2009). The individuals who responded to have "some difficulty", "a lot of difficulty" or "cannot do at all" in at least one of the six questions of the set, were classified as having a mild disability or a severe degree of disability respectively in any of the full functioning spectrum.

The participant's co-morbidity status (binary) was defined pooling five variables reporting co-morbid antecedents of high blood pressure, stroke, heart attack, heart failure and diabetes.

Socioeconomic status was defined using self-reported monthly average income in the last 12 months, (categorized according to Tumbes department monthly average income that in Peruvian soles equals to US$ 305: none, US$ 1 to 305 US$, more than 305 US$), and a wealth index, estimated as a composite numeric index based on facilities and goods owned by the household, based on the Peruvian DHS (ENDES) survey and other surveys administered by the Peruvian National Institute of Statistics and Informatics (INEI).

For the use of alcohol, tobacco, self-reported sleep pattern and lack of physical activity, domains from the WHO STEPS approach questionnaire for surveillance of non-communicable diseases were used(World Health Organization - WHO, 2017). Alcohol use was defined as having at least 2-4 alcoholic drinks/month (binary) and being a current smoker, as smoking daily at least occasionally (binary). An abnormal sleep pattern (binary) was defined using three variables: a) sleep duration reported outside the recommended range of 7-9 hours for adults aged <65 and 7-8 hours for adults aged 65+ having answered "sometimes" or "frequently" to the questions b) Have you had difficulties falling asleep during the last month? And c) Have you woken up during the night during the last month? Lack of physical activity/sedentary hours was measured with two questions from the short version of the IPAQ (IPAQ, 2005)(physical activity questions). The participants self-reported the daily number of hours spent watching television.

All participants answered the same standardized questionnaire applied by trained health workers, including: village; sex; age; marital status (single, married/cohabitating, divorced/separated, widowed); education (none, primary, secondary, technical and university); occupation (student, homemaker, employee, independent worker, retired and unemployed); and access to health services (binary).

Analysis and Sample size

Sample size calculations and selection of the number of villages (*clusters*) were drawn using preliminary data from the baseline of the CRONICAS cohort study in Tumbes (Miranda et al., 2012) and the PERU MIGRANT (Miranda et al., 2011) reported study estimates. According to the reported sample calculations for the SALT trial: "Power for the stepped-wedge design was computed for a continuous endpoint, where X is a N x T matrix showing the treatment pattern i.e. Xij=1 if cluster "i" received the intervention at time "j" and 0 otherwise. We assumed a significance level of 5%, a standard deviation of blood pressure within sites of 20 mmHg, the number of clusters (N) of 6; the number of time periods (T) of 6 (excluding baseline assessment), the average number of subjects assessed per cluster and time period of

300, and an approximation to the coefficient of variation of 0.20. Based on those assumptions, we calculated a power over 90% to find a difference of 3 mm Hg in blood pressure levels between the intervention and control groups. This magnitude of difference is within the expected range that provides major public health gains in the long-term, in reduction of stroke. Typically, the coefficient of variation ranges between 0.15 and 0.40, but when this value is unknown, as in this study, sensitivity of the sample size within this range needs to be verified. In this protocol, power calculations using both extremes of coefficient of variation yields a power greater than 90%" (Bernabe-Ortiz et al., 2020).

To describe numerical variables, we used to mean and standard deviations (S.D.), and for categorical variables, proportions with 95% confidence intervals (95% CIs). To compare numerical variables, we used the two-sample t test, and to compare categorical variables, the $\chi 2$ test. Two-level regression models of individuals nested in the six study villages, were constructed following the study's conceptual framework. In addition, using a staged approach, we adjusted for the above mentioned *a priori* set of potential confounders, including them sequentially in the models. As abnormal sleep is considered a symptom of depression (Nutt et al., 2008), it was not included in the multivariable model to avoid reverse causality. Odds ratios (OR) and 95% CI were calculated using mixed-effect logistic regression models with robust variance to account for within-level clustering. All analyses were conducted using Stata version 15.0 (STATA Corp, College Station, Texas, USA) and we set a p- value of less than 0.05 for statistical significance. The post-estimation likelihood ratio test was used to assess the model fit.

Ethics

Ethical approval for the secondary analysis was obtained from the Institutional Review Board of London School of Hygiene and Tropical Medicine. The approval to conduct the implementation trial was granted by two Institutional Review Boards: Universidad Peruana Cayetano Heredia in Peru and John Hopkins University in the

USA. The trial project was registered in clinicaltrials.gov (Identifier: NCT01960972).

5.4   Results

Study Population

A total of 2,376 participants (91.2%) out of 2,605 eligible residents (aged 18 years or older) in the six study villages were enrolled in the study and assessed at the study baseline visit, prior to villages' randomization.(Table 5.1).

The flowchart of participants in the stepped-wedge trial, including those individuals lost to follow-up, those continuing in each cohort and those analysed per study visit have been published elsewhere (Bernabe-Ortiz et al., 2020). The relevant figure from that publication is included as Appendix S in this thesis. Overall, the lost to follow up numbers of participants in each study assessment range between 8 and 11.5%, which should not have a decisive impact on the study results.

Table 5.1 Study population characteristics and baseline health risks

Characteristics and baseline health risk		N	%
Female Sex		1197	50.4
Age (years) [a]		43.3	SD ±17.2
Marital Status			
	Single	473	19.92
	Married/Cohabitating	1658	69.84
	Divorced/Separated/Widowed	243	10.24
Education			
	None (≤1-year education)	51	2.15
	Primary School (1-6 years)	786	33.09
	High School (≥7 years)	1092	45.98
	Technical / University	446	18.78
Socio-economic Status [b]			
	Low	798	34.26

Middle	756	32.46
High	775	33.28

Monthly average income in US$ (last 12 months) [c]

None	962	40.8
1 to 305	1200	50.9
≥ 305	195	8.3

Unemployed	1010	42.6
Student	90	3.87
Homemaker	815	35.07
Employee	371	15.96
Independent worker	997	42.9
Retired/Searching for job	51	2.19

Currently has any health insurance	2061	86.8

Background co-morbidities [d] (at least one)	378	15.9

Some Disability [e]	102	4.3
Major Disability [e]	22	0.9

Currently smokes, at least occasionally (n=701)	330	47.08

Cigarette packs smoked in the last month (n=310)

Less than 1	194	63.4
Between 2 and 4	95	31.05
More than 5	17	5.56

Hours spent watching TV daily [f] (n=2120)

Less than 1	2,087	49.2
Between 1 and 3	1431	33.73
Between 4 and 8	682	16.08
More than 9 hours	39	0.92

Alcohol consumption frequency [g] (n=1634)		
Never	313	19.16
Less than 1 per month	1,198	73.32
At least once per week	120	7.34
More than 4 per week	3	0.18
Hangover experience frequency (n=961)		
Never	525	54.66
Less than 1 per month	299	31.11
At least once per month	137	14.26

[a] Mean. Otherwise N (%)

[b] Socio-economic status was calculated using an assets-based index.

[c] In US$ dollars.

[d] Unified variable considering HTN, stroke, MIA, HCC, and diabetes

[e] Short set Washington group disability questions. A positive response in at least one of the six domains.

[f] Reported in the last 7 days.

[g] Reported in the last 12 months.

The mean age of participants was 43.3 (SD: 17.2) years, and 49.6% were men. The majority (69.9%) were married or cohabitating and 79.1% had completed at least primary education. On average, most participants were currently working (57.4%), however, almost 41% reported zero average monthly income and 51% reported an income average of less than 305 US$ in the last 12 months. Regarding access to health system, 13.2% were not registered to any type of health insurance. However, almost 68% of those who had some form of health insurance were affiliated to the Peruvian "SIS" or integral health insurance for population with lowest resources. The prevalence of depression cases among both male and female participants at baseline were 10.8% and 21.2%, respectively was comparable to the national average of 17.1% [46] and to the expected for Tumbes department: 17.2% [47]. Prevalence substantially decreased over time across the study visits assessments in all villages (

Figure 5.1), reaching 2.5% and 4.5% for male and female participants, respectively (Figure 5.2).

Figure 5.1 **Time trends depression prevalence across study assessments by village PHQ9≥5**
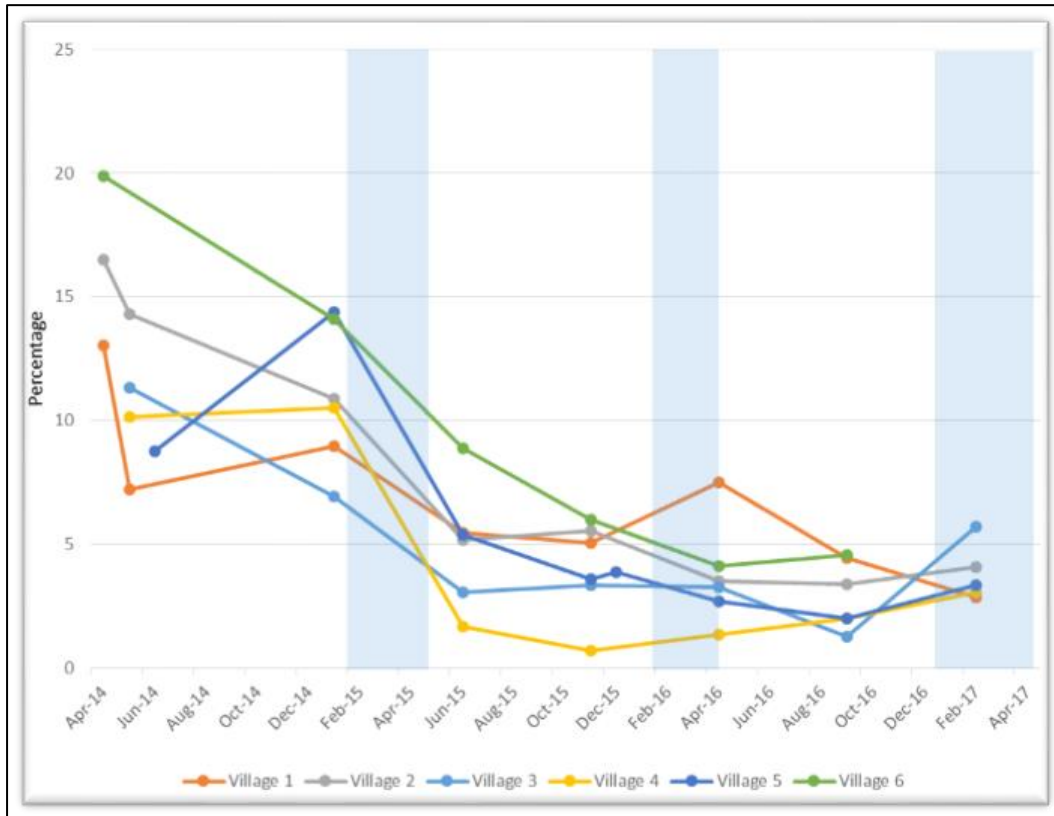
Figure 5.2 Time trends of depression prevalence across study assessments by sex (PHQ9≥5)
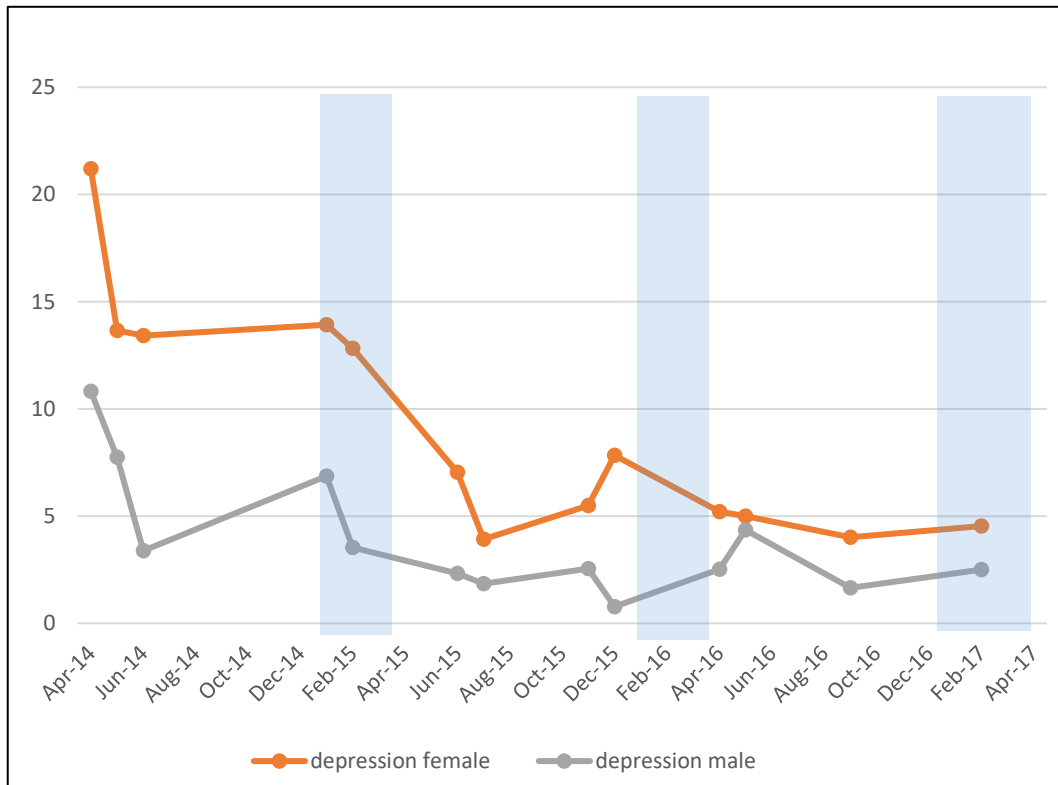
In bivariate analysis, exploring the theoretically associated factors for depression, being female (OR = 2.73, 95% CI: 2.18-3.41) and being more than 60 years old (OR = 5.76, 95% CI: 3.73-8.88) were significantly associated with increased odds of depression across study visits.

Other variables showed a decreased prevalence across assessments: abnormal sleep pattern (41.6% at baseline compared to 23.9% at the last follow up visit) (Figure 5.3), self-reported use of tobacco (47.1% at baseline compared to 11.3% at the last follow up visit)). In contrast, the use of alcohol slightly increased in follow up visits, especially for males.

Figure 5.3 Time trends of abnormal sleep patterns use across study assessments by sex (%)
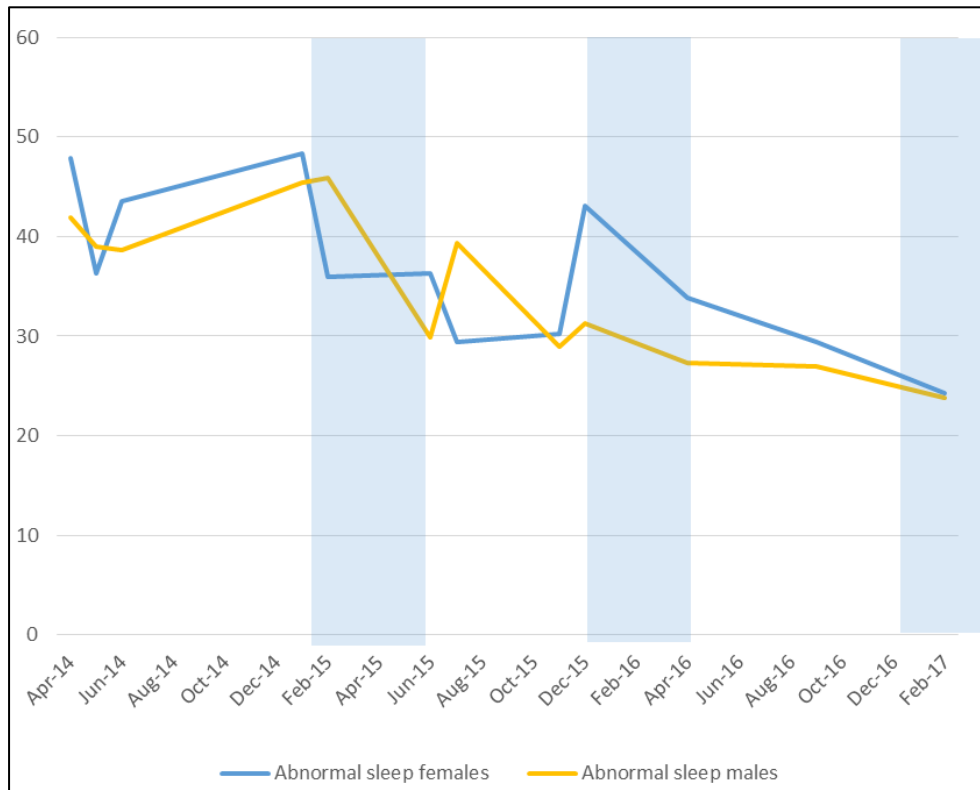
Figure 5.4 Time trends of tobacco use across study assessments by sex (%)
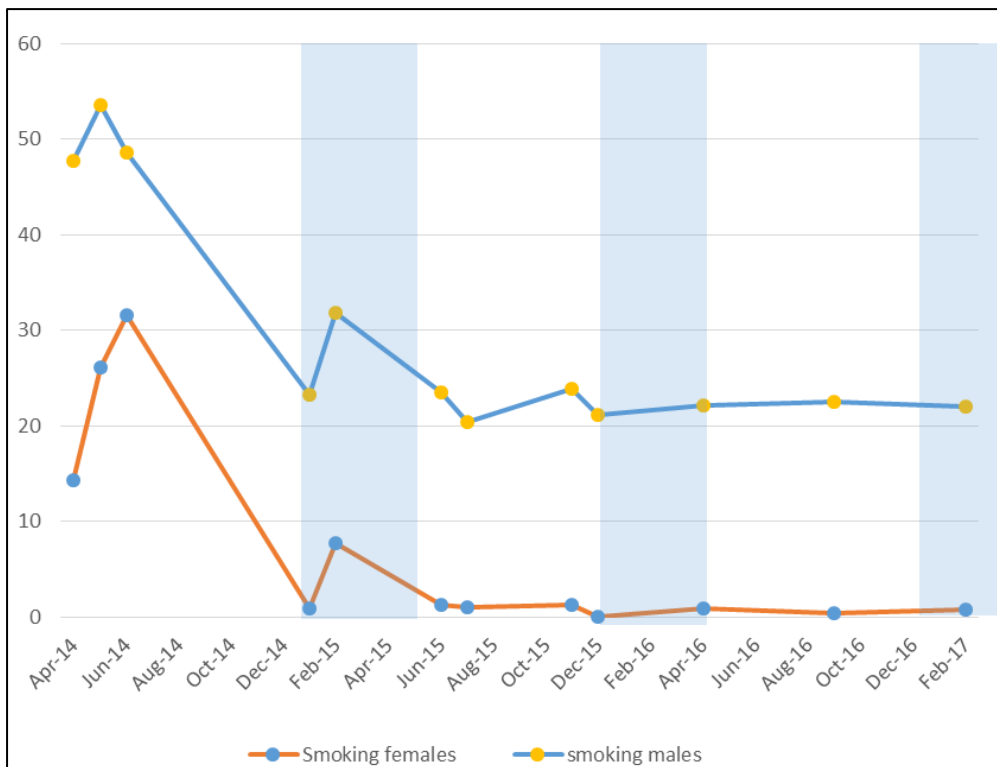
Figure 5.5 Time trends of alcohol use across study assessments by sex (%)
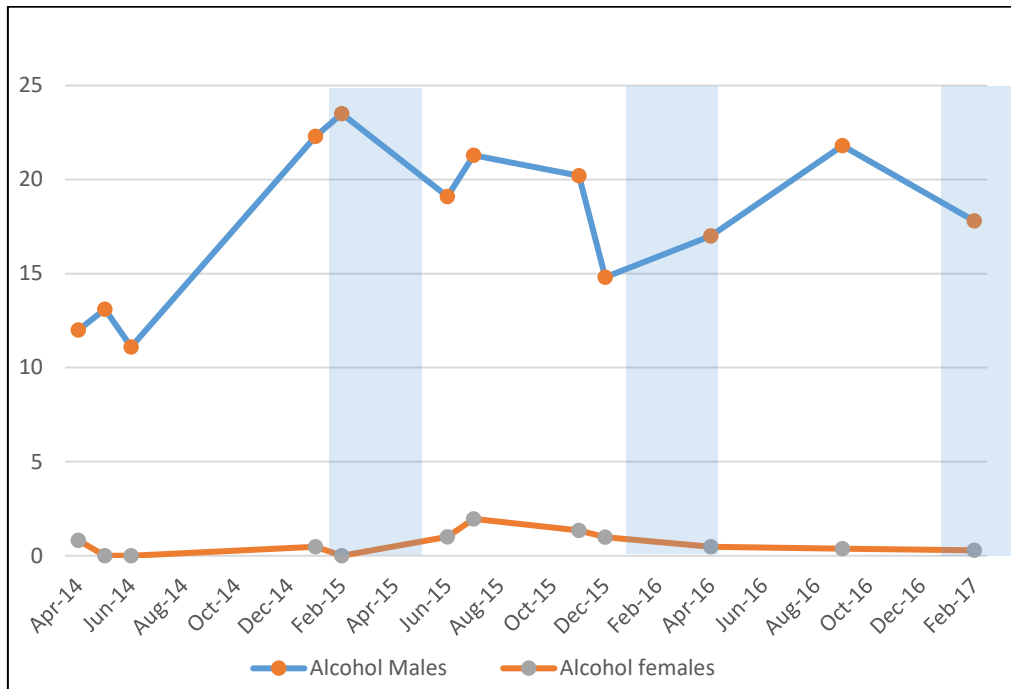
Individual risk factors related to El Niño and depression

The final model included the following variables: health services access, background co-morbidity, baseline depression diagnoses and no income reported at baseline. No reported monthly income (OR=1.46, 95% CI: 1.20-1.78), background-co-morbidity (OR=2.02, 95% CI: 1.62-2.52), access to health services (OR=1.45, 95% CI: 1-05-1.99) and a baseline depression diagnosis (OR=14.22, 95% CI: 9.71-20.83) were associated with a significant increase in the odds of depression in the follow-up assessments (Table 5.2).

Table 5.2 *El Niño* **related environmental & impact variables and potential confounders with depression**

El Niño related variables with depression (PHQ+9≥5)	Crude OR (95% CI)	p-value	Adjusted OR [a] (95% CI)	p-value
Environmental outcomes				
Rainfall (mm)	0.99 (0.99-1.00)	0.163	0.99 (0.99-1.00)	0.517
Air temperature (°C)	1.54 (1.14-2.10)	0.004	1.35 (0.98- 1.86)	0.066
Mean humidity (%)	0.98 (0.94-1.01)	0.21	0.98 (0.94-1.02)	0.496
Mean SST (°C)	1.72 (1.21-2.43)	0.002	1.30 (0.90-1.90)	0.156
Impact outcomes				
Crops lost (MT)	1.02 (1.00-1.04)	0.011	2.52 (1.31-44.84)	0.006
People affected	0.99 (0.99-0.99)	0.007	0.13 (0.04-0.47)	0.002
Houses affected	0.99 (0.99-0.99)	0.024	0.17 (0.053-0.55)	0.003
Potential Confounders				
No reported monthly income	2.32 (1.84-2.90)	<0.001	1.46 (1.20-1.78)	<0.001
Co-morbidity background	3.47 (2.67-4.50)	<0.001	2.02 (1.62-2.52)	<0.001
Health services access	1.69 (1.18-2.42)	0.004	1.45 (1.05-1.99)	0.021
Baseline depression [b]	19.2 (13.01-28.35)	<0.001	14.22 (9.71-20.83)	<0.001
Hours spent watching TV	0.93 (0.89-0.96)	<0.001	0.69 (0.56-0.84)	<0.001

a Model adjusted for: health services access, background co-morbidity, baseline depression diagnoses, no income reported

b Categorized PHQ+9 score 10-14

In contrast, the number of hours spent watching television during both weekdays and weekends was associated with lower odds of developing depression in the follow up assessments (OR=0.69, 95% CI: 0.56-0.84).

It was not possible to explore the theoretically proposed mediation effect of the use of alcohol and abnormal sleep pattern on depression and the exposure to *El Niño* environmental and impact effects, as 1. The study visits time periods and *El Niño* defined periods did not allow to clearly define a before, during and after *El Niño*

making it difficult to confirm the proposed hypothesis and 2. There was no association between these two variables and depression over time.

Environmental and impact variables related to El Niño and depression

Among the external environmental and impact variables related to *El Niño*, ambient temperature (OR=1.54 per 1°C increase, 95% CI: 1.14-2.10), mean superficial sea temperature (OR=1.72 per 1°C increase, 95% CI: 1.21-2.43) and crop losses (OR=1.02, 95% CI: 1.00-1.04) were also associated with developing depression in the follow-up period. However, both house damage and human injury were associated with decreased odds of developing depression in the follow up assessments, with similar odds ratio and confidence intervals (OR=0.99, 95% CI: 0.99-0.99). In the adjusted model exploring *El Niño* environmental and impact effects by baseline income, it was not possible to estimate associations between depression and heavy rain, crops losses, house damage and human injury (Table 5.3).

The periods of heavy rain related to *El Niño* do not show a relationship with depression prevalence trends over time (Figure 5.6).

As sensitivity analysis, we also evaluated the time trends of depression scores with a cut-off of PHQ-9≥10 by village. This cut-off point was decided based on the meta-analysis results of Manea et al. (Manea et al., 2012) which found that PHQ-9 had acceptable diagnostic properties for detecting major depressive disorder for cut-off scores between 8 and 11. There was not found a difference of the time trends with this higher cut-off, as the smaller number of major depression cases followed the same downward trend than the (Please refer to Appendix T). Additionally, we also explored if there were any changes in the trends of depression excluding the latest assessment of village number 6, as this particular setting had a large number of reported damages across the defined impact outcomes by the time of the last visit's assessment. There was not found changes in the trends of depression and the association of interest in this exploratory analysis (Please refer to Appendix T).

Table 5.3 *El Niño* related environmental and impact variables with depression by reported baseline income level

El Niño related variables and depression by reported income level	No income OR [a] (95% CI)	p-value	1 to 305 USD$ income OR [a] (95% CI)	p-value	>305 USD$ income OR [a] (95% CI)	p-value
Environmental variables						
Rainfall (mm)	0.99 (0.99-1.00)	0.087	0.99 (0.99-1.00)	0.674	0.99 (0.99-1.00)	0.633
Air temperature (°C)	0.99 (0.79-1.24)	0.955	1.35 (0.95-1.92)	0.085	0.96 (0.60-1.53)	0.894
Mean humidity (%)	0.98 (0.93-1.03)	0.550	0.99 (0.94-1.04)	0.860	0.98 (0.88-1.11)	0.851
Mean SST (°C)	0.79 (0.60-1.04)	0.104	1.49 (0.99-2.22)	0.052	0.83 (0.46-1.49)	0.546
Impact variables						
Crops lost (MT)	*	*	*	*	*	*
Houses affected [b]						
0	Ref		Ref		Ref	
1 - 5	0.65 (0.44-0.95)	0.030	0.75 (0.46-1.23)	0.27	0.75 (0.21-2.59)	0.652
6- 99	0.67 (0.29-1.53)	0.346	2.10 (0.63-7.00)	0.227	0.25 (0.02-2.66)	0.251
100+	0.13 (0.02-0.64)	0.012	0.36 (0.05-2.29)	0.285	*	0.988
People affected	*	*	*	*	*	*

a Model adjusted for: health services access, background co-morbidity, baseline depression diagnoses, no income reported
b Assessment of mediation and testing for the homogeneity of the odds-ratios was not possible due to model non-convergence with Likelihood Ratio Test

* Not estimable

Figure 5.6 Relationship between environmental & impact variables and depression diagnosis in male and female participants
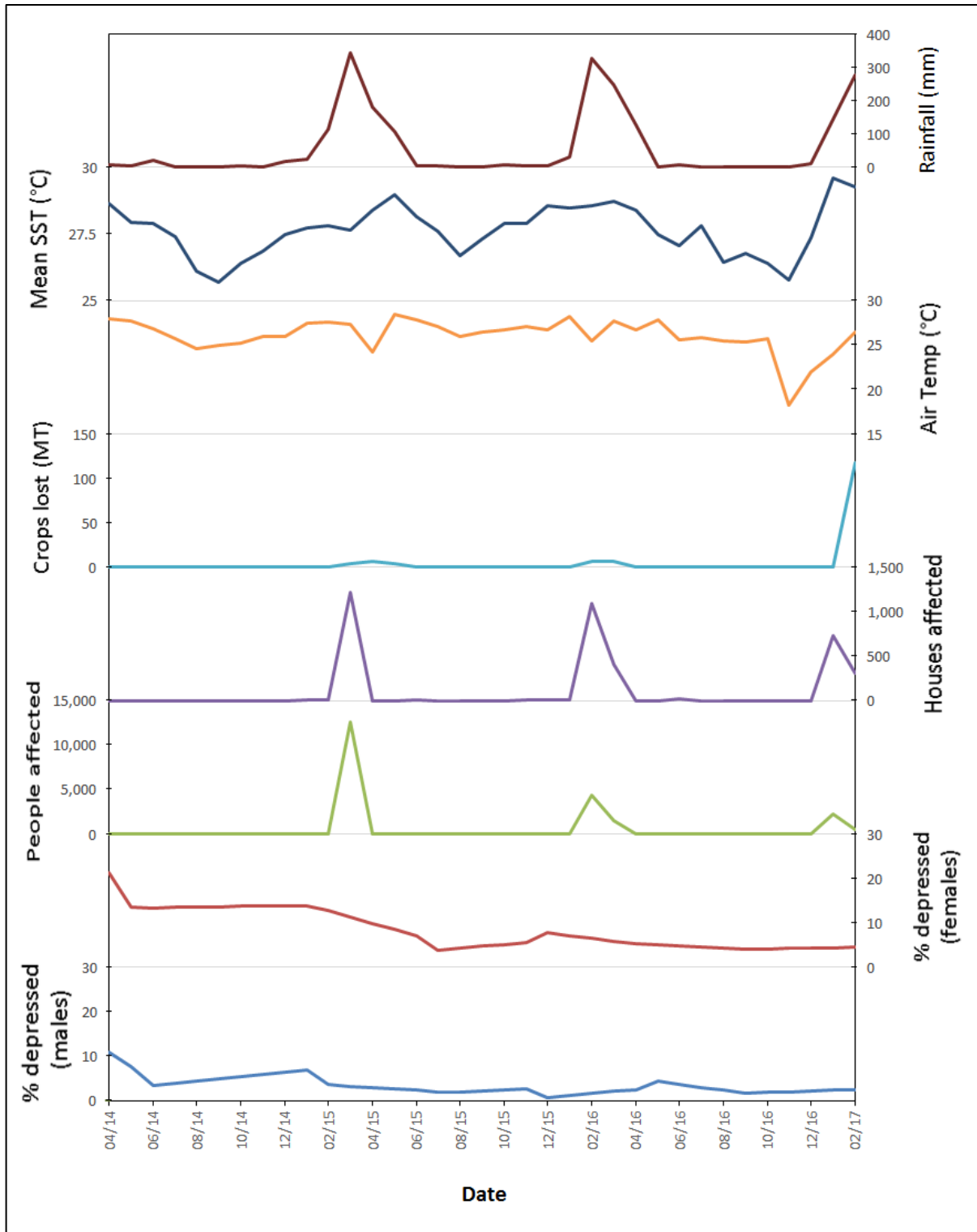
5.5 Discussion

We did not find evidence that the prevalence of depression increased over time was related to the occurrence of an *El Niño* event among the study villages. Due to the limitations of the ecological-level data, villages could not be clearly classified into "affected" and "unaffected", as all of them sustained damage to some extent. Also, evidence of effect-modification was not found for alcohol use or abnormal sleep.

Baseline depression prevalence for both sexes was comparable to the national average (17.1%) and to Tumbes region estimates (17.2%) and showed a sustained decrease over time in the follow-up assessments in each village. Exploratory analysis performed with an upper cut-off of PHQ-9 ≥10 showed a similar trend of decrease over time with a much smaller number of depression cases.

This raises the question if any unmeasured factor might have influenced this remission. The trial involved an extended social marketing campaign to introduce participants to the salt substitute and to ensure its acceptance and adherence, and this may have added an additional benefit to the participant's well-being, aside from being part of a structured, longitudinal trial, receiving further support and care opportunities in comparison to non-participants (McCambridge et al., 2014). I conducted a qualitative fieldwork in June 2017 where I assessed perceptions of the relationship of mental health and the *El Niño*. Some participants resided in the same trial villages, and most respondents agreed that being a study participant and having the opportunity of sharing their impressions and personal memories with the fieldworkers was a positive experience, unusual from their daily routine (Flores, 2017).

Previous studies on the impact of flooding and mental health have shown a clear detrimental association of natural disasters with common mental disorders, however most of them had cross-sectional designs and a causal effect could not

be established (Fernandez et al., 2015) and they were not directly related to an *El Niño* event.

In our study we used secondary data which was not designed to investigate the proposed association. Also, the impact data of damage and losses reports were measured in pre-established three-month periods, there was little variation either over time or between villages. In consequence, the results from the crude models are probably closer to the real values than the adjusted ones, they may not accurately show an effect (Table S1 – Appendix R) Reported damages related to flooding and heavy rain related to *El Niño* among study trial villages) and there may not be enough evidence that the depression scores diminish in the last available assessment of the trial study. Specifically, on the sixth follow-up visit of the sixth village, many houses and persons were affected, and the association found there may have been driven by these outlier results. This combined relationship with the lack of variance of the data, and the absence of an additional follow-up assessment afterwards, does not allow us to fully confirm that there was not an increase in depression cases after this period. We have explored this through sensitivity analysis, excluding the last time point on that village, finding similar trends.

In addition, as the mild depression cases in this sample were selected with a low PHQ-9 cut-off score, the spontaneous symptoms´ remission is a plausible possibility (Whiteford et al., 2013). Trial respondents may also have experienced 'research fatigue' over time and engaged less with the questions (Clark, 2008).

The lack of association between depression cases and *El Niño* effects may reflect a selection bias among the sample. Almost 92% of the study participants reported an average monthly income lesser than the average monthly family income in Tumbes (Instituto Nacional de Estadística e Informática, 2017a), classifying them below the poverty line. If the trial sample is not representative of Tumbes population by income level, other related differences that may also be exposure-related are possible, e.g. if the participants were not land-owners and are casual

workers in the affected areas, the risk factor of "losses of crops" would not be applicable to them.

Also, we need to consider further the Tumbes context itself when interpreting the results. Most of the adult inhabitants have lived through and may clearly remember past, stronger *El Niño* events. Due to the protracted history of social conflicts and corruption scandals among Peruvian authorities (CNN en español, 2019, Goldenberg S., 2018) there is a chronic lack of implementation of infrastructural prevention and recovery measures upon disasters. Health systems and food distribution networks are disorganized and markedly vulnerable to external stressors (CENEPRED, 2015, Hernández-Vásquez A, 2016). During the months before the 2015-2016 *El Niño*, the local residents were exposed to continuous media forecasts, warning about an "extraordinary *El Niño*" event that may lead to catastrophic consequences and the Peruvian government declared an emergency status, urging the regional authorities to clean solid waste in the riverbeds (Chinchay, 2015, Redaccion, 2015, Cesare Chris, 2015). Months later the forecasts were corrected (L'Heureux, 2016), and the effects in Tumbes were milder than those predicted. This led to a sense of relief among the population, which may have acted as a protective factor afterwards. This may also have been in place when the vulnerable participants, found themselves unaffected by *El Niño* effects and compared their situation with neighbours or other villages´ residents. Afterwards, in early 2017, when the unexpected coastal *El Niño* event occurred, the trial had finished data collection, and we were unable to assess the posterior effect of this last event.

Finally, although we did not assess them for this study, it is a possibility that there may be among Tumbes's resident's resilience factors at community-level and institutional ties which may have helped them against mental disorders related to repeated exposure to environmental events and would be necessary to explore and magnify for other settings (West et al., 2013, Wind et al., 2013).

The main strength of this study is that it is based on longitudinal data from a large sample size of participants in a resource-limited setting over three years. We used standardized tools for measuring depression and other health-related outcomes to allow study comparability. Also, we used officially reported data from national bodies to assess the association of a highly prevalent mental disorder with a widespread periodic environmental phenomenon that may increase its severity. To the best of our knowledge this is the only study that has evaluated longitudinal assessments of depression and its association across *El Niño* 2015-2016 event.

Our study has several limitations. First, as this is a secondary analysis, the trial was not designed to answer our research question and did not evaluate additional mental disorders, frequent among post-disaster survivors. In consequence, our regression estimates, due to the inclusion of ecological-level variables, could have been underpowered to find an association. Despite this possibility, some of the exposure variables did show significant associations with the outcome. Second, alcohol and tobacco use, and sleep abnormalities was self-reported, which may encompass both a recall and social desirability bias, as well as under-report. Third, it was not possible to conduct a mediation analysis for individual loss of income or impoverishment across visits and depression, as only baseline data for self-reported income was available. Fourth, the only measure of mental health available was the PHQ-9 for depression. The literature shows that natural disasters have more of an effect on symptoms of anxiety or traumatic stress (Ahern et al., 2005, Fernandez et al., 2015), but these could not be measured in the study.

It will be critical to ascertain how the human systems place unequal risks to groups of people, which can be better understood evaluating the individual's, community's, or society's vulnerability characteristics. Therefore, building community awareness of the risk that future extreme *El Niño* related flood occurrences due to climate change must be the first step in a practical strategy to adapt to and diminish the impact of future similar events and having information on the availability of local resources to ameliorate their repercussions using a

community-based approach will be especially beneficial among vulnerable groups living in flood-prone areas.

5.6 Conclusions

The findings of this study, which linked ecological and individual-level data, do not provide evidence supporting the hypothesis that environmental and disaster impact variables of 2015-2017 *El Niño* affected depression rates, use of alcohol and tobacco or sleep patterns among study participants. The inclusion of mild depression cases, spontaneous remission of symptoms, the milder-than expected effects of *El Niño* during the study period assessments, the possible unmeasured effects of local resilience-promoting factors and the implementation of a sustained marketing campaign to facilitate the study intervention adoption among the selected villages may have influenced these findings.

RESEARCH PAPER COVER SHEET

Please note that a cover sheet must be completed <u>for each</u> research paper included within a thesis.

SECTION A – Student Details

Student ID Number	lsh1509548	Title	Dr
First Name(s)	Elaine Catherine		
Surname/Family Name	Flores Ramos		
Thesis Title	Mental health and resilience-promoting strategies associated with El Niño Southern Oscillation (ENSO) in the north coast of Peru		
Primary Supervisor	Victoria Simms		

If the Research Paper has previously been published please complete Section B, if not please move to Section C.

SECTION B – Paper already published

Where was the work published?			
When was the work published?			
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion			
Have you retained the copyright for the work?*	Choose an item.	Was the work subject to academic peer review?	Choose an item.

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SECTION C – Prepared for publication, but not yet published

Where is the work intended to be published?	Social Science and Medicine
Please list the paper's authors in the intended authorship order:	Elaine C. Flores, Daniela C. Fuhr, Victoria Simms, Andres G. Lescano, Nicki Thorogood

Stage of publication	Not yet submitted

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I was the lead author of this paper, and was responsible for the study design, Data collection and fieldwork, data analysis, and the writing of the manuscript. NT, DCF, VS and AGL advised on the design of the study and the presentation of the results, and offered feedback on the draft manuscript. NT as final author provided guidance throughout the process of study design, analysis, and writing, was present and guided data collection and fieldwork and also gave detailed comments and feedback on initial drafts.

SECTION E

Student Signature	Elaine C. Flores
Date	29 Jan 2020

Supervisor Signature	Victoria Simms
Date	29 Jan 2020

6 CHAPTER 6. PhD Paper C. "You cannot build a giant umbrella over Tumbes when *El Niño* comes": A qualitative study of the perceptions of *El Niño*'s impact on mental health, barriers to resilience and access to support in Tumbes, Peru"

6.1 Abstract

Background: Despite the well-known widespread effects on health of the *El Niño* phenomenon, there is little evidence of its psychosocial impact on historically affected communities and the ways that they respond to this cyclic environmental event. We aimed to describe the perceived effects on residents' mental health, and the barriers to achieving psychological wellbeing and accessing support, in a post-*El Niño* scenario in Tumbes, Peru, a historically high-risk area for floods and heavy rains.

Methods: Between May and June 2017 we conducted 27 semi-structured in-depth interviews and 3 focus group discussions with 24 adult residents of Tumbes, Peru. The participants were classified into the following subgroups: a. Representatives of the local authority based in Tumbes city; b. Representatives of the local authority based outside of Tumbes city, in the Tumbes region; c. Residents from heavily affected localities; and d. Residents from low-affected localities.

Findings: During early parts of the interview', the overall impact of *El Niño* effects on mental health was minimized. Authorities and some residents suggested that they were "accustomed" to them. Most of the responses changed later when they described flood-related suffering either directly experienced or witnessed. Related socioeconomic struggles were described, as well as feelings of lack of

support, unfairness, and helplessness. The local representatives acknowledged that effective support and aid was sometimes unavailable. Contextual factors related to corruption, underfunding of prevention activities, and lack of reconstruction programs, led to despair and distrust of authorities. Many participants allocated responsibility to specific actors, but suggested solutions or acknowledgement of personal responsibility were less commonly reported. Neither psychosocial programmes, availability of psychological therapies or community-based support programs were routinely reported. Mutual collaboration with neighbours, local authorities and aid organizations were highlighted as potentially useful, but currently non-existent as an organized or evenly distributed force. Findings suggest that psychosocial distress was exacerbated by poverty, scarcity of work, and membership of an already vulnerable group.

Conclusions: The findings show the multiple and interrelated issues associated with under-resourced communities in a post-disaster context, and how socioeconomic distress and lack of support contribute to psychosocial suffering in this population. In addition to providing emergency aid and health support, these vulnerable communities would benefit from an integrated care and a resilience-promoting approach, that considers contextual and community-level distress alongside improved access to prevention measures and reconstruction activities.

6.2 Background

Worldwide, it is estimated that 1 in 4 people will suffer from a mental or neurological disorder at some point in their lives, (Vos et al., 2015, WHO, 2018). Poverty is a risk factor for increased mental disorder incidence, severity, and poor outcomes, and those with fewer resources have the least access to adequate treatment, and therefore the highest burden(Lund et al., 2011). Constant exposure to severely stressful events such as disasters, dangerous living conditions, labour exploitation, and poor health in general contribute to greater vulnerability for mental disorder among these disadvantaged populations.

The *El Niño* Southern Oscillation Phenomenon (*El Niño*) is a recurrent climate pattern that has existed for at least 500 years which entails oscillating changes in the average sea surface temperature (SST) of the Pacific Ocean. This heating and cooling pattern is called the ENSO cycle, and it directly affects the level and distribution of rainfall in tropical circumscribed areas and may have a strong influence on global climate. The phenomena *"El Niño"* and *"La Niña"* events are the extreme phases of the ENSO / *El Niño* cycle.

These events cause disasters through their direct impact on natural ecosystems, and in socioeconomic sectors such as health, transport, tourism, fishing, and agriculture, with particularly strong impacts in developing countries. Peasant families and subsistence farmers are particularly vulnerable as they are heavily dependent on weather patterns for irrigation and have limited access to alternative income sources as well as basic health services, education, and safe food.

Additionally, as the current climate emergency caused by climate change attributed to human activity is being experienced globally, it is expected that these effects will increase both the frequency and magnitude of cyclical environmental events, such as the *El Niño* phenomenon. As most countries lack proper implementation of strong preventive measures against these effects, in a post-disaster setting, the mental wellbeing of the survivors may require support and coordinated actions over the long term, especially during the recovery and reconstruction phases. However, in Peru (Kohan et al., 2011) as well as in many

other low-and-middle-income countries (Mardones Carrasco and Velásquez Tapia, 2015), there is marked low coverage and poor response capacity of the existent mental health programs and health services in disaster cases. In addition, the phases of recovery and reconstruction of affected communities can be extended (Silove and Zwi, 2005) for many years or indefinitely, without them being able to reach a point of stability and resilience.

In the process of adaptation to a traumatic disaster, the psychological and emotional responses of survivors will vary greatly. An important mediator of resilience and psychological well-being in post-disaster contexts is community support and participation (Wind and Komproe, 2012). In the groups most affected by disasters there will often be a deterioration of the community social fabric (Le et al., 2013), a loss of the structure of family life and an increase in the signs of psychological suffering (Stain et al., 2011). Healing social ties between community residents can foster adaptation and survival, allowing the inhabitants to determine their own priorities, select their options and intervene in decision-making. In addition, specifically in post-disaster situations, community participation [5] (UNDP, 1993) can diminish common psychosocial disorders (Levula et al., 2017, Tsuchiya et al., 2017) through social support (Margie, 1998, Ehsan and De Silva, 2015a) and the exchange of information, communication and trust among community members (Tan and Pulhin, 2012) and authorities(Bisung et al., 2014). This will be especially necessary in the case of people suffering forced displacement in relation to disasters and in the adaptation process to factors with global influence, such as the current climate emergency where areas severely hit by this environmental crisis may have barely contributed to trigger and fuel it as contributors (Patz JA, 2007, Reguero et al., 2015).

In Peru, neurological and psychiatric disorders make up the greatest proportion of the disease burden nationally (Ministerio de Salud del Perú, 2018a). At any one

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[5] The Human development Report defines participation in terms of people having constant "access to decision-making and power" and in terms of economic participation.

point in time 1 in 5 people will be experiencing some kind of those disorders, with a higher prevalence across those who have suffered economic impoverishment and political violence. According to epidemiological studies carried out across all regions in Peru (Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2007a, Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2005, Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2007b, Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2009, Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2003) , the annual prevalence of mental disorders is almost twice as high among those who cannot meet their basic needs. The Peruvian population (Flores et al., 2014), "due to the constant accumulated exposure to traumatic events, has a significant vulnerability to develop mental disorders related to natural disasters due to its location, its vulnerability to climatic events and its past and recent history of social conflicts and internal violence". Peru also has a high risk and vulnerability to natural disasters related to the *El Niño* phenomenon which affects the coastal region through increased rainfall, floods, and landslides. This consequently leads to physical, mental, material, and economic losses of the affected regions.

The northern coastal region has repeatedly experienced *El Niño* events in the past 40 years. Additionally, there is low implementation of infrastructural and educational preventive measures for flooding and environmental disasters by local and regional authority bodies, low compliance with protective measures for residents in high-risk areas and lack of preventive educative programs that are related to disaster response (Cueto et al., 2015, Cavledes, 1985, -PRISMA, 2011).

Finally, Tumbes residents, even without *El Niño* live amid structural challenges, corruption scandals involving their authorities, and social conflicts. The *El Niño* event of 2015-2016 and the subsequent *El Niño costero* (coastal *El Niño* event) of 2017 brought additional material losses, an increase in the prevalence of communicable diseases, displacement, food insecurity, and reportedly insufficient

aid or reconstruction efforts, all of which are likely to have effects at both individual and ecological levels (International Organization for Migration IOM, 2017, Chávez Cresta, 2018).

There is evidence on the links between environmental-related disasters and mental ill health (Sweileh, 2019), but most of the studies rely on quantitative measures. Qualitative exploration of this topic in a similar context is scarce (Bayer et al., 2014, Karlin et al., 2012), and the evidence base for the effects of repeated environmental stressors, specifically floods, on complex social systems in low-and-middle-income countries and how they may influence individual and community wellbeing is still only at an early stage of its development.

This study is one of the few to use a qualitative approach to explore the lived experiences of *El Niño* events, focusing on both residents and Tumbes authorities affected by the occurrence of the latest *El Niño* events. The study describes how these events and the later responses and support were perceived by the respondents from their point of view as local authority representatives and as residents from both highly affected and low affected areas. From the side of the authorities, we were interested to explore how the preparation, response and actions related to the *El Niño* events were undertaken by their institutions; how they perceived the *El Niño's* effects on the resident's mental health and wellbeing, how they viewed the residents' response to this event, and about the availability of support measures for the affected groups. From the residents', we wanted to explore their own life experience of dealing with the *El Niño's* related effects; any perceived impact of these events on their mental health and about the response and offered support by the institutions of Tumbes and by their fellow neighbours. Our aim was to identify the interrelated ways in which the occurrence of these events is perceived to psychosocially affect the communities in the context of a complex social system.

6.3 Methods

6.3.1 Setting

This study focussed on the adult population of Tumbes, a region (county) located on the north Peruvian coast. Tumbes covers 4,669.2 km^2, representing 0.36% of the Peruvian territory and is home to 243,362 residents (131,821 males and 111,541 females). It has a predominantly warm and semi-tropical climate. Tumbes is situated 1,271 kilometres to the north of the national capital, Lima, and 30 kilometres south of Ecuador. It is under the administration of the Regional Government of Tumbes, and divided in 3 provinces (Tumbes, Contralmirante Villar and Zarumilla).

This area has been historically affected by floods and heavy rains related to the *El Niño* southern oscillation phenomenon. Recently, it experienced a strong *El Niño* event, from December 2015 to April 2016, and afterwards an unexpected local phenomenon, labelled "*El Niño costero*" (*coastal El Niño*) from February to May 2017. During 2015 there were 1,100 acres of cultivated lands destroyed, and in 2016 a further 160 acres were destroyed. By August of 2017, *El Niño Costero* had destroyed 3,438 farming acres in Tumbes alone (Kuckzynski P.P, 2017).

Due to its level of impact in Peru, this event was classified as the third most severe *El Niño* phenomenon in the last hundred years (Sanabria et al., 2018). The regional and local response capacity collapsed due to facilities being affected by flooding, lack of medicines, supplies and shortage of health and administrative staff, requiring support at the national level. Emergencies were declared in fourteen out of twenty-five Peruvian regions. Nationally, this event affected 1.7 million people and 283,000 lost their homes nationally.

6.3.2 Study design

This study used a qualitative research approach. In-depth semi-structured interviews (IDIs) and focus group discussions (FGDs) were planned and conducted by the principal researcher (ECF) in Spanish. In order to be able to explore sensitive topics, avoid power imbalances and allow a more open and critical environment, individual interviews were conducted with representatives of local authorities in Tumbes region and with residents of both high and low affected areas. Focus group discussions, with the support of the senior researcher (NT), an experienced social scientist, were conducted only with residents of both high and low affected areas, to be able to obtain their shared life experiences and compare different perspectives of the same event.

6.3.3 Topic guides

Based on the research objectives and exploratory aims for each group of participants, I developed and tailored three topic guides in both English and Spanish for submission to UK and Peruvian ethics committees (one for the authorities' interviews, one for the residents' interviews and one for the residents' focus group discussions). The guides were independently reviewed by the staff of the Centre of Salud Global Tumbes (CSG-Tumbes) to ensure that the questions were clear and comprehensible to local participants. CSG operates locally in Tumbes, working on a range of health and research projects and are well-known across urban and sub-urban communities of Tumbes region.

For all participants, these guides covered four topics, related to recent *El Niño* events: life experiences and mental health impact, individual and community responses during or after *El Niño*, support systems in place in Tumbes and strengthening community engagement for resilience in Tumbes. Minor adjustments were made to the topic guide questions throughout data collection, as some subtopics for further exploration emerged during the interviews and focus

group discussions. The final topic guides that were used can be found in Appendices K, L and M.

6.3.4 Sites and participants

The people who were invited to participate in the study were adults (18+ years) who had been residing for at least 2 years in the districts of Tumbes categorized selected as highly affected and low affected by the level of heavy rains and floods related to the *El Niño* events of 2015-2016 and 2017.

Participants were recruited purposively by area of residence and work organization, to represent a range of experiences and perspectives and to be able to triangulate and compare findings.

The participants were divided into four groups:

a. Representatives of health and civil local authorities based in Tumbes city (urban).
b. Health and civil local authorities based in Tumbes region (peri-urban / rural).
c. Residents from highly affected localities.
d. Residents from low affected localities.

It was decided to include the last group because some of the residents of low affected areas work in high risk areas and this has an impact on their livelihoods, and because official reports *El Niño* damages may not accurately differentiate between the areas with little or no impact. Lastly, in previous *El Niño* events, aid and support from the authorities has been distributed in areas with lower impact, simply because they were closer or more accessible from the distribution sites.

The health and civil regional authorities and most representatives from all levels of Tumbes institutions were directly contacted face-to-face during April 2017, on the principal author's (ECF) first trip to Tumbes. In order to recruit interviewees,

residents, key informants (such as health promoters, local coordinators of social programs) and local authorities (such as governor lieutenants and mayors) were initially approached on our behalf by the research staff of CSG-Tumbes, who then contacted and recruited the study participants during May and June 2017 (on the 2nd trip of ECF and 1st trip of qualitative supervisor NT to Tumbes). The participants were adult residents from pre-selected localities who complied with the study selection criteria. The CSG-Tumbes research coordinators called participants directly on their cell phones or visited them at home, explained the purpose of the study, and invited them to attend a focus group discussion. Later, those participants who expressed opinions and ideas related to the topics of interest during the FGDs, or who were referred by key informants or other participants as persons who may have some relevant experience related to the study topics, were invited to participate in the IDIs.

The representatives' institutions covered the following areas: health and mental health, development, regional government, National Institute of Disaster and Civil Defence, education, agriculture, and district municipalities. These representatives were also sub-divided according to the scope of their position: those whose work had a regional reach and those working at a district or cluster level. Most of the authorities had previously met and briefly spoken with ECF in March 2017, during informal meetings held at the Regional Directorate of Health of Tumbes, in the Regional Government facilities and two cluster health offices, facilitated through ECF's colleagues and CSG-Tumbes staff. None of the residents had previously met ECF or NT, however, a group of them already knew and had previously collaborated with CSG-Tumbes research staff.

We chose to interview separately the local authorities and the residents, to ensure that we were able to hear both perspectives, especially on access to support, contextual needs and mental health views. Also, it was decided that authorities would only be invited to participate in individual interviews, to allow a more candid and open environment, as several representatives worked in similar sectors

and knew or had worked with each other. The IDIs were also used for the in-depth exploration of sensitive topics of invited participants, following approved thematic guides and the standard operating procedures for participant's distress (V.23Apr2017) created for the study (Appendix O). In both groups of participants, the terms "mental illness", "mental disorder" or "mental disease" were not used across any of the initial activities or topics of discussion from the side of the facilitator, who used the term mental health instead. This was done to avoid discussing any specific clinical condition unless the respondents mentioned it first or made any remarks containing those terms. It was agreed that the final sample sizes for both the interviews and focus groups would be when theoretical saturation was agreed to have been reached (Saunders et al., 2018, Sandelowski, 1995). This was decided during debrief discussions held by ECF and NT after each data collection activity.

6.3.5 Data collection

Data were collected via semi-structured IDIs and FGDs, conducted in Spanish by ECF between May and June of 2017, with the support of NT.

Each interview and focus group lasted 0.75-1.5 hours and was digitally audio recorded with participants' permission. All recordings were saved onto the password-protected computer of ECF and on the London School of Hygiene and Tropical Medicine (LSHTM) secure server, and later erased from the recording devices. The recordings were transcribed verbatim for analysis. ECF coded the data directly from the Spanish transcripts and translated the data into English to a tailored spreadsheet for the next stage of analysis, where all the identification details were removed.

All the interviews with authorities and residents were conducted in private, usually in participants' own offices or at their homes. For the FGDs, the venues provided by the local authorities were a community centre used for meetings, a large meeting room in a health centre and a large meeting room in a local municipality.

They were coordinated beforehand and scheduled with the local authorities' support. To add detail to their accounts, -especially during one of the focus groups, when the male participants were much more participative than the females, despite the facilitator efforts-, some residents were later invited for a personal interview to explore in more detail their perspective voiced during the group discussions. This allowed them to better comment on shared experiences expressed during the focus groups while also voicing their opinion, especially for the participants who counteracted the shared group narrative during this activity.

The participants did not receive monetary compensation for their travel time and related expenses; however, refreshments and snacks were offered. ECF conducted all interviews, and in the majority, she was accompanied by NT as silent observer. During FGDs, two or three of the CGS-Tumbes staff also attended the activity, as logistic support, and silent observers. All the team members stressed that the motivation for the study was to assess how their experience of *El Niño* events has been in Tumbes, to inform the public and academic circles. Participants stated that they clearly understood the main aims of the study and that the research team was not related to the Peruvian Ministry of Health or public health services.

ECF and NT took field notes on the context of the focus groups, detailing body language of participants and other non-verbal signs noted across the activities. ECF digitally recorded verbal notes after each interview with the same details. Notes were later reviewed and debriefed daily during the period of data collection and were re-reviewed during the analysis.

6.3.6 Ethics

The approved study information sheet and consent form for in-depth interviews and focus group discussions were provided to all the participants. An informed consent process was followed, and written consent was obtained from all participants, either by ECF or by trained research staff from the CSG-Tumbes.

Field staff read aloud from a script for better understanding and to prompt questions, explaining in detail the purpose and procedures of the study, emphasising that participation was voluntary and not linked in any way to receiving any aid or assistance, and that participants could withdraw at any time or choose not to answer some questions without any repercussions. The participants also received an information leaflet prepared by ECF, with current information on mental health and disasters and local advice on how to access mental health services and register themselves with the government-funded health insurance, Seguro Integral de Salud (SIS) (Appendix N)

To minimize the risk of a breach of confidential participation data, any identifying information (such as names and contact details) were recorded and stored separately. All participants were assigned a unique code to link their information to the data obtained in both the interviews and focus group discussions.

This qualitative study obtained ethical approval from the Institutional Review Board of Universidad Peruana Cayetano Heredia (UPCH, Lima, Peru) and the Observational Ethics Committee of the London School of Hygiene & Tropical Medicine. The Regional Direction of Health (DIRESA) of Tumbes also granted approval to undertake the study (Appendix C).

6.3.7 Analysis

For the data analysis process, we followed the thematic content approach (Braun and Clarke, 2006, Clarke and Braun, 2013) steps, which includes a thorough review and familiarization with the IDIs and FGDs data, open or free coding, a repetitive grouping and regrouping of codes while also refining categories for preliminary classification of descriptive topics, and finally allocating all the data into new adjusted categories. (Please refer to Appendix U of this document).

Two separate spreadsheets, one with the interviews data and one with the focus groups data were created, to be analysed separately after being translated in English. The anonymized transcripts of the interviews and focus groups were analysed by ECF with the close support of NT. This process sought to identify themes and relationships between themes in line with the study objectives.

After multiple readings, the initial set of codes was identified and transformed into an initial group of themes. Management of the coding process was carried out using the qualitative data analysis software NVivo [QSR International Pty Ltd. Version 11].

The resultant "codebook" grouped the codes into the following key categories:

a. Life experiences related to the *El Niño* event.

b. Relationships between *El Niño* and physical and mental health.

c. Personal and witnessed experiences of the responses of institutions and communities to *El Niño,* and,

d. Support or strategies to boost community ties and resilience in hardship contexts.

All FGDs data were analysed separately, comparing them with the coding, topic and themes identified during the IDIs analyses. Any additional ideas that surfaced in focus group discussions that were relevant to environmental risks and vulnerabilities and the relationship between mental health and community-based resilience strategies, were integrated into the coded interview data.

Participant age, gender, work location, residence (Tumbes urban area, Tumbes peri-urban/rural area), area (high affected, low affected area), occupation, position

(for authorities), and time at that position (for staff) were described. Data from individuals in authority positions were described and later compared by their institution's sector, their time in the said position or sector, and level of scope (regional vs. local reach), and contrasted with the residents' data, which was also compared between residents from high- and low- affected areas.

Data obtained from residents' and authorities' interviews and focus group discussions were coded and analysed in English.

6.4 Findings

Twenty-seven individual participants, fifteen from local authorities and twelve residents were interviewed. Twenty-four additional participants engaged in three focus group discussions, giving a total of 51 participants in the study.

Participant characteristics are presented in Table 6.1 and Table 6.2.

Table 6.1 Sociodemographic Characteristics of the sample – Interviews

Characteristics of Study Population - Interviews	N	%
Participants		
Local Authorities	15	55.6
Residents	12	44.4
Gender - Authorities		
Female	5	33.3
Male	10	66.7
Gender - Residents		
Female	9	75
Male	3	25
Age (years)[a] Authorities	47.8	SD ±10.46
Age (years)[a] Residents	60	SD ±17.07
Location – Authorities		
Urban Tumbes	10	66.7
Semi-Urban / Rural	5	33.3
Location – Residents		
High Affected Areas	7	58.3
Low Affected Areas	5	41.7
Position – Authorities		
Director / Head – Regional	4	26.7
Coordinator - Regional	5	33.3
Mayor – Locality	2	13.3
Head of Health division - District	3	20
Area Coordinator – Regional	1	6.7
Time in Position (Sector) – Authorities		
Months in the same role	26.8	(4-156) [b]
Months in the same sector	126.4	(6-432) [b]
Principal Occupation – Residents		
Homemaker	6	50
Homemaker and casual worker	2	16.7
Homemaker and shopkeeper	1	8.3
Farmer	2	16.7
Farmer and casual worker	1	8.3

[a] Mean. Otherwise N (%)

[b] Min-Max

Table 6.2 Sociodemographic Characteristics of the sample – Focus Group Discussions

Characteristics of Study Population - Focus Groups	N	%
Gender - Residents		
Female	19	79.2
Male	5	20.8
Age (years)[a] Residents	51.7	SD ±12.45
Location - Residents		
High Affected Areas	16	66.7
Low Affected Areas	8	33.3
Principal Occupation - Residents		
Homemaker	13	54.2
Homemaker and casual worker	3	12.5
Homemaker and shopkeeper	1	4.2
Farmer	5	20.8
Employee	2	8.3

[a] Mean. Otherwise N (%)

Across the IDIs, the sample of authorities was 66.7% male (n = 10), median age 47.8 years, while among the residents, 75% were females (n = 9) with a median age of 60 years old. Around 75% of residents (n = 26) were homemakers, and 10 of them worked as farmers. All the regional level authorities (n = 9) were men. At the local / district level, most of them were women.

The authorities interviewed represented many disciplines. The sample consisted of 2 counsellors, 1 clinical officer, 3 physicians, 2 midwifes, 2 educators, 3 engineers and 2 had other professions. The median time authorities had worked at their position was similar: 27 months at the regional level (range two months to 24 years) and 26 months in the district or cluster level (range two months to 26 years). Only 2 from the 15 authorities came from outside Tumbes region, as they were appointed from a national exam for public service and were relocated from Lima. Despite that, they both acknowledge to be familiar with the region, due to previous personal or family ties.

Participants' personal perceptions of the residents' multidimensional needs related to current and past *El Niño* events, their interrelations with the social context, and the support required to manage and overcome those problems, emerged as central themes. Among the authorities, their opinions highlighted the actions taken by their organizations as prevention and response measures to *El Niño* in benefit of the residents, their perceived responsibility for the main negative outcomes related to the event suffered by the affected residents, and their perceived chronicity of *El Niño* effects.

Eight subthemes emerged:

1. Personal historical memories related to *El Niño*.

2. Chronic and acute effects of *El Niño*.

3. Blame and responsibilities.

4. Coping and resilience.

5. Psychosocial distress.

6. Fairness in support or aid.

7. Corruption and distrust, and

8. The interconnected nature of individual and community problems.

Each of these will be discussed in turn below. Please refer to Appendix U, which includes a table and a thematic map showing the relationship between the broad study objectives, descriptive topics and subtopics identified during the descriptive

analysis and the 8 subthemes presented in the findings, which lead to the three interrelated pathways.

When quoting participants, the following identification codes are used: R (resident), A (authority), followed by gender, age, occupation (residents), regional or local scope (authority) sector (authority), effect of *El Niño* (residents) and location (urban, sub-urban or rural). Considering the number of villages and locations involved, we consider that anonymity of the participant's is ensured if we do not reveal the specific nature of the institution in this code. However, all the institution's representatives said that it would not be a problem to be quoted directly; this may be something to consider for the dissemination of the findings.

6.4.1 Personal historical memories related to *El Niño* events

Among the interviewees, two specific past *El Niño* events were clearly remembered: 1982-1983 and 1997-1998. These events were identified as *"mas fuertes y bravos"* ("stronger and rougher") than the most recent ones, and the main causes of devastating effects on Tumbes.

Almost all of the interviewees vividly recounted details they had witnessed that were related to those events. For example: road blockages and broken bridges, and increased river flow, resulting in reduced access to transport and leading to community isolation. One of the main concerns related was the lack of work, as the farms were destroyed by river flooding, and the consequent lack of food for themselves and their families.

The residents clearly thought of this as a period of suffering for the whole family, directly related to this lack of means and resources, and highlighted the little support received from the authorities. For example, this quote from a resident living in a highly affected area:

165

"I have already suffered two disasters…the ′83…it was "mas bravo" (rougher) than this one…rougher, doctor. Look, doctor, I was younger, right? I went to work in Tumbes because there was no work here, there was nothing, no work, no banana (a local key crop), the river left nothing, the disaster left us (with) nothing (…) That's how it was, like that we spent almost all 6 months of rain … They were stronger than (the ones happening) now…6 months, and there almost the president did not help us much, he helped us, but little, little …We suffered, we did not have (anything) to eat, my children were kids, well, I had to go out and look out for them…".

(R) Male, 88 years old. Farmer, highly affected, semi-urban area

Most of the interviewees also shared personal memories of witnessing and directly experiencing the effects of past *El Niño* events. They considered these events as unforgettable ones, describing traumatic memories lasting until the present, triggered by day-to-day activities, such as the sight of the river. An example is the personal account of one of the authorities who lived through the event of 1983 as a small child. He highlights that, -although almost 40 years have passed -since that event, he still remembers this experience, with lasting flashbacks until the present day. He also believes that children would have a much more traumatic experience from living through such events than adults, because of a lack of control over events and their greater vulnerability.

"..I will say an example of when I was a child, at the time of the '83 (El Niño)…the Tumbes river…took a bridge in Corrales…we were in boats, and …I was a child then, and I was traumatized… yes, that is, they carried me in (their) arms… and for me there has been a long effect, because I always remember it....until now I remember it…(…) I know that El Niño is more of a trauma to a child than to an older person....my parents took my other sister and

166

they gave me to a "pasador", that is, a person who was helping people to cross (the river)...well, me and my mother ... we were hand in hand, but I felt fear, fear that the water could take me away ... In my mind it was...that I had drowned, right?... (...) always, when I now see the river, I remember it. The images come back again, as if it were (from) yesterday.

(A), Male, 45 years old. Regional Level. Economic Development , urban area.

6.4.2 Chronic and acute effects of El Niño

Another point that arose from the interviews was whether the current impact of *El Niño* could be classified as acute or chronic, as most of the adult population at Tumbes may have periodically experienced heavy rains and past *El Niño* disasters. Most of the authorities perceived that the impact of *El Niño* was long-standing and chronic for the population, something that was "traditional" for the area and that the population was accustomed to these *El Niño* events and their effects. For example, these authorities' quotes:

"Let's understand, then, that it is not a "now" problem, it is an "always" problem".

(A) Male, 43 years old. Regional Level. Mental health Sector. Urban area

"Well, look, I'll be honest, we as Tumbes, department of Tumbes, we are already accustomed to this type of event...that is, in this past year, right? with the phenomenon of El Niño Costero...for us it's something like a tradition...always at the end of the year the rains begin in Tumbes and then go away after 3, 4 months...".

(A), Male, 45 years old. Regional Level. Economic Development. Urban area.

Another of the authorities considered that the affected communities, especially those living in villages that experience isolation due to the river floods, may see these events as usual or "normal".

> *"...they (In Casitas district) have a stream that blocks them, and no car, no truck, nothing, can pass...then they stay 10, 15 days without food, without anything, right? That is normal for them ..."*
> (A) Male, 55 years old. Regional Level. Disasters Sector. Urban area

Most of the interviewed authorities highlighted the recurrent and chronic nature of *El Niño* phenomena in this area, and said that, in their opinion, current *El Niño* events should not have caused significant disruption. Most of the authorities' opinions seemed to be indifferent or appeared that they had normalized the population's suffering, becoming desensitized. Most of these opinions seemed to be minimizing the residents' experiences.

> *"The situation of the past phenomena, of '83, '97, right? Of '98, of those years...it did have a connotation of extreme concern for the population...now, we have seen people that have continued making their normal life, right?"*.
> (A) Male, 50 years old. Regional Level. Head of health sector, urban area.

These perceptions amongst the authorities differed in relationship to the following attributes : 1. If their work location was in a highly affected peri-urban area (instead of a Tumbes urban area); 2. If the scope of their work was at regional level (instead of at a district or local level) and, 3. If they had directly witnessed the impacts of *El Niño* (especially in the rural area and countryside).

In the last case, the authorities acknowledged the effects of the current events have been strong and acute for the population. They also recognized that these effects were much worse for specific vulnerable groups of the population, such as subsistence farmers, elderly people, children, those with little or no income, and those with a previous diagnosis of a mental disorder or other chronic condition or disability. For example, the quotes from these authorities:

> "...We established an air bridge[6]...when the humanitarian aid arrived at our region, with the Hercules plane flights of the Peruvian air force, of Chile, of Brazil and of Argentina, we sent back our agricultural products...in order to alleviate a little the difficult situation that the farmers had. But that lasted for only 15 days...then the air bridge (Reis, 2018) was cut and again...until the Pan-American highway was reopened, which lasted more than a month ... the effects that El Niño has generated in our region Tumbes, in the agrarian sector have been tremendously strong ...".
>
> (A) Male, 47 years old. Regional Level. Agriculture sector. Urban Area

> "I believe that for people who have not had [previous El Niño events] experience, like our children...for them this could have been like something even traumatic...(...) the elderly...some live alone, or sometimes their family is not around to help them, to support them. I understand that the ... this ... the elderly people could also somehow have suffered that type of trauma, right?".
>
> (A), Male, 45 years old. Regional Level - Economic Development Regional Government, urban area.

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[6] An airbridge is the route and means of delivering material from one place to another by an airlift.

Local mental health professionals perceived an increase in the prevalence of common mental disorders cases and in help-seeking attitudes. As this specialized mental health practitioner described:

"There were increased cases of anxiety disorder, of depression... people who, for example, are engaged in agriculture and the river overflowed and took their crops…and now they have the debt in the bank… how I'm going to pay, I cannot sleep, doctor, I think the bank is going to seize my property, and now what am I going to do….and the patients with a chronic treatment, for example patients with schizophrenia, patients with bipolarity…right?
(A) Female, 33 years old. Regional Level – Health Sector - Psychiatry. Urban area.

Among the residents, there were identified specific groups with worst outcomes in relationship with *El Niño* losses and distress. For example, farmers who had losses of crops and animals, and also, those with family members requiring additional care in the capital city, and were unable to travel.

"Well, the farmers, the loss of their farms … sometimes the ranchers also...their animals died there ..."
(R), Female, 28 years old. Resident of a low affected community. Semi-urban area

"It affected us all because… no, well, someone who has children, right?... with a disability, someone that takes him (the child) to Lima…we cannot take them anymore ..."
(R), Female, 55 years old. Resident of highly- affected community. Semi-urban area

An authority of a highly affected district mentioned that a main characteristic of the latest event was that it was "unexpected" and with "unimagined consequences". Those consequences happened, they said, despite having an alarm (warning) the year before and despite government-scheduled preventive work and funded action plans. The latest event overcame these measures. Some of these authorities mentioned that having a milder-than-expected 2015-2016 *El Niño* phenomenon gave the population a false sense of security, so when the violent effects of the 2017 coastal *El Niño* event happened, both the population and authorities were caught off-guard and unprotected. For example, this health authority quotes:

> *"...this coastal El Niño, we really did not expect it…until last year and on the previous one, there was a warning about rain levels. There was money at the national level for prevention... Then, we saw that prevention work was executed…and we waited for the rains, and they did not arrive. I mean, then, the population said, well it was a good thing that (they) have not happened as we were expecting, but also were a little confident because the prevention works had been carried out. This year, eh, no one announced… or anyone at the national level let us know that this coastal El Niño was going to happen. No, no, no ... we did not imagine the magnitude of the coastal El Niño...we did not imagine...and, the consequences have been serious, right? I am getting older, I have lived through previous (El Niño) phenomena, but this one has been strong ...".*
> (A) Female, 46 years old, Local level. Head of Primary care centres. Highly affected, semi urban area.

Interestingly, none of the interviewees related the unexpectedness of this local event to global climate change. Only one civil authority referred to the fact that

usual and recurrent events were no longer within the "normally" expected areas, as "natural events were spreading" and he perceived those changes over time.

> *"Today the scope of natural events has already spread so much that it is no longer limited to places that are normally affected…that is, every time the effects of El Niño spread more than (where) it normally does, right?".*
> (A) Male, 48 years old, Local Level. District mayor. High affected. Semi-urban area.

For some authorities, such as those in the health sector, the arrival of *El Niño* magnified some chronic issues. These were related to underfunding and resource management in Tumbes, the lack of trained staff, supplies, and basic medicines for patients. These long-term issues coupled with the heavy rains and flooding during *El Niño* worsened the difficult context endured by the population and health professionals. For example, this quote:

> *"The issue of the [lack of] human resources…which is not from this phenomenon, but is widespread in the entire region, I believe. We have a lack of human resources in all of health establishments...(…) Another problem that we had during El Niño was the provision of medicines, we were ... we did not have stocks across all health facilities...we lacked basic medicines, such as amoxicillin, paracetamol, naproxen ...".*
> (A) Male, 42 years old. Local Level - Head of primary care health centres. Moderately affected area, semi urban.

From the point of view of the affected residents, there was a clear narrative of suffering associated with feelings of helplessness and lack of aid. Even amongst residents living in an area officially classified as "low-affected", they still reported being worried, witnessing losses of specific groups, and an overall lack of faith in

172

authorities, due to their perceived inaction. They reported a sense of abandonment, of not having anyone to turn to for support and, of being continuously let down by their authorities. For example, these residents from highly affected and low affected communities, quotes:

"In this sense…of the phenomenon of El Niño I have suffered a lot…because…in the sense that I have no support from any authority"…(...)… [the authorities should] support more, then, [to] the people who really need a job, who need help …".
(R), Female, 62 years old. Resident of highly affected community. Semi-urban area.

"I have been worried, yes, because there has been not help...they said that they were going to send...I do not know how many, thousands [of soles[7]] that were going to be sent… for the farmers, but nothing was received...".
(R), Female, 63 years old. Resident of a low-affected community. Semi-urban area.

"Yes, the landslides have been very strong here... and have even damaged several..., several houses and also the crops, the farms of the farmers too … Oh, the farmers have lost a lot, until now they [the authorities] have not given them help".
 (R), Female, 56 years old. Resident of a low-affected community. Semi-urban area.

"No, that is, we do not have that help… that farmers really should have...even now…In other words, we do not have anyone

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to turn to …you do not feel that you have someone [who helps]
…No, we do not have any support, from anyone".
(R), Male, 62 years old. Resident of Highly affected community.
Semi-urban area.

6.4.3 Blame and responsibility

Another common topic among the authorities was to mention a person or an institution who should be responsible for *El Niño* outcomes, usually highlighting a direct action or a lack of it, leading to negative consequences.

Their responses again differed, directing the blame to separate actors, depending on the participant's role and responsibility level. If the interviewees worked at the regional level, most of them would mention underfunding of proposed programs and plans, or specific actions that were needed but were not carried out by the national government. A few of them mentioned that authorities at local level were also to blame, as they failed to implement the programs and prevention measures "despite having the funds and resources". Specifically, local mayors were described by both regional authorities and residents as not doing what they should, for example not carrying out prevention activities, failing to enforce governmental programs, and disaster planning work, and not working jointly with other sectors to avoid duplication efforts, focusing instead on being recognized for political and economic purposes. And from the point of view of local mayors and other local authorities, the blame was directed toward two fronts: the regional and national level authorities, who were both deemed responsible for chronic underfunding, long administrative processes and lack of support for the local problems. Finally, the affected residents were also deemed responsible, for various reasons related to poor decisions on where to live, and failure to take preventive actions. For example, some of the authorities' quotes:

"The coordinated work within the authorities is not very good, it is not, eh ... For example, between the Municipality with the regional government, as there is no coordinated work then each one does its activities on a different scale...in parallel and sometimes they duplicate efforts...they want to lead, to show off ... then that is a problem for the community work".

(A) Male, 42 years old. Local level. Health sector. Moderately affected, semi urban area.

"The municipalities must somehow coordinate more closely with each other, with the other [administrative] divisions ...[instead] what happens is that each one walks alone, so sometimes the efforts are duplicated...and that there is not enough care in the execution of resources, basically ..."

(A) Male, 45 years old. Regional Level. Social Development sector. urban area.

Most of the authorities, in some way, blamed the local population for "choosing" to live in high-risk areas, despite also acknowledging that, some of these groups they were able to settle there with the local authorities' permission (which may also be encouraged due to political reasons). And, that the affected residents may not have in the end a real choice about where they can live or move, due to economic reasons, lack of connections or resources.

"The [river] streams here were clean because they were prepared for the year before the past one [El Niño 2015-2016]...then up to a certain point [we were ready]..but what happens is, that there are people who are irresponsible and go to live inside the ravines and install their houses in the ravines.

And…the local authorities are sometimes to blame...why...because, I mean, they, to win their votes, authorize that".

(A) Male, 55 years old. Regional level. Disasters sector. Urban area.

"…unfortunately, a part of the population is somewhat challenging, incomprehensible…that is one of the important aspects that must also be recognized in this crisis... I need to live [settle]… but I cannot go and live in a stream… and, if the flood comes to the stream, I blame the mayor or the authorities, because they have not come to clean up the mess…and they cannot, they cannot, do that…to live in a ravine is illegal …"

(A) Male, 48 years old. Local level. District mayor. Highly affected, semi-urban area.

Authorities frequently placed the blame for *El Niño*-related losses on the residents, for making poor decisions, such as in their construction materials and choice of locations to build their houses They also considered that it was hard to discuss or implement prevention measures when the houses are already built in high-risk zones by the residents. Another "mistake" made [by the farmers] was to return and cultivate their crops in the same area that has been flooded. For example, this authority quotes:

"...the population knew that where they have been building their houses were dry riverbeds...then those [house]) have been taken, [the river]) has destroyed them...because they [were built] with materials of the region, which are cane, quincha and adobe"...(…)… the question is: how can you get all that [prevention] information when you are already located in a house of 120 square meters [built] already with solid materials, maybe

176

even with a second floor, knowing that it is in a place of risk…. We are now in a community that it is agricultural...the river has already taken [it], it returned, reduced its water level again, and there we are again cultivating ...another mistake..."
(A) Male, 43 years old. Regional level. Mental health sector, urban area.

Despite this, one authority acknowledged that there is no readily available information for people to confirm if the area where they intend to live is safe. Population growth in the area was also considered a contributing factor, as more people will be searching for areas to settle in, and that are potentially insecure upon a disaster. For example, this authority quotes:

"...the population continues to grow, and there is a [group of] population that is always settled in the dry beds of river streams...they are closer...they think that as the rains did not affect them in the past [it will then not happen]...But that is not the power of nature...there are [El Niño] phenomena with so much intensity that devastate you even in the most [farthest] sectors ... you think that the water will never rise and it reaches them ... right now, mostly due to that...because our population grows and we do not have a ... how do you call it, a map sketch where you [know where you] can establish your home [safely] ...right now they [the people] want, they go and place themselves there. And they cannot ... they cannot make their homes there.... it is not how it should be..."
 (A) Male, 47 years old. Regional level. Agriculture sector. Urban Area.

6.4.4 Coping and resilience

There has not been a common narrative mentioning or reporting resilience and coping means at community level, or sources that provide coordinated or organized support. At personal level, the interviewees mentioned religious or spiritual reasons as one source to achieve resilience, to be able to keep going with their day-to-day activities.

Most of Tumbes population self-report as Catholic, and some of the authorities' representatives consider that the church and their local priests continue to have a strong influence in the communities. They also consider that through the volunteer groups and internal organizations they can keep themselves connected. For example, these authorities' quotes:

> *"The church is a fundamental sector because it has a very large influence on our society"*
> (A) Female, 47 years old. Regional Level. Education in Health promotion sector. Urban area.

> *"...I have been able to observe, right? In the church there are sometimes voluntary groups, that are joined in a spiritual way... that are well organized, and sometimes go to some towns (to help)"*
> (A) Female, 45 years old. Regional level. Education sector. Urban Area.

Despite these affirmations, most of the participants across both highly affected and low affected areas, mentioned that they had not received any "tangible support" from the church as an institution. Rather, that they rely on their own faith in God, as a "catholic custom". For example, these responses from residents participating in a focus group discussion in a highly affected area:

E: A very upfront question, have you ever received support from
the church? How? In what way?

*"No", "Nothing", "No", "No", "You simply rely on your faith,
well, don't you? Your belief in God ...", "It is a custom already, to
have faith in God", "Well, as Catholics, right?", "Nothing,
doctor"*

A resident mentioned that the absence from their fellow community members at the local monthly mass was associated with a lack of community "unity", implying that if the community attended mass, they would be united. However, it has not been mentioned that there was a joint force or organized action coming from the church aimed to bring the communities together. For example, this resident quote:

*"...No, people are not united here… people are not united ... I
tell you, the locality is not united because… here, they do a
monthly mass... the people do not go…and if they go, they are 4
cats and nothing more…(it would be) weird if they are a group
of maximum 12, 15 people from town who go to church and listen
to the word of God…from the rest no one…they shine with their
absence ..."*
(R), Female, 63 years old. Resident of low affected community.
Semi-urban area.

Interestingly, most references to "the church" referred directly to the Catholic church, which is the leading church and religion reported across Peru. According to the latest 2017 national census (Instituto Nacional de Estadística e Informática, 2018b) in Tumbes, the self-reported Catholics were 78.4%. Those practising in Evangelical churches were 14.8% and 3.1% had other religions. Of those censed, 3.7% did not follow any religion. Despite this, only few of the interviewees

referred to other churches, and not in a positive way, but without providing further details. For example, an authority at regional level mentioned that the other "few religions" would aim to take advantage of the population but did not specify on what extent or how. Also, other health authority highlighted that the evangelic churches have been seen increasing its numbers, especially in the rural sectors, which were historically forgotten. Other authority emphasized that the churches from different religious communities do not work coordinating with each other. For example, these authorities' quotes:

> *"Yes, yes, they [the population] continue going [to the Catholic church], and although there are quite a few religions that come out at the moment, that sometimes take advantage of the population, but ... they always meet and do ..."*

> E: Like which ...?

> *"Let me see, Adventists ... there are different religions that are… right? Right now [post-El Niño], they come out like this and come together to be able to ... well, for me we are all, what is the word… children of God, and we always have to do things well, right, no?*
> (A), Male, 42 years old. Regional level. Economic development sector. Urban Area

> *"Yes...more the evangelicals [churches]...have increased its numbers considerably...even in rural areas, that used to be almost… [null]...".*
> (A), Male, 42 years old. Local level. Health sector. Moderately affected. Semi-urban area.

"The churches ... leaving aside the creed, the Mormons, the evangelicals, the Catholics, they are all a Christian community...but they are not united".

(A), Male, 65 years old. Regional level. Staff of the Regional health office. Urban Area.

There was a pervasive sense among the residents that people can just barely attend to their own personal needs. They would be mostly reporting that they do not receive help from others, or from the authorities, who normalize their requests and belittle them. Instead of helping each other in this disaster context they have to prioritize looking after themselves, with their own faith, or with their own resources. For example, these residents from highly affected and low affected communities' quotes:

"I tell you like this...I have no support, from nobody, from nobody, only from God who gives me the health and the strength to be able to walk and work".

(R), Female, 62 years old. Resident of highly affected community. Semi-urban area.

"Also, poor people, it is sad to see them crying, that sometimes, sometimes mothers sometimes do not even have a little food… Me, at least I go and wash...when I do not have…I go and wash other people's clothes and then I have (money)…".

(R), Female, 75 years old. Resident of a low affected community. Semi-urban area.

"Sometimes, you know what? The difficulty is that the authorities do not care for us, doctor…sometimes they say no, they say "that group is protesting for this, for that…for

other"...they don't listen to us, doctor, right ... So that' is the problem".

(R), Male, 86 years old. Resident of highly affected community. Semi-urban area.

Despite this, few participants highlighted specific examples of help that they received from their neighbours, especially in the critical moments of the emergency and the floods, mentioning that they were fortunate that their neighbours were generous and helped them. But overall the study, these seemed to be fortunate exceptions instead of the general experience. For example, these residents from highly affected area quotes:

"...him [my husband] suffers from generalized osteoarthritis, so he has mostly not moved from where we have been lodged...since he cannot move, he cannot do anything, so it has been mostly me who has done everything and I have to ask the neighbours... please help me to carry this, because I cannot do it alone...if I could, I would carry it alone...but we got the help of the neighbours ...yes...very loving neighbours, they did help us ...".

*(*R), Female, 63 years old. Resident of highly affected community. Semi-urban area.

"I had nowhere to go [after El Niño], nothing, well ...and luckily, a neighbour who travelled to Lima lent me where to live...[but now] she has called, and told me she will be back at the end of the month, and I am really desperate...well, where will we go ..." (...) "...We do not have light [electricity], we do not have [running] water, because the house is not ours, well, and they do not live here...[when the owner returns] she was going to come and fix it....we use candles, for the light...and the

water they give us [in buckets]...thank God, because the neighbour that I have, she is the helpful type...but light...sometimes, she says, I cannot give you because my husband is like that and so and so..."

(R), Female, 48 years old. Resident of highly affected community. Semi-urban area.

6.4.5 Psychosocial distress

The effect that *El Niño* may have on mental health was at first minimized across participants, and it was only in later responses that people considered or mentioned that specific groups, as children or elders, having been affected.
 Some of the authorities mentioned that traumatic effects could be expected among people with no previous experience of *El Niño* events (such as children or elderly with no family support). For example, this authority's quote:

> *"I believe that for people who have not had previous experience like our children, who have not had a notion of what has been happening, for them it has been like something...could be even traumatic...It could also have been to the elderly...we understand that some (of them) live alone, or that sometimes their family is not around to help them, to support them. I understand that the ... the ... this ... the elderly people have somehow also been able to suffer that type of trauma, right?"*.
> (A) Male, 45 years old. Regional level. Social Development sector. Urban area.

One of the authorities who worked in the psychiatry sector gave an overview of the mental disorders that have been seen among some vulnerable groups: those with severe economic losses, patients with a previous diagnosis of a mental condition, those who are on chronic treatment for a mental disorder, and children.

183

"…here what we saw were anxiety disorders… there have even been patients who have arrived with a diagnosis of depression because they have lost their investment, they have lost their land, they have lost their animals, so for them this was very important …second, it would be the patients who have chronic treatments, for example, patients with schizophrenia, patients with bipolarity, who need treatment, continuously, and they could not access to it, right?...and another, I think the child population also, as they see so much concern from their parents, neighbours…everyone commenting of how bad they were doing, that …in children we also saw that, the mothers came saying they do not want to be left alone …"

(A) Female, 33 years old. Regional level. Psychiatry sector. Urban area.

The role of the local media coverage was also pinpointed as one factor that may have contributed to a "sense of anguish" among the population of Tumbes. The effects seen in other neighbouring regions were permanently featured in both newspaper and local TV channels, and the viewers were waiting to see what may happen in their own region with the news announcing that rains with more intensity were due to occur in the immediate future. This, jointly with the rains and storms, would also add to the population feeling distressed and unsafe. For example, these authorities' quotes:

"What has happened this year was something totally different…well, there came the news of Chiclayo [Region], Piura [Region], with the [news of the] river overflow. Then, logically, here we were waiting, with a sense of anguish…even more so with the news repeating that rains of greater intensity were coming, right?".

(A) Male, 45 years old. Regional Level. Social Development sector. Urban area.

"…what happened here was, they [the media] said, that the river is going to overflow, the river is going to overflow…and everything, everything was an anguish…I mean …it was a distress, and in reality, it was not something that was going happen… they said that… Do you understand me? …a psychologist, a psychiatrist should advise on the [TV] programs…to see how you can control the "psychosocial" [fictitious news], right? Because a lot of misinformation also increases the sense of anguish …"

(A) Female, 33 years old. Regional Level. Psychiatry sector. Urban area.

Most health providers, especially those working directly in the affected areas, recognized the somatic symptoms that the residents brought. They referred them to psychological care despite admitting that these professionals were scarce, overloaded, and would not be able to care for all the patients that required help. For example, this health authority' quote:

"There were many people who only had a headache as symptom…but when asking more… it was logical that there was an anxiety disorder, distress…(…) doctor look, I lost my chickens, I lost my cows, I lost …And then, of course, at the time of questioning them, it was obvious that they were going to need psychological support ….then, we had to intervene, so we immediately referred them to psychology…and in the end (of the health campaign) the psychologist was the last one to finish, because the patients came, continuously…"

(A) Female, 35 years old. Local level. Head of cluster of primary care centres. Highly affected - semi urban area.

During the interviews and focus groups, the residents referred to having physical health needs and deeply unfulfilled priorities related to health and sanitation at both the individual and at community levels, explaining that themselves or their family members could not easily get health attention for chronic or acute diseases.. Nevertheless, some structural barriers to healthcare by the interviewees included: having to travel long distances from health centres to their homes, long waiting times to get an appointment, absence of health professionals on duty during afternoons, evenings, or weekends. Other barriers were attitudinal, for example, the perception that health professionals in Tumbes were not well trained or lacked specialized equipment to treat them. For instance, this resident of a highly affected area, quote:

> *"Maybe if I could, if I could I would ask that there are better doctors here ...doctors that can treat different diseases ...(...) because due to my illness, I have to go to Tumbes [urban], and ... queue from ... 5am, 4 in the morning, to be able to get an appointment..."*
> (R), Female, 63 years old. Resident of highly affected community. Semi-urban area.

The residents would frequently conceptualise their source of their distress, worries or "nerves" as related to specific challenges or hardships, not in terms of a disorder or illness, and these symptoms were seen like a frequent response to the associated lack of work, earnings or poverty. Overall, there was also a lack of perceived need to seek for mental health services for themselves, despite of having lived crude and difficult circumstances. Nevertheless, some participants expressed their desire that other family members get support or treatment.

The effects of the *El Niño* on mental health were closely related to the scarcity, losses, and rupture of livelihoods. This has been reported especially across vulnerable groups, as children and elderly. For example, one of the residents of a highly affected community, explained how her husband and teenage daughter

expressed their feelings of being overwhelmed with the economic hardships related to the disaster context, and that she expected that with psychological support this can be ameliorated.

> *"My husband was depressed, anguished ...Yes, yes, a lot, uufff, to this day, to this day ...The desperation of [not having] your work (...) he [my husband] himself cries and says "but I am a man"..., but I mean, for my children, he says...I have 3 children (...) yes...very difficult, he despairs..(...) and I say, daughter, all [of] that will be solved with the name of the Lord, I say; oh, mommy, she says to me...sometimes I cannot continue anymore...that is, they are damaged, right?, that is...a psychologist would help them reflect that things pass...everything will pass"...*
> (A) Female, 49 years old. Resident of High affected community. Semi-urban area

Associated factors to the scarce seeking of mental health support for themselves can be related to sociocultural barriers, stigma, myths and prejudice surrounding mental disorders, including low level of mental health literacy (Arriola-Vigo et al., 2019, Jorm et al., 1997) , lack of resources to pay for therapy and out-of-pocket expenditures and also distrust in the ability of physicians and mental health staff to be able to help them. This would be aligned with the results reported across Peru by the National Institute of Mental Health Honorio Delgado, where 59-68% of participants across different epidemiological surveys reported that the main reason for not seeking mental health support was the idea that they should be able to solve the issue by him or herself (Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2013, Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2007a, Instituto Nacional de Salud Mental "Honorio Delgado-Hideyo Noguchi", 2002). In comparison with health services, the residents did not mention mental health services as a main factor lacking in their

communities, but a few of them highlighted the need of having access to competent "psychologists" who would bring a difference.

The importance of having "mental health" was deemed essential. For example, a resident from a highly affected community was a single mother, survivor of domestic violence and had two daughters with disabilities. She attributed to the "stress" or "nervios" experienced throughout unrelenting domestic violence the impaired development of her daughters.

> *"[mental health]...it is the most, it is the most, this… the most essential...and how deeply…I can tell you what I am going through...perhaps… I wish it to no woman ...to any woman, I wish this burden that I have ...my problem has been because the father [of my daughters] beat me a lot when I was pregnant, a lot ... he beat me a lot, he left me locked in the house ... and that's the reason ... the doctor told me that due to the many nerves [stress] that I had, that I cried a lot...they [my daughters] did not develop their brain properly..."*
>
> (R), Female, 63 years old. Resident of highly affected community. Semi-urban area.

6.4.6 Fairness in support or aid

A common complaint of the affected residents was that there had been an unequal distribution of aid upon the occurrence of *El Niño*. They highlighted that some communities or areas received support and others did not. Interviewees mentioned several contributing factors, for example, that some areas were farther or harder to reach by the aid staff.

> *"...here in the health centre there has been a lot, a lot of (aid) personnel that have not been able to get to where I live...maybe they have reached, as far as where there are paved roads, to*

avoid getting dirty with mud, but they have not reached the far back"

(R), Female, 62 years old. Resident of highly affected community. Semi-urban area.

Following this topic, related to disorganization and uneven distribution and works, a common complaint was that the "authorities do not know how to do their work". One of the regional authorities questioned the criteria of the local authorities' plans and execution of works. He implied that some of them lack the preparation, training or background that would allow them to plan and follow adequately the projects related to disaster prevention and reconstruction.

"...There are others that don't...so, their criteria are not very good, right? I mean, if they were professionals, all the mayors would be excellent, because their projects would be good, or (at least) regular, would not? They (the projects) could be corrected, but there are some (local mayors) that are not, they do not have culture (education), right? to be able to do something good ...in this case, I depend on the mayors...".

(A) Male, 55 years old. Regional Level. Disasters Sector. Urban area.

6.4.7 Corruption and Distrust

One common topic that was mentioned across the interviews was the widespread corruption and the distrust that the population felt, related to the unequal distribution of aid. Most of the authorities acknowledged that this was often mentioned by the general population as well as in the media, and that the corruption cases are widespread. The authorities were also perceived to decide based on personal factors or political convenience which of the affected

neighbourhoods would receive aid. For example, the quotes of a resident from a highly affected area and a health authority:

"...Sometimes the mayor does not want to send motor pumps...he sends (motor pumps) where he wants...as the people say, where he has influence ... "
(R) Female, 49 years old. Resident of highly affected community. Semi-urban area.

"I do not say that it is so, but sometimes people express themselves that way, right? Like...the municipality takes away (steals) the maintenance budget..."
(A) Female, 33 years old. Regional level- Psychiatry Sector. Urban area.

A few of the authorities linked the widespread existence of corruption in Peru to "degeneration" of the human person and felt that the loss of moral values will then wear down social ties and have a pernicious effect on morale in the community. For example, this civil authority quote:

"There have definitely been a series of situations...that we see in the newspapers, and we are already exhausted, we live as there is a serious issue, corruption in the country, it is a sad matter to know how it is degenerating the value of the human being...there is no respect, tolerance, there is no understanding, and then the limits are overcome..."
(A) Female, 47 years old. Regional level.- Education in Health promotion sector. Urban area.

Among the residents, they all agreed that widespread corruption exists in the region and there are many unfulfilled promises made by the authorities, as they

190

have not completed specific construction works for the communities that were offered and are still needed. For example, the quotes of residents from highly affected areas:

"A bad relationship [between the community and the authorities]... bad...when the mayor arrives, sometimes my neighbours, all the people from around here get together and sometimes kick him out...because they cheat on us a lot...yes, they have cheated us a lot, and ... they have tricked us...with [not building] a path for the children to go to school, and many have deceived us...that they were going to give us, even an unpaved road, so that the motorcycles could come out...something...no, it has been a lot, I do not know how many years have been already…".
(R) Female, 49 years old. Resident of highly affected community. Semi-urban area.

Some of the residents claimed to have had witnessed acts of abuse and stealing among workers of local institutions in the context of post-disaster aid distribution.

"...the authorities of Tumbes are not good ...there is not a good relationship (with the people) they all hate them..."...(...) so I say this to you, because I have seen it….there are people who are workers (for local authorities) and sometimes they take out for them 10 or 12 corrugated sheets..."
(R), Female, 62 years old. Resident of High affected community. Semi-urban area.

Regarding some tangible works, some residents highlighted that the authorities, have not done any real infrastructure and preventive works. Instead they have used the allocated budget money to build or repair infrastructure that later cannot be

used, or that quickly deteriorates due to poor quality or manufacture. This purchase or contract will later be used to justify the money that was spent, without adding much to the community's infrastructure. And, many times will reflect corruption practices, as the purchase or repair will be registered in the annual budget with a huge over cost compared to the original budget and favouring a third party. For example, this resident from a highly affected area quote:

> *"...they (the authorities) do some work that is useless ... They do just to cover up there ... so many millions have already been spent, and now there is no money ..."*
> (R), Female, 32 years old. Resident of High affected community. Semi-urban area.

6.4.8 Interconnected nature of individual and community problems.

Some of the authorities acknowledged that there are multiple reasons behind the problems faced by the population at high risk of disasters, and the economic factor is a main one. For example, *El Niño* will not only damage houses and result in loss of work, among farmers it will also increase the debt they are already in, and it will push them to stay in the high-risk areas instead of evacuating, bringing even more vulnerability to their situation. For example, these health and civil authority's quotes:

> *"...what happens is that there is another problem...and the problem is that there are the "famous" loans [due to extended marketing campaigns] to the municipal savings banks...to the bank institutions that do not allow that person to evacuate...they do not evacuate ...because you have to pay the loan...and there it*

192

is the limitation...it is not only one factor, there are many factors....".

(A) Male, 43 years old. Regional level. Mental health sector. Urban area.

"Here is a sector in La Canela, El Chivato and Pueblo Nuevo, which is the lower part that we have here, where the river always overflows, that, those areas are rice fields...several of the farmers have not sown (their crops), they have not sown (them) yet ... They had debt, they have not been able to cover it, the financial entities have not refinanced their loans, obviously, no? And as a result, they have lost their crops, right? And many of them have not sown... there are approximately 800 hectares that have not been sown in this season. And several of them, then, have changed their occupation or simply, therefore, are looking for something, for work".

(A) Male, 47 years old. Regional Level. Agriculture sector. Urban Area.

Finally, other actors deemed responsible for Tumbes' problems of distrust and unsafety without a direct relationship to the *El Niño* event were also mentioned across residents of highly affected areas. For example: internal immigrants disguised as farmers and thieves disguised as health workers, and their relationship with the rising crime rate, which it is felt may be breaking down community bonds and leading to division among residents. For example, these health and civil authorities quotes:

"...the crime rate has increased ...Immigration...the native people of Tumbes may be 50% right now ...a lot of migration from other places, from other places..."..."There was an enormous migration, from the area of mountains of Piura, from Cajamarca,

from over there ...people who are not good come from there...that they are farmers yes, that is perfectly well...but sometimes they come camouflaged...they're all hiding out there ..".
(A) Male, 63 years old. Regional level. Health sector. Urban area.

"At least here in Pampa Grande, in the rural area is a little more, say easier to work with the community than in the urban area...there have been reported cases of people pretending to be health workers and entering a house to steal. So, that's also a ..difficulty...people will talk to you through a little window, but with the door closed, while watching you from inside… the ...crime rate, at least in the urban area, is so high that people distrust everyone. And to do community work, you need to have contact with the people"
(A) Male, 42 years old. Local level. Health sector. Moderately affected, semi-urban area.

6.5   Discussion

This study aimed to explore and describe the perceived effects on mental health of *El Niño*, and the barriers to achieving psychological wellbeing and accessing support in post-*El Niño*. To our knowledge, this is one of the first studies to explore the multidimensional stressors experienced in an *El Niño* setting in the northern coastal region of Peru. With this study, we aimed to address the need for empirical evidence to inform the development of appropriate implementation programs for populations affected by environmental disasters. Our findings highlight three interrelated prominent pathways that link experiences of a disaster with historical precedent with communities' wellbeing and suffering:

1.   The interaction between previous and current experiences and consequences of the *El Niño*.

2.   Stories of survival and resilience, which focus on personal and close family members' experiences.

3.   Shared experiences of trust and distrust, at the regional and local level of communities, including the breakdown of social trust, both between community members and particularly between authorities and residents.

Please refer to Appendix U for more information on the relationships between the study topics, subthemes, and interrelated pathways.

Overall, from the participants' perspectives, the experience of recent *El Niño* events has heavily impacted on the livelihoods and everyday lives of people in an already underserved region. The use of multiple perspectives enabled triangulation of findings, contributing to better understanding of this complex situation, and further disentangling an established local thought pattern implying that the communities affected by *El Niño* are "already accustomed to" its effects.

In contrast to this, some interviewees highlighted the lasting traumatic experience and longstanding memories that an *El Niño* event can generate, -especially among children- and that they remain a memorable event despite the passing years. Similar results were found in other studies of trauma affected populations (Bayer et al., 2014, Cherry et al., 2015)

The participants expressed psychosocial concerns, interrelated with feelings of helplessness, insecurity, distrust, lack of support, and socioeconomic scarcity, among other needs, which seem to be barely addressed by the regional and local authorities. Some of the authorities minimized the affected residents' experiences, seeming to be indifferent to the population's suffering, in line with the apparent assumption that they have been desensitized by repeated similar events and the many needs of the affected communities. This may be one reason why the authorities have failed to take sufficient action to protect and support the affected population: they may see their predicament as their inevitable fate, rather than fully recognizing that they could act within and across their responsibilities to make a difference.

These findings highlight the harsh reality in which residents of developing countries live, where various preventive and reconstructive measures are unaddressed. Furthermore, the authorities' reported opinions show that, despite their lived experience of previous events, some of them are unprepared, lack proper funding or do not implement in a timely way the funds for works. Therefore, they do not offer equally distributed support for the population, that are, in consequence, unable to recover from environmental disasters. This is a protracted problem, as has been reported recently across regions: By the end of 2019, 129 Peruvian municipalities had implemented less than 25% of the funds allocated in their annual budgets for structural works in their districts (Huacasi W., 2019).

A tension between public and private narratives shared by the authorities was also evident, despite the anonymity of responses. Authorities frequently placed the blame for material and personal losses on residents for making poor decisions, such as in their construction materials and choice of locations to build their houses, while recognition of their own scope and capacity to create change was rarely mentioned.

The affected residents, as in other similar disaster scenarios where community "weariness" was found to be related to repetitive traumatic stressors (Wind et al., 2013) continue to be immersed in protracted situations of financial distress and uncertainty without receiving help. An especially vulnerable group that many participant's felt would particularly benefit from an approach focused on building and rebuilding the community ties were the elderly. Most of them lack the funds that would allow them to retire, and they live alone and without support, as their children may have move to the region's capital or to Lima. This situation further damages the community's social fabric and exacerbates the sense of helplessness – findings which corroborate previously reported experiences of survivors of affected communities of Tumbes (Bayer et al., 2014). This also fits with this project's hypothesis: that *El Niño*-related effects will negatively affect both psychological and social factors at both individual and ecological levels. This finding is consistent with other research which relates post-disaster secondary stressors (Fernandez et al., 2015, Lock S et al., 2012) as one of the primary mechanisms through which floods and similar disaster exposure affects mental health. The economic impact, the lack of social engagement efforts and lack of an efficient institutional response or aid are stressors that define the experience of ongoing survivor stories, rather than past exposures to previous *El Niño* phenomena, and were viewed by participants as the main drivers of shared community behaviour and attitudes. Past *El Niño* events / experiences related to those events do underly how current events are experienced, but do not -as often presumed-, lead to 'acceptance' or 'becoming accustomed' but are, for many the source of traumatic memories and flashback that exacerbate the negative

experiences in the present. However, our findings extend this understanding to suggest that these experiences are intimately related to feelings of despair, hopelessness, lack of control and the breakdown of community social ties. It is also possible that these factors can also be embedded into an overall weariness and psychosomatic problems that the Peruvian population have experienced since several decades ago, and which continue to be intersected in the complex political and turbulent Peruvian setting (Laplante and Holguin, 2006, Fraser, 2004).

It is important to highlight the pervasive extended stigma associated with mental health and mental health services in Peru (IOP;, 2018), which has been reported in both the community and healthcare professionals in several Peruvian regions. Recently, a qualitative study (Arriola-Vigo et al., 2019) exploring the perceptions of clinical practitioners and policy makers on community involvement in the novel Community Mental Health Centres (CMHC) programs in Lima and Lambayeque, found that patients did not want to engage in the programs or activities organised by the CMHCs, due to fear of being treated differently by their friends, and that the primary care providers would commonly prematurely refer their patients to mental health services, due to having misconceptions of them being dangerous or having a poor prognosis secondary to their mental illness. In another qualitative study (Cavero et al., 2018) conducted in Lima, across mental and primary care providers and patients, the results highlighted the need of having access to mental health services. Also, that the current provision of these services was not done in collaboration or alignment with physical health practitioners and the primary care level in general. The patients also acknowledged the stigma associated to mental health-seeking behaviour and had their own misconceptions associated to the provision of care itself, as for example, that a one-off consultation would suffice as treatment. This important integration barrier has also been found across other countries in the Latin American region. (Sapag et al., 2018) . Therefore, a high proportion of population demanding access to health services may reflect in fact help-seeking behaviour for psychosomatic issues and unrecognised problems related to the mental health spectrum. The missing of these symptoms and failing

to provide proper management to them at the primary care level has been described in other contexts (Goldberg and Bridges, 1988).

Further work to ameliorate this barrier will require to adapt or design meaningful interventions that address psychosocial hardships and increase the access and the quality of mental health services. This provision must consider the related social determinants of the population, and its needs, especially for those groups already experiencing social deprivation and marginalization, as, for example, those with transmittable diseases (Shin et al., 2011) and other chronic diseases (World Bank Group, 2018). It is also necessary to involve and articulate the work between the community members, including service users, family members associations (OPS;, 2017), policy makers (Toyama et al., 2017) and clinical practitioners. The involvement of this last group, which includes mental health and general health practitioners, will be crucial to ensure the reduction of any discriminatory attitudes towards those seeking help (Henderson et al., 2013) and increase the proper recognition and management of mental health issues at primary care level (Borus et al., 1988, Siddiqi and Siddiqi, 2007).

These findings have important implications for the design of appropriate interventions to reduce mental health problems for survivors in the aftermath of disasters and for adaptation to environmental vulnerabilities (Ashida et al., 2016, Bennett et al., 2016, Bisung et al., 2014, Brune and Bossert, 2009), which ideally may combine components to increase people's sense of control, to improve financial protection and reduce losses, and to increase social capital as a main protection factor.

We strongly believe that this intervention should work side by side with available local and national-level resources and aiming to sensitize authorities at all levels, so they can fully grasp the magnitude, negative outcomes, and risk factors for mental health that survivors face.

6.5.1 Reflexivity

To provide additional context on the interview process and focus group conduction, I present some reflections that need to be fully considered to interpret the findings.

ECF is a Peruvian female physician, trained in epidemiology research and educated to post-graduate level in Peru and the United Kingdom. She had previous experience conducting interviews and clinical assessments and received training to conduct qualitative research during her master's studies and during the first two years of her PhD studies. ECF was introduced by CSG-Tumbes staff as "the female doctor" or "*la doctora*" as is culturally accepted in Peru for health professionals. There were a few cases where the participants mentioned, as soon as the introductions were made, that they initially thought that she was a foreigner and not a Peruvian citizen, due to her manner of speaking, identified as coming from outside Tumbes region. NT was introduced as British, experienced researcher who spoke a little Spanish, and from the participants' perspective it was evident that she was highly educated. NT's background is in sociology, anthropology, and psychotherapy, and has many years of experience doing and overseeing qualitative studies globally.

Initial contact with the residents and some local authorities was made by the local research team, who lived and worked in the area and were in contact with participants of the trial conducted by CRONICAS team at UPCH. During the first visit of ECF to Tumbes region during March 2017, initial contacts were made with the research assistants, affiliated to the Centre for Global Health at UPCH and most of the local authorities based in urban Tumbes. All of them agreed to take part in the interviews, which were tentatively scheduled for June 2017, corresponding to the estimated date when the local ethics committee and the Regional Health Directorate would have granted a final decision on approval for the project.

The recruitment of participants for the focus group discussions occurred through previous connections from the CSG-Tumbes staff and their local key informants

and collaborators in each village, such as health promoters, workers at the local mayor houses and health centres. Also, the neighbours and family members of the initially contacted potential participants shared the study through word of mouth with their own neighbours and family members, who also expressed their interest and availability to participate. Around 10-15% of those who contacted the CSG-Tumbes staff stating their willingness of attending the group discussions ended not participating. Given the small size of the localities, most of the attendees knew those who were also potential participants and vaguely mentioned that their friend or family member was unable to be there due to work or family obligations, meaning that it was not possible to compare the perspectives of those residents who may have been younger adults with a higher degree of workload or family duties, which would have been an useful comparison group. However, all participants have experienced the effects and the impact of *El Niño* in their localities and livelihoods, being well-placed to describe the consequences of *El Niño* event in an individual and community level, which was the main goal of this research. Also, based on the analysis of the 12 resident's interviews and 3 focus groups with 24 participants, I believe that we reached saturation of the perspective and points of views of the themes arising during the group's discussions, despite the lack of that last comparison.

Locally, Tumbes is known across Peru for having friendly and warm residents. As such, participants were welcoming and engaging with the research team. Most of them were aware of the Centre for Global Health at UPCH, having heard of it from the health services and projects that the Centre offers in Tumbes, or having participated in a prior project. A few of them had also been contacted by key informants of the research staff of the Centre before. After the initial introductions and greetings, ECF introduced NT, who spoke a little Spanish, and answered any preliminary questions that the participants had, about where we had come from, what we intended to do and why we had chosen them.

ECF made sure to highlight that the team was not affiliated to the public health services or any local governmental institution. Despite this, there was still a large

power imbalance between the research team and some of the participants (the residents), as they clearly associated us with having higher education levels and coming from a different background. The residents from the affected areas would defer to us as authority figures, which was evident in some of their responses, answering with "Yes, doctor" and "No, doctor" before giving more detail. Despite this, most of the participants were willing to share their lived knowledge and perceptions on current and previous *El Niño* events in Tumbes, conceding that their personal experiences made them much more knowledgeable on that topic than us. When it came to questions about community engagement and social empowerment, most participants asked for more examples and clarification, admitting that it was a concept that was hard to grasp and give feedback on. As this construct is intimately related with the ancient Inca concept of "*Ayni*"[8] of mutual support and solidarity, of the Quechua Andes region (Allen Catherine, 2002), we discussed some ideas based on that concept, as it is a common subject in Peruvian schools. Later, examples were discussed based on ideal post-disaster scenarios of social and community empowerment, where residents organize themselves and keep coordination and communication channels with the authorities, so that everyone affected receives first aid, health and mental health support and feels safe. Later in the reconstruction period, cooperation among neighbours is established to solve community problems, restore livelihoods, and protect the most vulnerable members. We suggested other basic scenarios focused on not leaving anyone behind in an emergency and confirmed with the participants that the concept was clear. Across all study participants, they again confirmed that nothing like that exists, is organised, or is encouraged among their communities.

6.5.2 Strengths and limitations of the study

In this study, I aimed to triangulate the responses of both authorities' representatives from different aligned sectors (government, health, education,

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[8] Ayni - Quechua concept of reciprocity, as an alternative, non-exploitative, and non-alienating model of exchange.

mayor's offices, among others) and residents of different localities with different degrees of damage within the Tumbes region, to better explore their perspectives. I focused on a sample living in an area historically and cyclically affected by *El Niño*, who may have insight at two levels: 1. Those who play a role in the decisions that are made in both preventive and reconstruction stages, and 2. Those who are impacted by those decisions in this context. This is one of the few studies conducted in the northern coast of Peru that have explored this phenomenon from a mental health and social capital perspective using qualitative methodologies (Bayer et al., 2014).

Despite this, there are some limitations that should be acknowledged for this study: Firstly, due to lack for funding for external translation services, data analysis was conducted in English by ECF – who is Peruvian and whose mother tongue is Spanish, but is also fluent in English – whereas the original interviews were done in Spanish. To avoid any misunderstandings in the local manner of speaking and different regional meanings of some expressions, she consulted with the local fieldwork staff, who were also residents of the study area, for clarification of some terms and phrases used by the participants during the transcription and coding phases. Also, ECF discussed the findings extensively with NT during all stages of the research and interpretation process, in an effort to challenge any assumptions that she may have brought to the qualitative analysis based on her previous research experience in Peru and educational background.

For the focus group participants, their degree of endured damage related to *El Niño* was all self-reported, rather than being selected with an objective assessment of material loss or other objective evaluation. This was not the case with the participants who were interviewed, as flood damage was visible during the visit to their houses. Given the markedly unequal distribution of flood damage between localities, there was an unequal impact, among some participants in the same locality were likely to be have been more impacted by flood damage than others. However, all selected participants shared common characteristics and were aware of the problems faced by their communities.

It was also very difficult to find a shared available time slot to conduct a focus group discussion including only the local authorities, due to their different schedules and other commitments, so it was not possible to collect their grouped perspectives across different sectors at the same time. However, we also believe that the individual interviews conducted with the authorities allowed a more candid and secure space for them to express more freely any critical points of view on their own institution and what they had seen across other bodies during and after the emergency. Based on the findings from the analysis of the fifteen authorities' interviews, we believe that we reached saturation of the topics which this study aimed to explore.

6.5.3 Research and Policy recommendations

With increasing investments in mental health interventions and program implementation for humanitarian settings (Hodgson, 2019) it is important to recognise that supporting resilience among affected communities will require initiatives to be nested within a macro system in which effective preventive and aid systems are in place, rather than relying on individual coping efforts or help-seeking behaviours alone. We must recognise that structural features of this system have direct and indirect effects on survivors' coping behaviours and organized responses within and between communities. Corruption, nested among all sectors in Peru (García, 2019), especially in government bodies, including the health sector, has impaired and blocked post-disaster reconstruction efforts, leading to a widespread sense of unfairness (Redaccion RPP, 2017, Agencia AFP, 2018).

Any efforts to mitigate the effects of these structural barriers and address socioeconomic distress as well as psychological suffering may have tangible impacts on various aspects of both individual and community wellbeing. For instance, providing job alternatives and effective aid distribution with equity could reduce survivors' distress and increase their sense of safety by restoring their

dignity and providing means for the restoration of their livelihoods. This could in turn increase positive individual and community interactions, ultimately reducing the risk of society insecurity, interrelated violence and improving psychosocial outcomes.

The attitude expressed by most of the authorities that "it is the residents' fault" is surely a major barrier to improving disaster responses. It is necessary, then to explore ways to shift this perception and also to increase the community's self-efficacy. The lack of understanding on the part of some of the authorities towards the residents suffering and distress, and their apparent lack of efficacy in engaging with residents in the aftermath of a disaster would be a key factor to work on in a future intervention that aims a behaviour change, sensitization towards the residents or an effort to co-design solutions to prevent the same problems from recurring in other events. This may happen sooner than expected, as a new *El Niño* event has been early forecasted for the end of the year 2020 (Ludescher J., 2019).

6.6 Conclusions

This study's findings highlight the multiple and interrelated issues experienced by under-resourced communities in a post-disaster context. It highlights how socioeconomic distress and lack of support contribute to psychosocial suffering, how a lack of coping strategies and feelings of helplessness lead to feelings of resentment from the affected communities towards those responsible for providing aid; and how the views of the authorities towards the affected residents adds to this complex context. The findings suggest that in addition to providing emergency aid and health care services support, these vulnerable communities require an integral care and resilience approach that considers socioeconomic, psychosocial, and community-level distress alongside improved access to prevention measures and reconstruction activities. As the residents' problems are deeply interrelated within the pre- and post-disaster context, the response and treatment care approach should be in line with both individual and community

self-reported needs. This will more likely result in supporting real resilience in other vulnerable populations in similar contexts.

7   CHAPTER 7. Discussion

The overall aim of this thesis was to explore and assess the impact of *El Niño* phenomenon related effects on the mental health of affected communities and possible resilience-promoting factors related to the theory of Social Capital in this context. The thesis used mixed methods to pursue the following four research objectives, resulting in three interrelated papers:

1. To systematically review current evidence globally to search and identify interventions that employed Social Capital theory components, and that assessed mental health outcomes. (PhD Paper A published in Social Psychiatry and Psychiatric Epidemiology).

2. To determine whether there is an association between the presence of *El Niño* and the depression scores assessed in the Salt substitution trial in the northern coast of Peru, through an appropriate panel longitudinal analysis. (PhD Paper B, under internal review to be re-submitted to PLOS ONE).
   and

3. To estimate the effect of differential exposure to *El Niño* related flooding and heavy rains on depression in the same trial through multilevel regression models. (PhD Paper B, under internal review to be resubmitted to PLOS ONE).

4. To evaluate the perceptions of *El Niño* event effects on the mental wellbeing, individual and community responses, availability of support systems and possible community resilience strategies of the residents affected by El Niño in the northern coast of Peru through in-depth qualitative research (PhD Paper C, in draft, to be submitted to Social Science and Medicine).

This concluding discussion chapter synthesizes and integrates the qualitative and quantitative results from these three academic papers and offers steps towards translating the needs of the target population into a future intervention.

This thesis adopted a multidisciplinary approach. The chapter ends with a discussion of these findings and their implication for policy, practice, and future research in relevant environmental disaster-related humanitarian contexts and a summary of dissemination activities conducted thus far to maximize research impact and uptake.

7.1 Synthesis of results

The findings of the three papers presented in this thesis can be summarized taking an integrative perspective with a two-level approach. We have assessed quantifiable risks factors at the individual level but there are also social-ecological level factors that have an undeniable influence on the individual and the community. Therefore, an effort to promote resilience and wellbeing for communities affected by environmental disasters should also follow an integrative approach with consideration of both the individual and ecological levels. This perspective has also been recommended elsewhere (Berkes and Ross, 2013, Christens, 2012).

There are eight main findings to highlight from the thesis papers:

- *There are few controlled studies of the effect of social capital interventions on mental health outcomes, and those conducted in post-disaster settings are even rarer.*

The systematic review results showed that from the identified and included studies, both social capital scores and mental health outcomes showed

improvement over time in intervention groups. However, there was little evidence of benefit compared to control groups in the long term.

Further larger high-quality intervention trials are needed to confirm those results, especially among populations exposed to adversities, and conducted with a longer follow up period, to assess sustainability of effect.

- *An intervention to build or strengthen social capital would need to be integrated at both individual and ecological level.*

From the findings of the systematic review, a potentially successful approach to building or strengthening social capital and ameliorating negative mental health outcomes across participants would require two separate goals at two different levels: Firstly, the participants would need to reach self-awareness of their own social identity and network membership. There are various methods (Carrington et al., 2005, Cruwys et al., 2016, Liebman and Paulston, 1994) to achieve this, e.g. with a social mapping technique, that would allow them to assess their own useful resources and networks. Secondly, participants should for improvement of their social ties through strengthening their community bonds and creating tangible changes in a social-ecological level setting.

- *Chronic exposure to past El Niño may relate to a status of "survivor trauma" that may not be readily translated and measured into a mental disorder such as depression.*

The quantitative component of this thesis measured the effect of the most recent *El Niño* events and did not find a relationship between depression and exposure to these effects. However, those who were not recently directly exposed may have already a chronic exposure to previous *El Niño* phenomena, as the Tumbes region has been hit with two *El Niño* events with extraordinary consequences in the decades of 1980 and 1990.

This possibility was also mentioned across the qualitative component responses, with the perception that most adults can be considered "accustomed" to chronic *El Niño* effects. Whereas that would not be the case for those in age group extremes, who would also have diminished endurance or "less strength", in contrast to able adults who could cope better in adverse conditions.

- *Day to day economic and life stressors, along with post-disaster trauma are key determinants of vulnerable survivors' mental health and wellbeing*

Results from the qualitative component of this thesis suggest that post-*El Niño* daily stressors, coupled with a general feeling that no tangible support or help for reconstruction efforts will be provided by anyone, exert a significant, negative influence on mental health. The stressful social and economic context in which disaster survivors have been living plays a decisive role in their psychosocial wellbeing. Participants described economic deprivation, lack or restrictions to access support and healthcare in "common" and "disaster-related" contexts, and the inequitable aid provided by government bodies or local institutions. Current recommendations in the literature (Sphere Project, 2018, (IASC), 2007) for psychosocial protection of trauma and adversity survivors clearly state that proper relief aid should be concurrent with actions focused on recovery, maintaining their dignity and claiming their rights.

- *People with a background or baseline diagnosis of depression were at higher risk to have an increased severity of symptoms in the aftermath of a disaster.*

In the quantitative component, participants who screened positive for depression symptoms at baseline assessment had higher odds of having depression over time through the *El Niño* periods. In the qualitative component, local mental health professionals perceived an increase in the prevalence of common mental

disorders, including depression. However, this increase of prevalence perception was not associated with *El Niño* in the quantitative component' results.

It is possible that clinical professionals perceived an increase in the severity of those conditions. And other unmeasured personal or family factors may have triggered more help-seeking behaviours during the El *Niño* periods, as help-seeking for treatment options is not usually reported in persons with an increase of symptoms' severity (Jorm, 2012, Oliver et al., 2005). It is also necessary to consider the cultural interpretations of distress terms (e.g. somatization and seeking of help for others rather than themselves) that would allow a better understanding of the findings.

- *Vulnerable groups had higher odds for depression in the aftermath of the El Niño event and were perceived to have worse outcomes of distress and suffering.*

In the quantitative component, vulnerable groups -such as those living in poverty, with chronic conditions and lack of access to health services- had higher odds of depression in the aftermath of the *El Niño* event. The perception of affected residents and authorities in the qualitative component was also that marginalized groups and those living with chronic conditions had worse outcomes like distress, feelings of suffering and hopelessness.

- *Some authorities at all levels in the study region were found to be insensitive and indifferent to the affected population's needs.*

The qualitative component of this thesis found that those authorities working in key institutions, engaged in survivor blaming, were insensitive to the plight of the residents and did not seem to fully understand the public's needs and suffering. Most of them mentioned that the affected residents were to blame as they should not have installed themselves in dangerous areas and that they should move to

safety. Unfortunately, disproportionately vulnerable groups from the affected areas will be in the worst position, and unable to move by themselves to secure zones. This will be especially the case for those without access to money, social connections, and easy logistics.

- *Macro-level structures and policies at regional or national level were identified as the cause or source of suffering at both individual and community levels.*

Participants in interviews and group discussions mentioned existing systems and factors in Tumbes (and in Peru) having a direct impact on their wellbeing and recovering, in addition to direct consequences of *El Niño*. For example, they cited the chronic underfunding that their villages receive for agriculture activities subsidized by the government, despite being the main economic activity in the region, and the lack of affordable and effective health services near their villages. This means family illness has expensive consequences including onerous transport costs, reaching out to private health practitioners and, in some cases even temporary migration to access health services. These examples are attuned with the long-term structural centralization of public programs, services and assets located in the capital city of Lima leaving Peruvian citizens living in other regions to face an additional structural inequality (Analytica, 2020, Figueroa and Barrón, 2005).

This thesis findings need to be interpreted from a two-level reality ingrained in the background of the Peruvian context, which can also be generalised to other LMICs with shared similar characteristics. The individual level would be the quantitative & qualitative measurements from each study participant, and the socio-ecological level would be the role and the impact that the context and the structural economic and political system have on these individuals.

The feelings of inequity, suffering and injustice largely described by study participants are attuned with the description of structural violence (Johan Galtung, 1969) referencing the impact that the violence inherent to the political, economic, and social structures have. There is evidence (Thorp and Paredes, 2010, Figueroa and Barrón, 2005, Analytica, 2020) on how this inequal system has been and continues being carried out for several decades by the Peruvian government, the groups holding the economic and political power and regionally, by the local authorities. This perpetuates the unequal distribution of power and consequently unequal life chances to population groups.

Adversity scenarios, as the ones posed by *El Niño* phenomena, will add to this context, disproportionately affecting those who are already enduring vulnerable conditions. Therefore, the efforts to promote resilience, increase post-disaster wellbeing and decrease the psychosocial suffering across affected population groups must consider a two-level perspective. They should be aiming to address factors at both the individual and the social-ecological levels.

7.2 Implications for policy and practice

Based on the integrated findings of this thesis, the following recommendations can be made:

Interventions or programs aimed to promote resilience and alleviating psychosocial distress should have an add-on component with the main objectives would be to achieve community empowerment[9]including:

1. the creation and strengthening of social movements focused on gaining back lost capacity and ability to take decisions at community level and / or

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[9] Empowerment' refers to the process by which people gain control over the factors and decisions that shape their lives. It is the process by which they increase their assets and attributes and build capacities to gain access, partners, networks, and/or a voice, in order to gain control.

2. having legitimate representation through strong civil society organizations who can later articulate the communities' needs with specific demands to be worked out with the authorities.

 Rather than having discussions aimed to solve community-level problems, a lack of agreement and postponed goals, mixed with a widespread sense of resignation is spread among the public. Repeatedly, reports after one, two or more years after a disaster showcase the living conditions endured by the survivors, as well as the political class' repeated, protracted crises and corruption scandals, which are spread across government and private sectors.

Among high-risk population groups, the demands of having an efficient system of aid distribution and support for reconstruction is mentioned much more rather than what specific actions can be articulated with each sector within a collaborative preventive and reconstructive work.

In a worn out setting like the Peruvian context, with so much political distrust and reported unfairness to vulnerable groups, as is, challenging the status quo[10] with a two-level approach intervention program targeting disaster survivors resilience and decrease of psychosocial distress is most needed (Kawachi, 1999).

Interventions based on the Social Capital theory should be included as a feasible option to promote resilience among the high-risk affected communities. This type of program should offer psychosocial and community empowerment support for affected survivors and be nested within and alongside structural interventions that improve survivors' social and material reconstruction of their livelihoods and fragmented social bonds. From the literature review and qualitative data collection done for this thesis, it was not found in Tumbes region, a consistent, long-term, well-funded project or formal association based in the community whose main aim was to build or strengthen community's social capital and psychosocial

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[10] Status quo - the existing state of affairs, especially regarding social or political issues.

wellbeing, and whose coordination and /or management relied on a local civil society group.

When the health and civil authorities were asked if they were aware if such a program or association existed or worked in Tumbes the overall response was negative. When they were asked on suggestions on what they considered would be needed for such a program to be implemented, most of the responses were aligned that the base of such a program should rely on governmental bodies, such as the health and education sector, and also involve community-based health promoters, school teachers, parents and other influential or already established organisations (as the Catholic church) and syndicates or workers' associations. However, despite these ideas, the interviewees also acknowledged that the governmental sectors' programs and plans are already overstretched, have a high rotation of staff and that it would be unlikely for them to provide funding or technical support to external activities. They also considered that a first step towards that goal would be to lay stepping stones of trust within the communities and also between the communities and their local authorities.

Nevertheless, there are some successful examples of community empowerment projects, sponsored by external funding and aimed to build or strengthen social capital within the communities. These have been conducted in other regions (such as Piura, Cajamarca or Cusco) and the capital city, Lima, with good results and different approaches (e.g. projects aimed towards reaching gender equality, sexual and reproductive rights[11] and those working to empower different groups, such as farmers[12], indigenous groups[13] and environmental protection[14]).

Also, as it was found among authorities working in key institutions in this thesis post-disaster setting an insensitive attitude towards the public's suffering. I recommend, based on these findings that they should take part in an integrative program aimed to deter survivor's blaming, sensitize, and understand the public's

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[11] Movimiento Manuela Ramos, Asociación Flora Tristán, PROMSEX, CARE Perú
[12] ONG Escuela Campesina de Educación y Salud - ESCAES
[13] AIDESEP - Asociación Interétnica de Desarrollo de la Selva Peruana
[14] Derecho, Ambiente y Recursos Naturales (DAR)

needs and suffering while reinforcing mutual bonds with the communities, also following a two-level perspective.

Finally, in the aftermath of *El Niño* or similar environmental-related disasters, the isolated, vulnerable groups -such as the elderly-, those living without close support networks and/ or those with a baseline or chronic mental condition, would get the most benefit from a social-capital based integrative intervention that emphasise the restoration of the victims' sense of control over their own lives, increase or restore trust across residents and authority bodies, increase social support, social bonds and community mutual help networks.

7.3 Implications for research

Currently, there is a strong awareness that the climate change emergency is fuelling environmental-related phenomena as the *El Niño* events. It is also recognised that vulnerable groups living in LMICs will experience the worst impact. With the current climate crises, this situation and its negative outcomes are expected to continue.

In retrospective consideration of this PhD thesis, I have been very fortunate to have had the opportunity to design my research project on a topic that I am passionate about and strongly believe requires further attention. However, if I had the chance to conduct this project again, I would also consider the following points as implications to be addressed in future research:

1. I would have extended the assessment period of the quantitative component, scheduling an additional follow up visit after *El Niño* costero ended (during June or July 2017). This extra visit may have added data to include in the analysis model that may had a different trend on the mild depression scores across the study villages.

2. I would have also considered adding to the community surveys screening tools for additional mental conditions (e.g. anxiety screening) related to the disaster.

3. If I had had additional funding: I would have extended my fieldwork trip for at least 4 weeks more and hired the CSG-Tumbes research staff longer, so we could better discuss the sampling strategy and change it according to interim analysis results while being in the field. Also, I would also have gathered additional context data, traveling, and staying in the affected areas a longer time, conduct additional interviews ensuring all group ages were represented (especially for the resident's interviews and focus group discussions).

Finally, I would have also had all interviews and focus groups transcriptions translated into English independently so I could ensure that the analysis is not missing any interpretation detail that I may have overlooked.

7.4   Strengths and Limitations

Strengths of the thesis includes the use of mixed methods to explore the mechanisms underlying the individual and community impacts of *El Niño* effects, as well as the focus on community factors that may promote survivor's resilience. The assessment of the quantitative and qualitative components data coupled with the systematic research findings guarantees a strong platform to issue recommendations for policy, practice and research based on integrated results.

This research is particularly timely and relevant given the current climate emergency that is affecting disproportionately disadvantaged, unprotected, and unequally supported communities as the ones included in this study setting. Also, the thesis findings have been obtained, collected, and integrated following rigorous methods and standardized guidelines, which aimed to make the most of the available data. I, as principal author also was in a unique position that allowed

me to conduct this study: as being Peruvian, a native Spanish speaker and a trained physician in quantitative methods and with a strong interest in qualitative methods skills, which allowed me establish collaborative networks across Peru and United Kingdom, secure appropriate data for secondary analysis and secured funding to conduct the data collection of the qualitative component study.

However, the following limitations should also be considered when interpreting the findings of this thesis:

Results should be viewed considering that the reliance on self-reported data may have bias, as this risk could have been diminished cross-referring information from more than one source, such as adding a psychological evaluation. Also, the survey design measured only depression through the PHQ-9 tool, which precludes the exploration of other mental disorders that may also occur in this setting. Also, the survey data does not explore the context after *El Niño costero* event concludes: the last follow-up visit of the Salt substitution trial was between February and March 2017 and *El Niño* costero rains and floods ended two months later, by April and May 2017.

Specially for the quantitative component, the data obtained from the SALT trial are constrained by what was measured through the community surveys and routine data collected by the Peruvian organizations. This excludes relevant contextual factors, related to the community response and tangible support from the *El Niño* events as well as neighbourhood safety levels. The study localities in Tumbes region may also be too homogeneous, especially in social determinants (e.g. low income, lack of access to health services, occupation,) meaning that the effect of these variables on the main proposed outcomes cannot be observed. Small variations on these assessments might be evident at a larger scale exploration, which we lack.

The sampling strategy that was used in the qualitative research component, was of purposefully sampling cases that could help to elaborate and refine the topics

or categories that were emerging from the data (Charmaz, 2006). The intention was to continue sampling to develop properties of the categories until no new properties emerge, a point called "saturation." While the methodological rationale for theoretical sampling is compelling in principle, in practice it involves considerable time and funding, both of which were in short supply while executing this self-funded research, and that may have limited an overarching sampling strategy that could have considered other factors or further in-depth exploration of the study topics. For example, if I been based in Tumbes during a longer period, then the fieldwork planning, conduction and preliminary analysis could have been extended. This would have given the chance of collecting additional context data, recruiting participants from specific age groups that could not be included, and performing an interim analysis while still in the field, that may have better guided the final fieldwork activities. Unfortunately, this could not be considered due to lack of funds.

Further limitations relate to the context where the study was conducted. There is still an environmental constraint on societal and community's views on mental health and help-seeking attitudes in Tumbes. The idea that needing treatment for mental conditions translates into being "crazy" persists in Peru. These points of view may have biased the respondent's responses and perceptions related to the impact of the disaster on mental health, and its evaluation or assessment was not targeted by the study tools. Further work could focus into a more in-depth exploration on this topic and the knowledge on mental conditions related to disaster stressors across similar settings.

Finally, the integration of the two main thesis components (quantitative and qualitative) might have a detrimental 'time lag' when considering the posterior impact of the two separate *El Niño* events: when the qualitative component took place, the 2017 *"El Niño costero"* event had happened in the previous three months, which was much stronger than the 2015-2016 *"El Niño"* event that was mainly assessed by the quantitative component study.

7.5   Dissemination and impact

To date, dissemination of these findings has included the following activities:

7.5.1   Peer-reviewed publications

The systematic review presented in Chapter 4 was published in February 2018 in the Social Psychiatry and Psychiatric Epidemiology journal (Flores et al., 2018). The results of the quantitative component of the thesis presented in Chapter 5 has been submitted to PLOS ONE journal and is currently under peer review.

7.5.2   Oral presentations

Some elements of this research were included in a guest lecture I gave in the Faculty of Psychology of the Universidad Los Angeles de Chimbote - ULADECH in Piura, Peru on 27th June 2019 (ULADECH Católica, 2019), to staff members and students, to raise awareness of *El Niño* effects, the impact of disasters on mental health outcomes and vulnerability factors of mental health in environmental-related disasters.

I also presented this project as a Lightning Talk at the "Road to Global Mental Health" Conference held on 29th Oct 2019 at King's College London (King's College London - KCL, 2019).

7.5.3   Posters

I presented a poster summarizing the key findings of the Systematic Review paper at the 21st World Congress of Epidemiology of the International Epidemiological Association (IEA) ((IEA);, 2017) in Saitama, Japan in 19-22 August 2017.

I presented a poster on the quantitative component of this project in the 2019 Planetary Health Annual Meeting (Planetary Health Alliance - PHA, 2019), organized by the Planetary Health Alliance and Stanford University, California in September 2019.

7.5.4 Internal dissemination

These results were presented at the monthly journal club of the Emerging Disease and Climate Change Research Unit (Emerge) of Universidad Peruana Cayetano Heredia in Lima, Peru in June 2017, to inform the current evidence of findings and planned future mental health work in this area. This Journal Club was attended by my PhD studentship sponsors, Emerge research associates, trainees, and students.

Also, a poster with these results was presented internally at the School, at the annual LSHTM Poster Day that took place on 15 March 2018.

7.5.5 Public engagement

The synthesized preliminary results were published in two blog posts: in English (Flores, 2019b) for the London International Development Centre (LIDC) and in Spanish (Flores, 2019a) in the Latin America hub of the Mental Health Innovation Network (LatAm hub MHIN). Both blog posts have been shared in social media (Twitter, and Facebook) by these two organizations.

7.5.6 Future dissemination

Future further dissemination of this work will include: the publication of the results presented in Chapter 6 in peer-reviewed journals, both in English and Spanish.

A short report and policy brief recommendations will be created and shared at National level with the Direction of Mental Health of the Ministry of Health of Peru and at Regional level with the Regional Direction of Health of Tumbes.

I will also develop a short summary synthesizing the results of the qualitative components to disseminate electronically or by post to all the participants.

7.6 Conclusions

This thesis contributes to the growing knowledge on the underlying ways that the cyclic environmental phenomenon "*El Niño*" affects underserved communities - and vulnerable groups within those communities-, focusing on social capital as a potential resilience-promoting factor on the psychosocial wellbeing of high-risk communities. This thesis also adds to mixed-method research studies conducted in a post-disaster setting in a low and middle-income country, highlighting the need to approach a complex scenario with a multi-disciplinary perspective.

Results from both the qualitative and quantitative components of the thesis suggest that it may not be always possible to obtain a direct measurable effect on a common mental health outcome. The impact of a specific phenomenon should also be considered in addition to past exposure to similar disasters, specifically in areas where repeated environmental disasters occur. However, these effects, especially if left untreated or unsupported, may have a significant deleterious effect on individual wellbeing and community integrity, which in turn contribute to contextual factors such as suffering, despair and lack of trust within communities and with their own authorities.

Social capital may be a potential modifiable factor for promoting positive survivors' mental health and promoting resilience in a context of past disaster trauma and ongoing protracted lack of reconstruction.

Implications for policy and practice include aiming for greater emphasis on psychosocial and community empowerment support for affected survivors, nested within and alongside structural interventions that improve survivors' social and material reconstruction of their livelihoods and fragmented social bonds.

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Appendix A List of variables to be included in the Quantitative component analytical model

VARIABLE NAME	SCALE	CATEGORIES	TYPE	SOURCE
Gender	Nominal	1. Male 2. Female	Possibly Associated with the outcome	SALT Trial
Age / Date of Birth	Continuous	• Number of years at assessment date • Date of Birth DD-MMM-YYYY	Possibly Associated with the outcome	SALT Trial
Education	Ordinal	1. Primary Education 2. Secondary Education 3. Technical Education 4. University Higher Education 5. Unknown or do not answer	Possibly Associated with the outcome	SALT Trial
Marital Status	Nominal	1. Single 2. Married 3. Cohabiting 4. Separated 5. Divorced	Possibly Associated with the outcome	SALT Trial

Socio demographic Factors			6. Widowed		
			7. Unknown or do not answer		
	*Poverty - Income (Average in past 12 months)	Ordinal	Average Monthly income in Last 12 months	Baseline: Possible Confounder	SALT Trial
			1. No income	Follow up: Possible effect modifier	
			2. Up to 100 soles		
			3. Between 101 and 450 soles		
			4. Between 451 and 750 soles		
			5. Between 751 and 1000 soles		
			6. Between 1001 and 1500 soles		
			7. More than 1500 soles		
			8. Unknown or do not answer		
	*Poverty - Income (Last month)	Quantitative	Last month income (not including family support)	Baseline: Possible Confounder	SALT Trial
				Follow up: Possible effect modifier	
	*Poverty – Assets Index	Ordinal	Do you have in your house…?	Baseline: Possible Confounder	SALT Trial
			1. Gas Kitchen	Follow up: Possible effect modifier	
			2. W.C with sewerage connection		
			3. Radio / Music equipment		
			4. Microwave		

5. Blender

6. Iron

7. Color TV set

8. Fridge

9. Washing machine

10. Personal Computer

11. Land line

12. Cellphone

13. Cable connection

14. Internet connection

15. Bicycle for adults

16. Motorcycle

17. Car

18. Do not answer

	Nominal	Are you currently working?	Possibly Associated with the outcome	
Occupation / Working status		1. Yes		SALT Trial
		2. No		
	Nominal	Current main occupation?	Possibly Associated with the outcome	

Student

SALT Trial

2. House worker

3. Employee or dependent worker

4. Self-employed or independent worker

5. Retired or pensioner

6. Searching for work

7. Unknown or do not answer

	Ordinal	Response Categories	Possibly Associated with the outcome	
Disability Score (Short set of the Washington Group)		1. No – No difficulty		SALT Trial
		2. Yes - Some difficulty		
		3. Yes – A lot of difficulty		
		4. Cannot do it at all		

- Current and permanent limitation to hear despite using a hearing aid?

- Current and permanent limitation to see despite wearing glasses?

- Current and permanent limitation to talk, communicate or carry on a conversation

		• Current and permanent limitation to walk, move, climb, or descend steps		
		• Current and permanent limitation to eat, dress or washing all over		
		• Current and permanent limitation to concentrate, memorize or learn simple things		
Cause of reported disability	Nominal	1. Born with it 2. Due to an Infectious disease 3. Due to a Chronic disease 4. Due to an accident 5. Due to old age 6. Other cause	Possibly Associated with the outcome	SALT Trial
Dependence due to disability	Nominal	Do this (these) disability (ies) make you dependent on another person? 1. Yes 2. No 3. Do not answer	Possibly Associated with the outcome	SALT Trial

	Health systems coverage and usage	Nominal	Do you have medical insurance? 1. Yes 2. No	Possible Confounder	SALT Trial
Access to health systems			To which health systems are you affiliated? 1. EsSalud 2. SIS 3. Private Insurance / EPS 4. Other 5. Unknown or do not answer	Possible Confounder	SALT Trial
			In the last 4 weeks, did you attend any of the following health professionals due to malaise or physical discomfort? 1. Yes 2. No 3. Unknown or do not answer • Physician • Dentist	Possible Confounder	SALT Trial

- Psychologist

- Nurse

- Physiotherapist

	Health Antecedents	Nominal	Have you been diagnosed with any of the following diseases?	Possible Confounder	SALT Trial
			1. Yes		
			2. No		
			3. Unknown or do not answer		
Chronic Co-morbidities			• History of HTN		
			• History of cerebral vascular disease		
			• History of myocardial infarction		
			• History of CHF		
			• Other Cardiovascular disease		
			• High cholesterol		
			• History of DM		

		Ordinal		Possible effect modifier	SALT Trial

Alcohol use

Use of Alcohol in the last 12 months

Frequency of any alcohol use

1. Never
2. 1 or less times/month
3. 2-4 times/month
4. 2-3 times/week
5. 4 or more times/week
6. Do not answer

	Ordinal	Consumption of 6 or more alcohol drinks in the same occasion	Possible effect modifier	SALT Trial

1. Never
2. Less of once/month
3. Monthly
4. Weekly
5. Daily or almost daily
6. Refuse to answer

		Ordinal	Frequency of hangover	Possible effect modifier	SALT Trial
			1. Never or almost never		
			2. Less of once/month		
			3. One time/month		
			4. Several times/week		
			5. One time/week		
			6. Several times/week		
			7. Every day		
			8. Do not answer		
	**Average sleeping hours during last 12 months	Quantitative	Average Number of hours slept per day	Possible effect modifier	SALT Trial
			• 99 Do not know / Do not remember		
Sleep patterns	**Difficulties to sleep in the last month	Ordinal	Difficulties to sleep in the last month	Possible effect modifier	SALT Trial
			1. Almost never		
			2. Sometimes		
			3. Frequently		
	**Waking up during the night	Ordinal	Frequency of waking up during the night on the last month	Possible effect modifier	SALT Trial
			1. Almost never		

2. Sometimes

3. Frequently

	Depression	Ordinal	With what frequency you have been troubled by the following issues?	Principal outcome	SALT Trial
Depression scores (PHQ-9) in the last 2 weeks			1. Never 2. Some days 3. More than half of the days 4. Almost every day • Low interest or pleasure to do things • Feeling low, depressed, sad, or hopeless • Difficulties to sleep, keeping asleep or sleep too much • Feeling tired or having low energy • Having low appetite or eat in excess • Feel bad about oneself, feel that you are a failure or having failed yourself or to your family • Difficulty to give attention or concentrate in tasks as reading the newspaper or watch TV		

- Move or speak slowly, noticed by other people, or the contrary: feel restless or unquiet that you have been moving more than usual.

- Having thoughts that you may be better dead or having the desire to hurt yourself in some way

Extreme precipitations related to ENSO	Precipitations level over expected thresholds per past weather reports	Ordinal	Report of period of extreme precipitations related to ENSO effects	Main Exposure	SENAMHI Registries
	Number of houses collapsed due to flooding and rain per locality	Quantitative	Report of collapsed houses due to ENSO-related flooding and extreme precipitation per locality	Main Exposure	INDECI Registries
Houses damaged related to ENSO	Number of houses damaged due to flooding and rain per locality	Quantitative	Report of damaged houses due to ENSO-related flooding and extreme precipitation per locality	Main Exposure	INDECI Registries

Crops lost related to ENSO	Number of cultivated hectares lost due to flooding and rain per locality	Quantitative	Number of cultivated hectares reported damaged due to ENSO-related flooding and extreme precipitation	Main Exposure	Peruvian Ministry of Agriculture reports

- *There are currently being considered 3 variables to define poverty: Two based on self-reported income amount (average in previous 12 months and last month) and an assets index that will be used to create a socioeconomic score with categories. Peruvian national surveys usually use both type of variables to define poverty, so it has been decided to select the final poverty indicator after the dataset has been reviewed, using Principal Component Analysis.
- **Use of alcohol, absence of physical activity and disturbances of sleep patterns variables are planned to be reviewed when the dataset is available, and plan to be merged and re-categorized accordingly.
- Precipitations data recorded by Peruvian environmental authority will be used to define the periods of extreme precipitations running from the baseline raining season levels and the ENSO-average expected precipitation levels in Tumbes department. The number of depression cases detected during these periods will be compared with the periods within expected precipitation limits.
- ENSO-related impacts: Damages of houses and economic losses due to flooded crops are the hypothesized exposure that will increase depression cases.

Appendix B Dissemination events Conference presentations and posters

- Poster presentation - 21st International Epidemiological Association (IEA), World Congress of Epidemiology (WCE2017), 19-22 August 2017

WCE 2017
Saitama, JAPAN

http://wce2017.umin.jp

The 21st International Epidemiological Association (IEA)
World Congress of Epidemiology (WCE2017)

August 19(Sat)-22(Tue), 2017

Venue: Sonic City, Saitama, JAPAN [Tokyo Area]   会場 ソニックシティ (さいたま市)
President: Yosikazu Nakamura, MD, MPH, FFPH   会長 中村 好一 (自治医科大学 公衆衛生学 教授)

25th August, 2017

Dr. Elaine Catherine Flores
London School of Hygiene & Tropical Medicine
Keppel Street
London
WC1E 7HT
United Kingdom

Dear Dr. Elaine Catherine Flores:

Subject: Letter of certification on presenting at IEA-WCE2017

Thank you for attending the 21st International Epidemiological Association (IEA), World Congress of Epidemiology (WCE 2017) which was held on 19th to 22nd of August, 2017 at Saitama, Japan.   This letter serves to confirm that you have delivered your presentation at this congress with details as follows:

Participant Name: **Dr. Elaine Catherine Flores**

Abstract Number: **244**

Abstract Title: **Mental health impacts of social capital interventions, a Systematic Review**

Thank you for your attention.

Sincerely yours,

Yosikazu Nakamura, MD, MPH, FFPH
Congress President

- Poster Presentation – Research Degree Students' Poster Day (15th March 2018, Keppel street, LSHTM)

- Poster presentation – Planetary Health Alliance Annual event - September 4-6, 2019, Stanford University, California
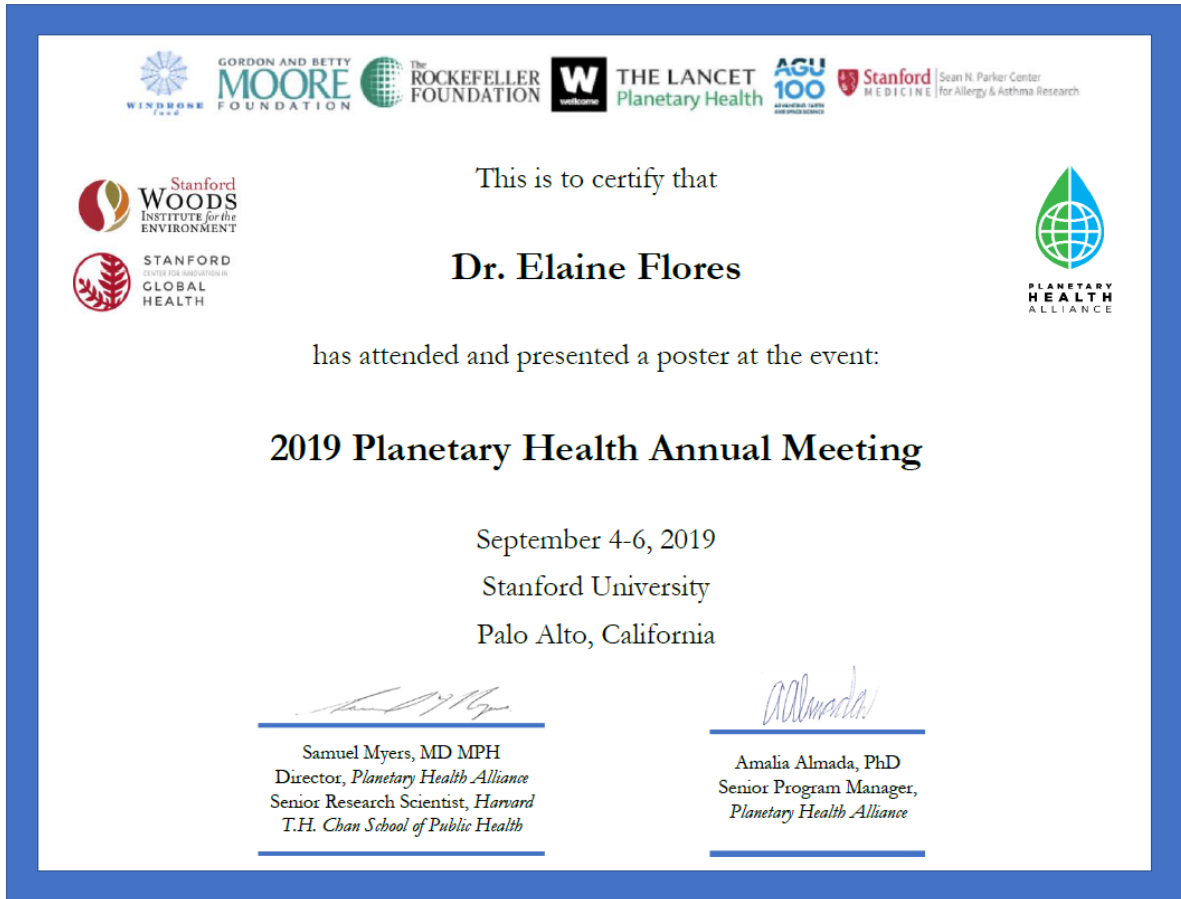
- Oral Presentation Chesmal Siriwardhana Memorial Lecture (10th October 2019, Keppel Street, LSHTM)

- Oral Presentation, Lightning Talks, "The Road to Global Mental Health Conference" (29TH October, Great Hall, Strand, King's College London)

CENTRE FOR GLOBAL
MENTAL HEALTH
CELEBRATING 10 YEARS

The Road to Global Mental Health
Conference
29 October 2019, 09:00-17:00
Great Hall, Strand
King's College London

Agenda

09:00-09:30 Registration

09:30-09:35 Welcome, Prof 'Funmi Olosinakin (King's Vice-Principal International)

09:35-10:05 The Journey of Global Mental Health, Prof Vikram Patel and Prof Martin Prince

10:05-10:30 Report: 10 years of the Centre for Global Mental Health, Prof Ricardo Araya

10:30-11:00 Looking back and looking forward: successes and ongoing challenges in integrating mental health into primary care in low resource settings, Prof Crick Lund and Dr Charlotte Hanlon

11:00-11:25 Evidence for reducing stigma and discrimination in low- and middle-income countries, Prof Sir Graham Thornicroft

11:25-11:50 Capacity building, Dr Ritsuko Kakuma (LSHTM)

11:50-13:00 Lunch break (food not provided)

13:00-13:50 *Lightning Talks* by early-career researchers, facilitated by Prof Sarah Byford

Lightning talks presenters	Title
Caroline Smartt	Pathways into and out of homelessness among a cohort of individuals with severe mental illness in rural Ethiopia: a qualitative study
Elaine Flores	Mental health impact of "El Niño" related effects on affected residents in the northern coast of Peru
Georgia Lockwood Estrin	From the lab to the field: measuring brain activity and eye movements to assess neurodevelopment in low resource settings
Matthew Aldridge	The Potential of Buddhist Ayurvedic Counselling & Psychiatry (BACP) for Global Mental Health
Nicole Votruba	Development and validation of the EMTA 13 framework for mental health research evidence agenda-setting and policymaking and in low- and middle-income countries
One Selohilwe	Evaluating the role of levels of exposure to a task shared depression counselling intervention led by behavioural health counsellors: Outcome and process evaluation
Roxanne C Keynejad	Psychosocial interventions for common mental disorders in women experiencing intimate partner violence in low and middle-income countries: a systematic review and meta-analysis
Wubalem Fekadu	Multidimensional impact of severe mental illnesses on family members in rural Ethiopia: Qualitative study
Prakash BK	Community perceptions on the feasibility and acceptability of the implementation of a group-based psychological intervention for adolescents with depression in rural Nepal

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&TROPICAL
MEDICINE

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College
LONDON

Appendix C Ethical clearance certificates

- Quantitative Component, SALT trial, Local ethics Committee approval, UPCH EC (24Apr15)

UNIVERSIDAD PERUANA
CAYETANO HEREDIA

Vicerrectorado de Investigación
Dirección Universitaria de Investigación
Ciencia y Tecnología - DUICT

CONSTANCIA

El Presidente del Comité Institucional de Ética (CIE) de la Universidad Peruana Cayetano Heredia hace constar que el comité de ética aprobó la **ENMIENDA/MODIFICACIÓN** del proyecto de investigación señalado a continuación.

Título del Proyecto:	"Launching a salt substitute to reduce blood pressure at the population level in Peru –Part 2"
Código de inscripción :	58563
Investigador principales:	J. Jaime Miranda, Robert H. Gilman, Antonio Bernabe-Ortiz, Francisco Diez-Canseco

La **enmienda/modificación** corresponde a los siguientes documentos:

1. **Protocolo de investigación**, versión 3.1 de fecha 04 de Marzo del 2015. Versión en español.
2. **Consentimiento informado**, versión 3.2 de fecha 22 de abril del 2015. Versión en español.

Lima, 24 de abril del 2015

Fredy Canchihuamán Rivera, MD MPH PhD
Presidente
Comité Institucional de Ética en Investigación

Av. Honorio Delgado 430, Lima 31 / Apartado Postal 4314, Lima 100, Telefax: 482-4541
Teléfono: 319-0000 Anexo: 2271 / 2542
e-mail: duict@oficinas-upch.pe   http://www.upch.edu.pe/vrinve/duict/

- Quantitative Component, Secondary Data analysis approval, LSHTM EC

London School of Hygiene & Tropical Medicine
Keppel Street, London WC1E 7HT
United Kingdom
Switchboard: +44 (0)20 7636 8636

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LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Observational / Interventions Research Ethics Committee

Dr. Elaine Flores
LSHTM

11 September 2017

Dear Elaine,

Study Title: Mental health outcomes and possible resilience strategies associated with El Niño Southern Oscillation (ENSO) in the north coast of Peru - Quantitative Component

LSHTM ethics ref: 14379

Thank you for your application for the above research, which has now been considered by the Observational Committee.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Conditions of the favourable opinion

Approval is dependent on local ethical approval having been received, where relevant.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document Type	File Name	Date	Version
Local Approval	2. Certificado de aprobación Salt Part-2 (Spanish) Original	17/09/2013	1
Local Approval	Salt - UPCH Ethical approval (Part 2) - Spanish	24/04/2015	1
Protocol / Proposal	Elaine-C.Flores_Upgrading-report_Final_19Jan17	19/01/2017	1
Protocol / Proposal	Amendment_ENSO and depression scores_Elaine Flores_v.4May17	04/05/2017	1
Investigator CV	CV_Elaine_Flores_MD_MSC_PHDc_Jul2017	04/07/2017	1

After ethical review

The Chief Investigator (CI) or delegate is responsible for informing the ethics committee of any subsequent changes to the application. These must be submitted to the Committee for review using an Amendment form. Amendments must not be initiated before receipt of written favourable opinion from the committee.

The CI or delegate is also required to notify the ethics committee of any protocol violations and/or Suspected Unexpected Serious Adverse Reactions (SUSARs) which occur during the project by submitting a Serious Adverse Event form.

An annual report should be submitted to the committee using an Annual Report form on the anniversary of the approval of the study during the lifetime of the study.

At the end of the study, the CI or delegate must notify the committee using an End of Study form.

All aforementioned forms are available on the ethics online applications website and can only be submitted to the committee via the website at: http://leo.lshtm.ac.uk

Additional information is available at: www.lshtm.ac.uk/ethics

Yours sincerely,

Professor John DH Porter
Chair

ethics@lshtm.ac.uk
http://www.lshtm.ac.uk/ethics/

Page 1 of 2

- Qualitative component, fieldwork activities approval, Local Ethics Committee, UPCH EC (Protocol v. 19Jan2019, ICF 2.1 14April 2017)

**UNIVERSIDAD PERUANA
CAYETANO HEREDIA**
Vicerrectorado de Investigación
Dirección Universitaria de Investigación,
Ciencia y Tecnología (DUICT)

CONSTANCIA 222 -07-17

El Presidente del Comité Institucional de Ética en Investigación (CIEI) de la Universidad Peruana Cayetano Heredia hace constar que el proyecto de investigación señalado a continuación fue **APROBADO** por el Comité Institucional de Ética en Investigación.

Título del Proyecto
: "Percepción de los efectos de El niño - Oscilación Sur (ENSO) sobre la salud mental comunitaria y estrategias de resiliencia basadas en la comunidad a través de la investigación cualitativa"

Código de inscripción
: 100510

Investigador principal
: Flores Ramos, Elaine Catherine
Lescano Guevara, Andrés Guillermo

La aprobación incluyó los documentos finales descritos a continuación:

1. **Protocolo de investigación,** versión en fecha 19 de enero del 2017.
2. **Consentimiento informado,** versión 2.1 de fecha 14 de abril del 2017.

La **APROBACIÓN** considera el cumplimiento de los estándares de la Universidad, los lineamientos Científicos y éticos, el balance riesgo/beneficio, la calificación del equipo investigador y la Confidencialidad de los datos, entre otros.

Cualquier enmienda, desviaciones, eventualidad deberá ser reportada de acuerdo a los plazos y normas establecidas. El investigador reportará cada seis meses el progreso del estudio y alcanzará un informe al término de éste. La aprobación tiene vigencia desde la emisión del presente documento hasta **18 de abril del 2018**.

Si aplica, los trámites para su renovación deberán iniciarse por lo menos 30 días previos a su vencimiento.

Lima, 19 de abril del 2017.

Dra. Frine Samalvides Cuba
Presidenta
Comité Institucional de Ética en Investigación

/ga

- Qualitative component, fieldwork activities approval, Local Ethics Committee, UPCH EC (Addendum ICFs v. 2.2 22 April 2017 FGDs and IDIs)

UNIVERSIDAD PERUANA CAYETANO HEREDIA
Vicerrectorado de Investigación
Dirección Universitaria de Investigación,
Ciencia y Tecnología (DUICT)

CONSTANCIA

El Presidente del Comité Institucional de Ética en Investigación (CIEI) de la Universidad Peruana Cayetano Heredia hace constar que el comité institucional de ética en investigación aprobó la **ENMIENDA/MODIFICACIÓN** del proyecto de investigación señalado a continuación.

Título del Proyecto : "Percepción de los efectos de El Niño - Oscilación Sur (ENSO) sobre la salud mental comunitaria y estrategias de resiliencia basadas en la comunidad a través de la investigación cualitativa".

Código de inscripción : 100510

Investigador principal : Flores Ramos, Elaine Catherine
Lescano Guevara, Andrés Guillermo

La **enmienda/modificación** corresponde a los siguientes documentos:

1. **Consentimiento informado (Grupos focales)**, versión 2.2 recibida en fecha 22 de abril del 2017.
2. **Consentimiento informado (Entrevistas a profundidad)**, versión 2.2 recibida en fecha 22 de abril del 2017.

Lima, 26 de abril del 2017.

Dra. Frine Samalvides Cuba
Presidenta
Comité Institucional de Ética en Investigación

/gra

- Appendix - DIRESA Tumbes, Administrative approval to the project

GOBIERNO REGIONAL TUMBES
DIRECCCION REGIONAL DE SALUD TUMBES
DIRECCION GENERAL

"Año del Buen Servicio al Ciudadano"

Tumbes, 04 de Abril del 2017.

OFICIO N° 711 -2017-GOB.REG.TUMBES-GRDS-DIRESA-DR

Señora.
Elaine Catherine FLORES RAMOS.
Investigadora Principal del Proyecto.

ASUNTO : ALCANZO OPINIÓN FAVORABLE.

Es grato dirigirme a usted, para saludarle cordialmente y a la vez hacerle llegar el documento adjunto N/C N°067-2017/GOB.REG.TUMBES-DRST-DR-DEE, Reg. Doc. 72811, la cual se da la opinión favorable para el desarrollo del Proyecto de Investigación **"Percepción de los Efectos del Niño – Oscilación Sur (ENSO), sobre la Salud Mental Comunitaria y Estrategias de Resiliencia Basadas en la Comunidad a través de la Investigación Cualitativa"**, así mismo se sirva tener en consideración las recomendaciones expresadas en el documento adjunto.

Sin otro particular y agradeciendo la atención a la presente, es propicia la ocasión para expresarle a Usted los sentimientos de mi consideración y estima personal.

Atentamente,

WJDC/DR
c.c.
Archivo

Mg. Wilmer J. Davis Carrillo
DIRECTOR REGIONAL DE SALUD TUMBES

Reg. Doc. 00069126 | Exp. 00063583

V° B°

10- 04- 17
Hora. 11:15

Av. Fernando Belaunde Terry
Dirección Regional de Salud Tumbes Mz. "X" Lote 01 10
Urb. José Lishner Tudela Telf. 523789

- APPENDIX – UPCH SIDISI Registry of the qualitative component

UNIVERSIDAD PERUANA
CAYETANO HEREDIA

REGISTRO SIDISI (Estado : [Registrado SIDISI])

CÓDIGO DE REGISTRO SIDISI :
100510

REGISTRO DEL PROYECTO :
10/02/2017 06:42:59

NOMBRE DEL PROYECTO :
PERCEPCIÓN DE LOS EFECTOS DE EL NIÑO – OSCILACIÓN SUR (ENSO) SOBRE LA SALUD MENTAL COMUNITARIA Y ESTRATEGIAS DE RESILIENCIA BASADAS EN LA COMUNIDAD A TRAVÉS DE LA INVESTIGACIÓN CUALITATIVA.

RESUMEN :
LOS EFECTOS CLIMÁTICOS CÍCLICOS, COMO LOS EFECTOS DE EL NIÑO OSCILACIÓN SUR (ENSO), ESTÁN ASOCIADOS CON LA SALUD MENTAL Y EL IMPACTO PSICOSOCIAL, QUE PUEDE SER DE MAYOR MAGNITUD DEPENDIENDO DE SU INTENSIDAD, LAS VULNERABILIDADES LOCALES DE SALUD Y EL NIVEL DE RESPUESTA Y PREPARACIÓN DE LAS COMUNIDADES AFECTADAS (OMS, 2016). A PESAR DE ESTO, SE TIENE POCO CONOCIMIENTO SOBRE LOS EFECTOS DE ENSO EN LA SALUD MENTAL DE LOS RESIDENTES DE TUMBES, UN DEPARTAMENTO DE BAJOS INGRESOS DE LA COSTA NORTE PERUANA, QUE USUALMENTE ES AFECTADO POR LAS FUERTES LLUVIAS E INUNDACIONES EN LOS EVENTOS ENSO. ESTOS RESIDENTES, QUE VIVEN EN ZONAS HISTÓRICAMENTE VULNERABLES Y SON INCAPACES DE DISMINUIR LOS PELIGROS AMBIENTALES QUE RODEAN A SUS COMUNIDADES, PUEDEN EXPERIMENTAR UN EFECTO PERJUDICIAL ACUMULADO EN SU BIENESTAR PSICOLÓGICO, TANTO INDIVIDUAL COMO COMUNITARIA. EXISTE EVIDENCIA QUE LAS ESTRATEGIAS BASADAS EN LA COMUNIDAD QUE BUSQUEN FORTALECER LOS LAZOS COMUNITARIOS Y LA COOPERACIÓN MUTUA REDUCIRÍAN EL RIESGO DE DESARROLLAR TRASTORNOS MENTALES Y AUMENTARÍAN LA RESILIENCIA DE LAS COMUNIDADES AFECTADAS.
ES POR ELLO, QUE SE REQUIERE EXPLORAR LAS PERCEPCIONES DE LA COMUNIDAD ACERCA DE LOS EFECTOS DE ENSO EN LA SALUD MENTAL, ASÍ COMO CONOCER CÓMO FUE LA RESPUESTA INDIVIDUAL Y COMUNITARIA AL EVENTO ENSO MÁS RECIENTE (2015-2016). ADEMÁS, CONOCER LA DISPONIBILIDAD Y EL ACCESO A LOS SISTEMAS DE APOYO PSICOLÓGICO QUE YA SE ENCUENTREN IMPLEMENTADOS EN ESTA ÁREA, LO QUE PODRÍA DISMINUIR LOS IMPACTOS PERJUDICIALES DE ENSO. POR ÚLTIMO, ES NECESARIO CONOCER SU PERCEPCIÓN SOBRE LAS POSIBLES ESTRATEGIAS QUE AYUDARÍAN A FORTALECER SUS LAZOS COMUNITARIOS Y MEJORAR SU CAPACIDAD DE ADAPTACIÓN Y RECUPERACIÓN ANTE FUTUROS EVENTOS DE ENSO.

ESTADO DEL REGISTRO :
REGISTRADO SIDISI

KEYWORDS :
SALUD , SALUD_MENTAL , MENTAL DISORDERS , DESASTRES , FENÓMENO , EL , NIÑO

TIPO DE PROYECTO :
INVESTIGACIÓN

SUB TIPO DE PROYECTO :
INVESTIGACIÓN

INTEGRANTES :
COAUTOR PRINCIPAL : 09356717 - LESCANO GUEVARA ANDRES GUILLERMO
AUTOR PRINCIPAL : 40673492 - FLORES RAMOS ELAINE CATHERINE

UNIDAD DE GESTIÓN:
FSP FACULTAD DE SALUD PUBLICA Y ADMINISTRACION

UNIDAD OPERATIVA EN LA QUE SE DESARROLLA EL PROYECTO :
FSP DPTO.ACADEMICOS DE SALUD PUBLICA ADMINISTRACION Y CIENCIAS SOCIALE

ÁREA DE LA CIENCIA :

270

CIENCIAS MÉDICAS Y DE SALUD

SUB ÁREA DE LA CIENCIA :
CIENCIAS DE LA SALUD

DISCIPLINA DE LA CIENCIA :
SALUD PÚBLICA

FINANCIAMIENTO :
AUTOFINANCIADO

EVENTOS DEL REGISTRO :
GUARDADO : 10/02/2017 06:42:59, EFECTUADO POR : [40673492] - FLORES RAMOS ELAINE CATHERINE
REGISTRADO SIDISI : 10/02/2017 06:42:59, EFECTUADO POR : [40673492] - FLORES RAMOS ELAINE CATHERINE

Appendix D Systematic review databases search strategy

Database	Query
Embase	1. exp social capital
	2. (social adj (capital or cohes* or organis* or organiz*)).mp. [mp=ab,ti,hw,ot,sh]
	3. (community adj3 (cohes* or participa*)).mp. [mp=ab,ti,hw,ot,sh]
	4. ((neighbourhood or neighbourhood) adj cohes*).mp. [mp=ab,ti,hw,ot,sh]
	5. or/1-4
	6. exp mental health/
	7. exp mental disorders/
	8. mental health.mp. [mp=ab,ti,hw,ot,sh]
	9. (mental* adj (health or ill* or disord* or disab* or handicap* or distress*)).mp. [mp=ab,ti,hw,ot,sh]
	10. (wellbeing or well-being).mp. [mp=ab,ti,hw,ot,sh]
	11. (psychotic or mood or bipolar or affective or obsessive?compulsive or panic or stress or common mental) adj3 disorder*.ab,ti.
	12. (psychiatric or psychiatry or neuropsych* or psycholog* or neurotic or neurosis or neuroses or depress* or anxiet* or anxious or schizophreni* or schizotyp* or psychos* or mania or manic or delusion* or OCD or phobia* or phobic or somatic or somatoform or suicid* or dement* or amnes* or eating or anorex* or bulimi* or personalit*).ab,ti.
	13. ((substance or drug* or alcohol or opioid* or prescribed opioid* or cannab* or cocaine or hallucinog* or inhalant* or sedative* or ATS) adj3 (dependence or misuse or abus*)).ab,ti.
	14. or/6-13
	15. 5 AND 14
	16. adults.mp. [mp=ab,ti,hw,ot,sh]
	17. 15 AND 16
lobal Health	1. social capital.mp
	2. (social adj (capital or cohes* or organis* or organiz*)).mp. [mp=abstract, title, original title, broad terms, heading words, identifiers, cabicodes]
	3. (community adj3 (cohes* or participa*)).mp. [mp=title, abstract, heading word,

table of contents, key concepts, original title, tests & measures]

4. ((neighbourhood or neighbourhood) adj cohes*).mp.

5. or/1-4

6. exp mental health/

7. exp mental disorders/

8. mental health.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures]

9. (mental* adj (health or ill* or disord* or disab* or handicap* or distress*)).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures]

10. (wellbeing or well-being).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures]

11. (psychotic or mood or bipolar or affective or obsessive?compulsive or panic or stress or common mental) adj3 disorder*.ab,ti.

12. (psychiatric or psychiatry or neuropsych* or psycholog* or neurotic or neurosis or neuroses or depress* or anxiet* or anxious or schizophreni* or schizotyp* or psychos* or mania or manic or delusion* or OCD or phobia* or phobic or somatic or somatoform or suicid* or dement* or amnes* or eating or anorex* or bulimi* or personalit*).ab,ti.

13. ((substance or drug* or alcohol or opioid* or prescribed opioid* or cannab* or cocaine or hallucinog* or inhalant* or sedative* or ATS) adj3 (dependence or misuse or abus*)).ab,ti.

14. or/6-13

15. 5 AND 14

16. adults/

17. 15 AND 16

Medline	1. social capital.mp 2. (social adj (capital or cohes* or organis* or organiz*)).mp. 3. (community adj3 (cohes* or participa*)).mp. 4. ((neighbourhood or neighbourhood) adj cohes*).mp. 5. or/1-4 6. mental health.mp. 7. mental disorders.mp. 8. (mental* adj (health or ill* or disord* or disab* or handicap* or distress*)).mp. 9. (wellbeing or well-being).mp. 10. (psychotic or mood or bipolar or affective or obsessive?compulsive or panic or stress or common mental) adj3 disorder*.ab,ti. 11. (psychiatric or psychiatry or neuropsych* or psycholog* or neurotic or neurosis or neuroses or depress* or anxiet* or anxious or schizophreni* or schizotyp* or psychos* or mania or manic or delusion* or OCD or phobia* or phobic or somatic or somatoform or suicid* or dement* or amnes* or eating or anorex* or bulimi* or personalit*).ab,ti. 12. ((substance or drug* or alcohol or opioid* or prescribed opioid* or cannab* or cocaine or hallucinog* or inhalant* or sedative* or ATS) adj3 (dependence or misuse or abus*)).ab,ti. 13. or/6-12 14. 5 AND 13 15. adults/ 16. 14 AND 15
PsycINFO	social capital.mp 2. (social adj (capital or cohes* or organis* or organiz*)).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures] 3. (community adj3 (cohes* or participa*)).mp. 4. ((neighbourhood or neighbourhood) adj cohes*).mp. 5. or/1-4 6. mental health.mp 7. exp mental disorders/

	8. (mental* adj (health or ill* or disord* or disab* or handicap* or distress*)).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures] 9. (wellbeing or well-being).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures] 10. ((psychotic or mood or bipolar or affective or obsessive?compulsive or panic or stress or common mental) adj3 disorder*.ab,ti. 11. (psychiatric or psychiatry or neuropsych* or psycholog* or neurotic or neurosis or neuroses or depress* or anxiet* or anxious or schizophreni* or schizotyp* or psychos* or mania or manic or delusion* or OCD or phobia* or phobic or somatic or somatoform or suicid* or dement* or amnes* or eating or anorex* or bulimi* or personalit*).ab,ti. 12. ((substance or drug* or alcohol or opioid* or prescribed opioid* or cannab* or cocaine or hallucinog* or inhalant* or sedative* or ATS) adj3 (dependence or misuse or abus*)).ab,ti. 13. or/6-12 14. 5 AND 13 15. adults/ 16. 14 AND 15
Cochrane (CDSR, DARE, CENTRAL)	1. MeSH descriptor Social Capital explode all trees 2. social near cohesion 3. social near networks 4. social near organization 5. social near community 6. social near community participation 7. social near neighbourhood 8. #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 9. MeSH descriptor Mental health explode all trees 10. (mental* adj (health or ill* or disord* or disab* or handicap* or distress*)).ab.ti. 11. (wellbeing or well-being).ab.ti. 12. (psychotic or mood or bipolar or affective or obsessive?compulsive or panic or

	stress or common mental disorder* adj6).ab.ti.
	13. (psychiatric or psychiatry or neuropsych* or psycholog* or neurotic or neurosis or neuroses or depress* or anxiet* or anxious or schizophreni* or schizotyp* or psychos* or mania or manic or delusion* or OCD or phobia* or phobic or somatic or somatoform or suicid* or dement* or amnes* or eating or anorex* or bulimi* or personalit*).ab.ti.
	14. ((substance or drug* or alcohol or opioid* or prescribed opioid* or cannab* or cocaine or hallucinog* or inhalant* or sedative* or ATS) adj3 (dependence or misuse or abus*)).ab.ti.
	15. #9 OR #10 OR #11 OR #12 OR #13 OR #14
	16. #8 AND #15
Social Sciences Citation Index	1. TS=(social capital)
	2. TS=(social cohesion or social networks or social organization or social organisation or community cohesion or community participation or neighbourhood cohesion)
	3. or 1-2
	4. TS=mental health
	5. TS=mental disorders
	6. TS=(mental health or mental* ill* or mental distress or disorder or disability or well-being)
	7. or 4-6
	8. 3 AND 7
	9. TS=adults
	10. 8 AND 9
Sociofile (Worldcat) World Bank elibrary LILACS IBSS - PROQUEST	kw:("social capital" OR "social cohesion" OR "social networks" OR "social organization" OR "social organisation" OR "community cohesion" OR "community participation" OR "neighbourhood cohesion" OR "neighbourhood cohesion") AND ("mental health" OR "mental* ill*" OR "mental distress" OR "disorder" OR "disability" OR "well-being" OR "well-being")'

Health Management Information Consortium	1. social capital.mp
	2. (social adj (capital or cohes* or organis* or organiz*)).mp.
	3. (community adj3 (cohes* or participa*)).mp.
	4. ((neighbourhood or neighbourhood) adj cohes*).mp.
	5. or/1-4
	6. mental health.mp.
	7. mental disorders.mp.
	8. (mental* adj (health or ill* or disord* or disab* or handicap* or distress*)).mp.
	9. (wellbeing or well-being).mp.
	10. (psychotic or mood or bipolar or affective or obsessive?compulsive or panic or stress or common mental) adj3 disorder*.ab,ti.
	11. (psychiatric or psychiatry or neuropsych* or psycholog* or neurotic or neurosis or neuroses or depress* or anxiet* or anxious or schizophreni* or schizotyp* or psychos* or mania or manic or delusion* or OCD or phobia* or phobic or somatic or somatoform or suicid* or dement* or amnes* or eating or anorex* or bulimi* or personalit*).ab,ti.
	12. ((substance or drug* or alcohol or opioid* or prescribed opioid* or cannab* or cocaine or hallucinog* or inhalant* or sedative* or ATS) adj3 (dependence or misuse or abus*)).ab,ti.
	13. or/6-12
	14. 5 AND 13
	15. adults/
	16. 14 AND 15

Keywords: ((social adj (capital or cohes* or organis* or organiz*))) OR TOPIC: ((community adj3 (cohes* or participa*))) OR TOPIC: (((neighbourhood or neighbourhood) adj cohes*)) AND TOPIC: ((mental* adj (health or ill* or disord* or disab* or handicap* or distress*))) OR TOPIC: ((wellbeing or well-being))

Appendix E Salt Substitution Trial (SALT Trial) - PHQ-9 scale (Spanish)

Código del Participante: ☐☐☐ – ☐☐☐ – ☐☐	Código de trabajador: ☐☐

Sección 6: Formato de Evaluación de Salud mental (MHF)

Módulo: Síntomas depresivos	Respuesta

Instrucciones: Escoja una de las opciones de acuerdo a las respuestas del participante:
0 = Nunca
1 = Varios días
2 = Más de la mitad de los días
3 = Casi todos los días

Pregunta: Durante las <u>últimas 2 semanas</u>, ¿con qué frecuencia le han molestado los siguientes problemas?

1	Tener poco interés o placer en hacer las cosas	☐
2	Sentirse desanimado/a, deprimido/a, triste o sin esperanza	☐
3	Problemas en dormirse o mantenerse dormido/a, o en dormir demasiado	☐
4	Sentirse cansado/a o tener poca energía	☐
5	Tener poco apetito o comer en exceso	☐
6	Sentirse mal acerca de sí mismo/a – o sentir que es un/una fracasado/a o que se ha fallado a si mismo/a o a su familia	☐
7	Dificultad para poner atención, concentrarse en cosas tales como leer el periódico o ver televisión	☐
8	Moverse o hablar tan despacio que otras personas lo pueden haber notado – o lo contrario: estar tan inquieto/a o intranquilo/a que se ha estado moviendo mucho más de lo normal	☐
9	Pensamientos de que sería mejor estar muerto/a o que quisiera hacerse daño de alguna forma	☐

Appendix F Protocol for qualitative component (Spanish)

Percepción de los efectos de *El Niño* – Oscilación Sur (ENSO) sobre la salud mental comunitaria y estrategias de resiliencia basadas en la comunidad a través de la Investigación cualitativa.

Universidad Peruana Cayetano Heredia (UPCH)

Equipo de Trabajo:

Elaine C. Flores, MD, MSc, PhD (candidata). Investigadora Principal

Andrés G. (Willy) Lescano, PhD, MHS, MHS. Investigador Asociado.

Lima, 19 de Enero del 2017

RESUMEN

Los efectos climáticos cíclicos, como los efectos de *El Niño* Oscilación Sur (ENSO), están asociados con la salud mental y el impacto psicosocial, que puede ser de mayor magnitud dependiendo de su intensidad, las vulnerabilidades locales de salud y el nivel de respuesta y preparación de las comunidades afectadas (OMS, 2016). A pesar de esto, se tiene poco conocimiento sobre los efectos de ENSO en la salud mental de los residentes de Tumbes, un departamento de bajos ingresos de la costa norte peruana, que usualmente es afectado por las fuertes lluvias e inundaciones en los eventos ENSO. Estos residentes, que viven en zonas históricamente vulnerables y son incapaces de disminuir los peligros ambientales que rodean a sus comunidades, pueden experimentar un efecto perjudicial acumulado en su bienestar psicológico, tanto individual como comunitaria. Existe evidencia que las estrategias basadas en la comunidad que busquen fortalecer los lazos comunitarios y la cooperación mutua reducirían el riesgo de desarrollar trastornos mentales y aumentarían la resiliencia de las comunidades afectadas.

Es por ello, que se requiere explorar las percepciones de la comunidad acerca de los efectos de ENSO en la salud mental, así como conocer cómo fue la respuesta individual y comunitaria al evento ENSO más reciente (2015-2016). Además, conocer la disponibilidad y el acceso a los sistemas de apoyo psicológico que ya se encuentren implementados en esta área, lo que podría disminuir los impactos perjudiciales de ENSO. Por último, es necesario conocer su percepción sobre las posibles estrategias que ayudarían a fortalecer sus lazos comunitarios y mejorar su capacidad de adaptación y recuperación ante futuros eventos de ENSO.

A. MARCO CONCEPTUAL Y CONTEXTO DEL PROYECTO.

Salud mental y desastres

Los desastres (naturales y provocados por el hombre) desafiarán la capacidad de adaptación del individuo, convirtiéndose en un riesgo adicional para las personas afectadas de desarrollar desórdenes mentales (1). El desarrollo de estos trastornos se asociará: con el grado de exposición al evento, la presencia de factores únicos de los grupos vulnerables dentro de las comunidades afectadas, así como factores de estrés secundarios (2, 3), como las perdidas socioeconómicas y la falta de acceso de servicios de apoyo, que contribuirán a determinar la naturaleza y la cantidad de morbilidad mental. Los desastres tendrán un peor impacto si ocurren en países de bajos y medianos ingresos (LMICs) y aquellos asociados con la destrucción substancial de la comunidad.

En los desastres relacionados con ENSO en la costa norte peruana, las comunidades afectadas experimentarán lluvias torrenciales e inundaciones. Los efectos globales de las inundaciones en la salud se examinaron en una revisión sistemática (SR) (4). Una sección especial sobre las asociaciones de estos con la salud mental, concluye que los problemas mentales fueron causados directamente por la experiencia de estar en una inundación, o indirectamente durante el proceso de reconstrucción. A pesar de ello, los autores informaron que se encontraron escasas evidencias sobre intervenciones de salud pública (como la gestión de los impactos de salud mental, enfocados en grupos vulnerables) y no encontraron estudios sobre la efectividad de las medidas preventivas de salud pública, incluyendo los sistemas de alerta temprana.

Volviendo al escenario local, el enfoque del ministerio de salud peruano en la atención de la salud mental post-desastre ha creado e implementado "brigadas de salud mental" luego de la notificación de un desastre. Profesionales capacitados en salud mental viajarán a la zona post-desastre unos días después del evento y apoyarán a las comunidades afectadas durante un periodo determinado, brindando consultas clínicas a las personas afectadas por el desastre (5, 6). No se han reportado datos en referencia al impacto o efecto en el desarrollo de desórdenes mentales en las comunidades peruanas afectadas por desastres con la implementación de estas brigadas.

Además, como se informó en un estudio realizado tres años después de un sismo en la costa sur del Perú, los participantes resaltaron que un desastre daña gravemente el tejido social y las redes comunitarias, con peores resultados en los lugares de pobreza. Las prioridades identificadas para ser resueltas fueron problemas a nivel interpersonal, las preocupaciones por la seguridad de los grupos vulnerables y las dificultades para organizar el trabajo en redes dentro de las comunidades. Por último, los participantes tuvieron una débil percepción de independencia entre los miembros de la comunidad, Lo que dificultó aún más la generación de iniciativas de acción social colectiva, como también se encontró en un informe anterior, en la costa norte del Perú (7). "La fragmentación social en este nivel se evidenció fuertemente cuando se requería un esfuerzo colectivo para hacer frente al impacto de un desastre natural ".

El Niño Oscilación Sur (ENSO) & el Cambio climático

ENSO, es un fenómeno oceánico-atmosférico que surge como una manifestación del aumento de la temperatura superficial del mar (SST) debido a la entrada de grandes cantidades de agua caliente desde el Océano Pacífico occidental hasta el Pacífico ecuatorial, producida por cambios en la presión atmosférica. El ciclo (ENSO) afectará la atmósfera y los patrones climáticos. Sus efectos dependen fuertemente de la ubicación y la estación. La principal amenaza proviene de la reducción de las lluvias y la sequía en algunas regiones, pero El Niño también puede causar fuertes lluvias e inundaciones en otras zonas, lo que lo convierte en un fenómeno complejo. La definición operacional de ENSO se basa en el Índice de Niño Oceánico (ONI) que se basa en elevaciones de la SST por 0,5 ° C o más, por lo menos durante 5 períodos mensuales consecutivos superpuestos en trimestres (8, 9). La distribución espacial y la gravedad de los impactos asociados con ENSO dependerán del tipo (ubicación de la anomalía máxima de SST) y de la fuerza (magnitud de la anomalía de SST) del evento (10). ENSO está constantemente asociado con fuertes lluvias e inundaciones en la costa oeste de Sudamérica. Existe la preocupación de que los sucesos actuales y futuros del ENSO se vuelvan más frecuentes y más intensos con el efecto atribuible al cambio climático global (11, 12). Como sabemos que casi el 99% del impacto en salud relacionado con el cambio climático se impondrá en países en desarrollo como el Perú, a pesar de que estos producen el 3% de las emisiones de CO_2 (13) y el riesgo para la salud que representa este factor, amenaza con seguir aumentando- esta exposición involuntaria representa una gran inequidad en salud que debe ser abordada y sus efectos negativos, prevenidos, como un riesgo global significativo para la salud (14)

Desastres ambientales en Perú

Perú está ubicado en un área denominada "Circulo de Fuego del Pacífico", caracterizada por una alta actividad sísmica, donde se produce aproximadamente el 80% de los movimientos sísmicos del mundo. Resultando en una exposición constante de su población a los terremotos, tsunamis y actividad volcánica. Además, su ubicación en la zona tropical y subtropical de la costa occidental de América del Sur, determina su exposición a los cambios ambientales que en muchos casos generan desastres como: ENSO (con precipitaciones extremas, inundaciones, sequías) heladas, vientos fuertes, entre otros. Por último, debido a la presencia de la Cordillera de los Andes, el territorio peruano se caracteriza por tener tres áreas geográficas definidas, costa, montañas y selva, presentando una amplia gama de microclimas que serán afectados específicamente por una alteración del equilibrio ambiental. Como resultado de sus características geográficas, los peligros geológicos tales como deslizamientos de tierra, avalanchas y deslizamientos de lodo ocurrirán cíclicamente. La población peruana, debido a la constante exposición acumulada a eventos traumáticos, tiene una vulnerabilidad significativa y única para desarrollar desórdenes mentales relacionados con desastres naturales debido a su ubicación, su vulnerabilidad a eventos climáticos y su historia de conflictos sociales y violencia interna (15-18)

En Perú, los eventos ENSO conducen a un aumento de la Temperatura de la Superficie del Mar (SST) de la costa peruana, con mayor Intensidad en el norte, aumentando sus tasas de evaporación, lo que, agregándose al efecto orográfico de los Andes peruanos, a su vez desarrollarán inundaciones y diferentes tipos de movimientos de masas, como "huaycos", deslizamientos de tierra, etc.

El último fenómeno de ENSO afectó a más de 30.000 personas en el departamento de Tumbes, que sufrieron daños a sus hogares y lugares de trabajo. Además, la región tuvo un colapso del sistema de distribución de agua y alcantarillado, así como daños a más de 70 kilómetros de redes viales y puentes (19, 20). Uno de los problemas recurrentes en este y otros eventos anteriores de ENSO es la falta de esfuerzos coordinados entre las autoridades locales, la falta de una respuesta eficaz frente a las inundaciones y la lluvia extrema que sufren las zonas vulnerables y la falta de implementación de planes preventivos para desastres ambientales (19). Así como después de los daños en el departamento causado por el último *El Niño* (1997-1998), las comunidades afectadas siguen viviendo en las mismas zonas propensas a desastres, ya que nunca fueron reubicadas por las autoridades locales o regionales y por razones económicas, no son capaces de hacerlo ellos mismos (21).

Capital Social y Salud Mental

Una salud mental pobre tiene una fuerte asociación con la salud física (22), la fortaleza comunidad y el impacto económico negativo (23, 24), y puede conducir a una deterioración del desarrollo, con la consecuente pobreza, pérdida y disminución del capital humano (25-27) y del capital social (28, 29). Este último es un constructo sociológico que ha sido activamente investigado en las últimas dos décadas, para conocer mejor el alcance y la naturaleza de cómo puede mejor emplearse como un factor protector o beneficioso para la salud mental y el bienestar psicológico, entre otros factores relacionados con la salud.

Se ha establecido la "psicología social de la participación" (30) como el proceso involucrado en el funcionamiento de la participación comunitaria, con tres factores: capital social, identidad social y representación social. Existe una fuerte evidencia que muestra cómo las relaciones sociales, las pertenencias a grupos y las identidades sociales relacionadas con ellos, proporcionan un impacto beneficioso, protegiendo a la salud mental de diferentes poblaciones y proporcionando bienestar psicológico (31-38). Sin embargo, las asociaciones complejas del capital social, el bienestar psicológico, los factores determinantes de la salud (39, 40) y los factores contextuales continúan siendo investigados por investigadores sociales. El principal obstáculo para determinar una asociación causal más fuerte para capital social y la salud mental ha sido la escasez de estudios prospectivos controlados sobre este tema (41-43). A pesar de las diferentes definiciones y clasificaciones de este constructo, se ha demostrado que un alto nivel de capital social dentro de una comunidad es un factor beneficioso para la salud mental y de apoyo para sus miembros. (42, 44-48)

<u>Intervenciones de Capital social como factor protector de los trastornos de la salud mental</u>

A pesar de la evidencia de los resultados beneficiosos del capital social en la salud mental, la mayoría de estudios realizados han sido transversales y algunos pocos longitudinales (49-54).

Particularmente en los países de bajos y medianos ingresos, donde existe una importante brecha de tratamiento para los desórdenes mentales (55) existe la necesidad de contar con intervenciones basadas en la evidencia, que puedan actuar como herramientas preventivas contra ellas y puedan ser administradas a nivel comunitario. Una revisión sistemática reciente (56) mostró evidencia de que las intervenciones dirigidas a mejorar el capital social pueden ser una forma costo efectiva de prevenir desórdenes mentales comunes, y las iniciativas enfocadas en aumentar el componente cognitivo del capital social pueden actuar como un factor de protección contra los desórdenes mentales a largo plazo. Las intervenciones que promueven el capital social en una comunidad pueden ser una opción atractiva, ya que implicarían el mapeo y uso de los recursos propios de las comunidades en lugar de depender de fuentes externas, para ser adaptados y puestos en práctica en diferentes contextos, como una herramienta preventiva o de tratamiento para desórdenes mentales. Las investigaciones en curso sobre este tema han reconocido extensamente las ventajas y los beneficios económicos de este acercamiento de la comunidad al bienestar psicológico y a la salud mental (57-60). Esto se aplica especialmente en los contextos de pobreza (29, 61), conflicto estructural, crisis humanitaria (62) o contextos ambientales y climáticos (63-68).

B. JUSTIFICACION DEL PROYECTO

Un elemento destacado y central en la revisión de la literatura sobre vulnerabilidades y manejo de desastres ambientales y climáticos es el objetivo de crear sociedades, comunidades e individuos menos vulnerables y resilientes, fortaleciendo los mecanismos que promueven su capacidad de adaptación a estos riesgos. El capital social tiene una influencia significativa en la capacidad de adaptación de las comunidades locales a eventos perjudiciales imprevisibles, ya que los impactos del cambio climático (69-71) y otros desastres ambientales (72-77). El impacto positivo del capital social en la adaptación de las comunidades al cambio climático fortalecerá el vínculo de confianza de las comunidades con las autoridades locales y ayudara a coordinar los esfuerzos preventivos y reconstructivos con medidas de apoyo social para minimizar los daños que una comunidad enfrenta cuando es afectada por un desastre ambiental.

Los contextos de LIMCs, como es el peruano, se enfrentarán periódicamente con eventos y desastres ambientales y geográficos. ENSO es percibido como el principal evento perturbador en el Perú (78), sin embargo, se ha investigado poco para su posible efecto en el MH de las comunidades afectadas. Según el Ministerio del Ambiente del Perú (Minam) el 46% del territorio nacional de Perú se encuentra en condiciones de vulnerabilidad alta a muy alta, y el 36,2% de la población (casi 10 millones de personas) vive en estas áreas (79). En la mayoría

de los casos posteriores a los desastres, las comunidades peruanas suelen enfrentarse a un escenario sombrío, ya que la mayoría de los residentes de las zonas afectadas dependen por completo del apoyo gubernamental y de otras instituciones no gubernamentales para hacer frente a la reconstrucción de sus medios de subsistencia (80). Desafortunadamente, a pesar de la reciente creación de regulaciones locales que tratan este tema (Ley No. 29664 de febrero de 2011) que crea el Sistema Nacional de Gestión de Riesgos de Desastres (SINAGERD) y el Centro Nacional de Gestión de Desastres Prevención de Desastres (CENEPRED), esto no ha ido acompañado de medidas de socorro rápido a las comunidades afectadas, como lo han demostrado algunos ejemplos recientes en el Perú (81, 82). La salud mental casi nunca se menciona como uno de los principales objetivos de estas campañas de ayuda. Además, hay altos índices de corrupción percibida por funcionarios públicos y autoridades de organizaciones privadas (83). Los informes internacionales consideran al Perú entre los 10 países más corruptos del mundo y lo sitúan en la posición 116 de 140 países según su fortaleza institucional pública. Además, varios escándalos de corrupción y estafa surgieron después de algunos desastres relacionados con los esfuerzos de reconstrucción de Las comunidades afectadas, debilitando aún más los bajos niveles de confianza de los residentes en dificultades en sus autoridades locales (84-86)

Este contexto desafiante, que enfrentará cíclicamente a los factores de estrés ambiental con la falta de oferta de servicios de salud mental o una escasa red de apoyo comunitario organizada. Es necesario contar con intervenciones replicables basadas en la evidencia y basadas en la comunidad que estimulen el capital social y puedan ser adaptadas e implementadas en diferentes escenarios para reforzar la salud mental conjuntamente con la recuperación, la capacidad de resiliencia y el bienestar de la comunidad.

C. OBJETIVOS DEL PROYECTO.

* Explorar cómo fue el impacto en los medios de vida, la salud y el bienestar psicológico de los residentes de Tumbes afectados por el evento ENSO 2015-2016 y cómo fue la respuesta individual y comunitaria a este evento.

* Explorar sus percepciones de disponibilidad y acceso a los sistemas de apoyo que se encuentren implementados en Tumbes, los cuales podrían disminuir los impactos perjudiciales del ENSO en su salud mental.

* Explorar sus percepciones sobre las posibles estrategias que ayudarían a fortalecer los lazos comunitarios existentes y mejorar su resiliencia en futuros eventos de ENSO.

* Examinar las opiniones de los representantes de las instituciones gubernamentales y no gubernamentales sobre los mismos temas.

D. METODOLOGIA

Entrevistas en profundidad y grupos de discusión focales con residentes afectados por ENSO de acuerdo al nivel en que fueron afectados por los efectos ambientales relacionados a ENSO y representantes de instituciones locales (organizaciones gubernamentales y no gubernamentales) que operen en Tumbes, Perú

Los participantes serán reclutados con el apoyo del personal de investigación del Centro de Salud Global de la Universidad Peruana Cayetano Heredia, ubicado en Tumbes, Perú. La investigadora principal, con el apoyo de una asistente de investigación experimentado, conducirá y analizará las entrevistas y grupos focales.

Se incluirán los siguientes grupos de informantes:

• Adultos (+18 años) residentes de los distritos de la provincia de Tumbes categorizadas por el nivel de fuertes lluvias e inundaciones relacionadas con el evento ENSO 2015-2016.

• Responsables políticos y administradores del Ministerio de Salud provincial, la oficina regional de salud, los municipios locales, representantes de las principales instituciones no gubernamentales y educativas que operan en la provincia de Tumbes.

Se necesitarán un mínimo de 5 grupos focales y 10-12 entrevistas a profundidad para promover la diversidad entre los participantes. El número final dependerá de cuándo se alcance la saturación teórica y se empleará un muestreo intencionado. Se proporcionará una hoja informativa para los participantes y se obtendrá un consentimiento informado por escrito de todos los participantes. Se llevarán a cabo grupos focales para cada tipo de categoría de participantes (Residentes de Tumbes categorizados de acuerdo al nivel de efectos de ENSO en su localidad, representantes de organizaciones gubernamentales y no gubernamentales) por separado e incluirán 5-7 participantes cada uno. Las entrevistas se utilizarán para la exploración en profundidad de temas delicados de participantes seleccionados. Se seguirán guías temáticas.

Cada grupo focal y entrevista durará entre 1-1.5 horas y serán grabadas en audio. Las grabaciones serán transcritas para su análisis y reporte. Todas las actividades de recolección de datos cualitativos se llevarán a cabo en lugares privados, convenientes para los participantes del estudio, proporcionados por el Centro de Salud Global Tumbes (GHC-T) de la Universidad Peruana Cayetano Heredia (UPCH). Todos los participantes recibirán una compensación por su tiempo y gastos de viaje.

Se analizarán las entrevistas y grupos focales tratando de identificar temas y relaciones entre temas para responder a los objetivos propuestos. Después de múltiples lecturas, el conjunto inicial de temas será identificado y transformado en códigos. La codificación se llevará a cabo utilizando el programa de software NVivo (software de análisis de datos cualitativos NVivo, QSR International Pty Ltd. Versión 11). Los datos recolectados serán analizados usando el análisis de matriz para restringir los datos en categorías clave: respuesta individual y experiencias de vida al evento ENSO, efectos en su salud y salud mental, respuesta y recursos comunitarios, apoyo y estrategias para impulsar los lazos comunitarios y resiliencia. Cualquier idea de las discusiones grupales que sean relevantes para: riesgos y vulnerabilidades ambientales, relación de salud mental con estrategias de resiliencia basadas en la comunidad, se integrará con los datos de la entrevista.

E. EQUIPO DE INVESTIGACION.

El equipo de investigación es multidisciplinario y estará conformado por personas con formación y experiencia internacional:

- **Investigadora Principal**: Elaine C. Flores, Médica, Magister en Ciencias en Investigación epidemiológica, candidata a doctorado por la Universidad de Londres de Higiene y Medicina Tropical, del Reino Unido y miembro del Centro de salud mental global de dicha casa de estudios. Este proyecto es parte de su tesis de doctorado en epidemiologia y salud poblacional que actualmente se encuentra en curso, y es becaria de EMERGE - Unidad de Investigación y Consorcio de Entrenamiento en Enfermedades Emergentes y Cambio Climático de la Universidad Peruana Cayetano Heredia.

- **Investigador Asociado**: Andrés G. Lescano, Doctor en Salud Internacional, Magíster en Ciencias de la Salud y Magíster en Políticas de Salud por la Universidad de Johns Hopkins de Estados Unidos. El Dr. Lescano es, además, Profesor Asociado en la Universidad Peruana Cayetano Heredia. Tiene más de cien publicaciones internacionales en revista de alto impacto aplicadas principalmente a poblaciones vulnerables y ha participado en múltiples evaluaciones.

Adicionalmente, el equipo investigador trabajará con colaboradores en Tumbes, vinculados al Centro de Salud Global – Tumbes, afiliado a la Universidad Peruana Cayetano Heredia, quienes proveerán el soporte logístico y de coordinación para poder realizar los grupos focales y entrevistas a profundidad planificados en este proyecto.

F. CRONOGRAMA.

Actividad/Mes	1	2	3	4	5
Desarrollo del plan de trabajo	X				
Recolección de fuentes e información	X	X			
Procesamiento y análisis de datos		X	X		
Presentación de informe final			X	X	
Difusión académica					X

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ANEXO 1: Cuadro de preguntas, objetivos y metodología de estudio.

Preguntas de investigación	Meta	Objetivos	Metodología
¿Cuál es el impacto percibido del último *El Niño* sobre la salud y salud mental de los residentes de Tumbes? Y, ¿cómo fue la respuesta individual y comunitaria a ella? ¿Qué estrategias de resiliencia se utilizaron y se pueden implementar para eventos futuros?	Evaluar las percepciones de los efectos de ENSO sobre la salud, el bienestar psicológico, las respuestas individuales y comunitarias, la disponibilidad y el acceso a los sistemas de apoyo y las posibles estrategias de resiliencia comunitaria de los residentes afectados por ENSO en la costa norte del Perú a través de la investigación cualitativa.	1. Explorar cómo fueron afectados los medios de vida, la salud y el bienestar **psicológico** de los residentes de Tumbes por el evento ENSO 2015-2016 y cómo fue su respuesta individual y comunitaria a este evento. 2. Explorar sus percepciones de disponibilidad y acceso a sistemas de apoyo que se implementan en Tumbes, lo que puede disminuir los impactos perjudiciales del ENSO en su salud mental. 3. Explorar sus pensamientos sobre las posibles estrategias que ayudarían a fortalecer sus lazos comunitarios ya existentes y mejorar su resiliencia en futuros eventos de ENSO. 4. Examinar las opiniones de los representantes de las instituciones gubernamentales y no gubernamentales sobre las mismas cuestiones.	Discusiones de grupo de enfoque y clave semiestructurada Entrevistas con informantes Con residentes afectados por ENSO por nivel de efectos ambientales y representantes de instituciones locales (gubernamentales y no gubernamentales) en Tumbes, Perú

Appendix G Qualitative component - Information Sheets for (English)

In-depth interviews and focus group discussions

UNIVERSIDAD PERUANA CAYETANO HEREDIA

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

INFORMATION SHEET FOR PARTICIPANTS

IRB Reference Number: XXX

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

Title of study: "Mental health outcomes and possible resilience strategies associated with El Niño Southern Oscillation (ENSO) in the north coast of Peru"

We would like to invite you to participate in this original research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

This study is being conducted by a researcher from Universidad Peruana Cayetano Heredia as part of her PhD thesis at the London School of Hygiene and Tropical Medicine, UK.

- **Aims of the research**

This study is looking to better understand the life experiences of people affected by El Niño 2015-2016 related effects, like heavy rains and flooding. Also, aims to know the people perceptions of ENSO effects in their mental well-being as well as how was the response to latest 2015-2016 ENSO event. Additionally, the research team wants to know how is the availability and access to support systems that are already in place in Tumbes, which may diminish detrimental impacts of ENSO in their mental health. Finally, it is necessary to know their perception on possible strategies that would help to o strengthen their community ties and enhance their resilience upon future ENSO events.

- **Who are we recruiting?**

We are including people who are permanent residents of localities affected by El Niño event, through 2015 and 2016, in Tumbes. Also, representatives of governmental (as ministry of Health, hospitals, Instituto Nacional de defensa Civil –INDECI) and non-governmental institutions (as the Centre of Global Health – Tumbes and other environmental and educative organizations of Tumbes)

- **What will happen if you agree to take part?**

In-depth interviews

You will be invited to participate in a one-to-one interview. The interviews will be held at a place that is convenient for you, as the Global mental health center, your workplace or your home. You will be asked some questions about your life experiences with El Niño event and your perceptions about the potential acceptability and importance of an intervention that aims to increase the community strenghts and mutual benefits, to promote mental wellbeing in persons affected by El Niño events and environmental-related disasters. The interview will last up to one hour. With your agreement, we will audio-tape the interview.

Discussion groups

The discussion groups will be located at a central location as the Global mental health center, within your location of residence/work. There will be between 5 and 7 people in the group, as far as possible with a similar background to you; for example, there will be separate groups for locations heavily affected by El Niño and others who were little or no affected at all. The group will be asked some questions about their life experiences with El Niño event and their perceptions on El Niño effect on their mental well being, the individual and community response to this phenomenon and also, possible strategies to streghten their communities for future events. You will be invited to contribute your opinion as part of the discussion, although there is no obligation for you to speak during the group discussion. The discussion will take between 1 and 1.5 hours.

If all participants give agreement then we will tape-record the discussions and interview. You will be given refreshments and reimbursed for your transport costs and time.

- **Risks of being in the study**

We don't expect that the discussion will cause you any difficulties. On rare occasions, people might be upset by the questions that are being asked. If you are distressed by the questions then you do not have to answer the question or you can leave the group at any time.

- **Possible benefits**

Information obtained through these discussions will be helpful in developing a future strategy or pilot employing social capital to improve community engagement, identification and strengthening of community groups and access to information and shared resources for people affected by environmental disasters as those related to El Niño, to prevent mental health illnesses and improve their well-being. We hope this will help to better their mental health and community engagement ties for people in Tumbes and other similar locations.

Once the overall study is completed, we will let you know what we found, either by giving you a letter or publicising our findings through the local authorities.

- **What we will do with your data**

If you take part in the tape-recorded discussion, we will make sure that the tapes do not include your name or identifying information. Also, If notes are taken, these will not include your name or identifying information. The tapes and notes will be kept in a locked cupboard, with access only to the research team. Once the interview tapes have been written down, and the data has been analysed, the tapes will be cleared.

Nobody except the research team will know that the information belongs to you. We will keep all study documentation in a locked cupboard.

After the end of this study, the information you tell us may be used by other researchers, but they will not be able to identify you in any way.

Main researcher:

- Dr Elaine Flores. You can contact me on telephone number +51 995067550, from Monday to Friday during working hours. And also to the following electronic mail addresses: elaine.flores@lshtm.ac.uk and elaine.flores.r@upch.pe

It is up to you to decide whether to take part or not. If you decide to take part you are still free to withdraw at any time and without giving a reason.

If this study has harmed you in any way you can contact the Institutional Review Board, Universidad Peruana Cayetano Heredia, using the details below for further advice and information:

- Institutional Review Board, Universidad Peruana Cayetano Heredia

  Telephone number: xxx

- You may withdraw your data from the project at any time up until it is transcribed for use in the final report.
- If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form.

Appendix H Qualitative Component - study consent form (English)

CONSENT FORM FOR PARTICIPANTS IN RESEARCH STUDIES

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of study: "Mental health outcomes and possible resilience strategies associated with El Niño Southern Oscillation (ENSO) in the north coast of Peru"

- Institutional Review Board, Universidad Peruana Cayetano Heredia Ref:

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

- I understand that if I decide at any time during the research that I no longer wish to participate in this project, I can notify the researchers involved and withdraw from it immediately without giving any reason.

- I consent to the processing of my personal information for the purposes explained to me. I understand that such information will be handled in accordance with the terms of the national data protection rules.

- If I am selected to be interviewed in more detail then I consent to that interview being audio-taped.

- I agree that the research team may confidentialy use anonymized data for future research and it will not be possible to identify me from any publications or reports.

Participant's Statement:

I _____
agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.

Signed*   _____ Date _____
***Or thumbprint**

Witness Statement (in event that participant is not literate):

I _____

Appendix I Qualitative Component. Informed Consent Form Interviews (Spanish)

Consentimiento para participar en un estudio de investigación
- Entrevistas en Profundidad–
Versión 2.2 – 22/04/2017

Instituciones	:	Universidad Peruana Cayetano Heredia – UPCH
		London School of Hygiene and Tropical Medicine
Investigadores	:	Elaine C. Flores
		Andrés G. Lescano
Título	:	"Percepciones de los efectos de *El Niño* sobre la salud mental comunitaria y exploración de estrategias de resiliencia basadas en la comunidad a través de la investigación cualitativa."

Propósito del Estudio: Este estudio busca comprender mejor las experiencias de vida de las personas afectadas por los efectos como las fuertes lluvias e inundaciones relacionados con El Niño. También tiene como objetivo conocer las percepciones de los pobladores acerca de los efectos de El Niño en su bienestar mental y su salud, conocer cómo fue la respuesta al evento El Niño más reciente. Además, el equipo de investigación quiere saber cómo son la disponibilidad y el acceso a los sistemas de salud y apoyo que existen actualmente en Tumbes. Por último, desean conocer su percepción sobre las posibles estrategias que podrían fortalecer los vínculos comunitarios y mejorar su adaptación y recuperación en futuros eventos de El Niño. La información que nos pueda brindar será muy valiosa para nuestro análisis y la elaboración de recomendaciones.

Este estudio está siendo realizado por una investigadora becaria de *Emerge*, la Unidad de Investigación en Enfermedades Emergentes y Cambio Climático de la Universidad Peruana Cayetano Heredia como parte de su tesis doctoral en la Universidad de Londres de Higiene y Medicina Tropical, del Reino Unido.

Procedimientos: El procedimiento será realizarle algunas preguntas, en una entrevista individual con un miembro del equipo de investigación, que esperamos responda con la mayor sinceridad posible. Si usted está de acuerdo en participar, esta sesión será registrada en un archivo de audio que luego utilizaremos para hacer el análisis de la información. De igual forma, tomaremos notas, si usted nos lo permite. Todo lo que usted diga será anónimo y su nombre no constará en los registros de audio, notas o el informe que prepararemos. Esto para preservar la confidencialidad de la información que nos dé. Esperamos que esto lo aliente a responder a las preguntas con total sinceridad.

Riesgos: No esperamos que participar en esta entrevista le cause ninguna dificultad. En raras ocasiones, las personas pueden sentirse disgustadas por las preguntas que se hacen. Si usted sintiera algún malestar o molestia por las preguntas que se hagan, entonces no tiene que responder a la pregunta o puede dejar la entrevista en cualquier momento.

Beneficios: La información obtenida beneficiará a la comunidad con la visualización y entendimiento de problemas relacionados al efecto de El Niño en la salud mental, y de esta

manera, prevenir el desarrollo de enfermedades mentales mejorando su bienestar. Esta investigación no tendrá un beneficio directo para usted, sin embargo, se le proporcionará un folleto informativo acerca del tema de salud mental y desastres climatológicos, con referencias a donde puede acudir en caso de requerir ayuda

Costos e incentivos: Usted no deberá pagar nada por su participación. Igualmente, no recibirá ningún incentivo económico a cambio de su participación.

Confidencialidad: Su confidencialidad será protegida en todo momento. Si participa en la discusión grabada, nos aseguraremos que los archivos o las notas no incluirán su nombre o información de identificación. Los archivos de audio y las notas se guardarán en un armario cerrado, con acceso sólo al equipo de investigación. Una vez que los archivos de audio de la entrevista se hayan transcrito, y los datos hayan sido analizados, los archivos se borrarán.

Derechos del paciente: La participación en este proyecto es completamente voluntaria y podemos parar en el momento que usted lo indique. De igual forma podrá retirarse si así lo quiere. La participación no supone beneficio o perjuicio alguno para usted.

Si tiene alguna queja o duda respecto a su participación, lo invitamos a comunicarse con los investigadores principales del estudio: Elaine Flores, a la dirección de correo electrónico: elaine.flores.r@upch.pe o al teléfono 932190739 y Andrés G. Lescano a la dirección andres.lescano.g@upch.pe o al teléfono: 947619799.
Si usted tiene preguntas sobre los aspectos éticos del estudio, o cree que ha sido tratado injustamente puede contactar a la Dra. Frine Samalvides, presidenta del Comité Institucional de Ética de la Universidad Peruana Cayetano Heredia, teléfono 01- 3190000 anexo 2271.

CONSENTIMIENTO. Acepto voluntariamente participar en este estudio, comprendo que cosas le pueden pasar si participa en el proyecto, también entiendo que puedo decidir no participar aunque yo haya aceptado y que puedo retirarme del estudio en cualquier momento. Recibiré una copia firmada de este consentimiento.

_____   _____
Participante   *Fecha*
Nombre:
DNI:

_____   _____
Investigador   Fecha
Nombre:
DNI:

299

Appendix J Qualitative Component. Consent Form. Focus Groups (Spanish)

Consentimiento para participar en un estudio de investigación
- Grupos focales –
Versión 2.2 – 22/04/2017

Instituciones	:	Universidad Peruana Cayetano Heredia – UPCH
		London School of Hygiene and Tropical Medicine
Investigadores	:	Elaine C. Flores
		Andrés G. Lescano
Título	:	"Percepciones de los efectos de *El Niño* sobre la salud mental comunitaria y exploración de estrategias de resiliencia basadas en la comunidad a través de la investigación cualitativa."

Propósito del Estudio: Este estudio busca comprender mejor las experiencias de vida de las personas afectadas por los efectos como las fuertes lluvias e inundaciones relacionados con El Niño. También tiene como objetivo conocer las percepciones de los pobladores acerca de los efectos de El Niño en su bienestar mental y su salud, conocer cómo fue la respuesta al evento El Niño más reciente. Además, el equipo de investigación quiere saber cómo son la disponibilidad y el acceso a los sistemas de salud y apoyo que existen actualmente en Tumbes. Por último, desean conocer su percepción sobre las posibles estrategias que podrían fortalecer los vínculos comunitarios y mejorar su adaptación y recuperación en futuros eventos de El Niño. La información que nos pueda brindar será muy valiosa para nuestro análisis y la elaboración de recomendaciones.

Este estudio está siendo realizado por una investigadora becaria de *Emerge*, la Unidad de Investigación en Enfermedades Emergentes y Cambio Climático de la Universidad Peruana Cayetano Heredia como parte de su tesis doctoral en la Universidad de Londres de Higiene y Medicina Tropical, del Reino Unido.

Procedimientos: El procedimiento será realizarle algunas preguntas, en una discusión en grupo con otros participantes y miembros del equipo investigador de este estudio, que esperamos responda con la mayor sinceridad posible. Si usted está de acuerdo en participar, esta sesión será registrada en un archivo de audio que luego utilizaremos para hacer el análisis de la información. De igual forma, tomaremos notas, si usted nos lo permite. Todo lo que usted diga será anónimo y su nombre no constará en los registros de audio, notas o el informe que prepararemos. Esto para preservar la confidencialidad de la información que nos dé. Esperamos que esto lo aliente a responder a las preguntas con total sinceridad.

Riesgos: No esperamos que participar en estas entrevistas o discusiones grupales les causen ninguna dificultad. En raras ocasiones, las personas pueden sentirse disgustadas por las preguntas que se hacen. Si usted sintiera algún malestar o molestia por las preguntas que se hagan, entonces no tiene que responder a la pregunta o puede dejar el grupo en cualquier momento.

Beneficios: La información obtenida beneficiará a la comunidad con la visualización y entendimiento de problemas relacionados a el efecto de El Niño en la salud mental, y de esta manera, prevenir el desarrollo de enfermedades mentales mejorando su bienestar. Esta

APROBADO
E. APROBACIÓN 26/09/17

investigación no tendrá un beneficio directo para usted, sin embargo, se le proporcionará un folleto informativo acerca del tema de salud mental y desastres climatológicos, con referencias a donde puede acudir en caso de requerir ayuda

Costos e incentivos: Usted no deberá pagar nada por su participación. Igualmente, no recibirá ningún incentivo económico a cambio de su participación.

Confidencialidad: Su confidencialidad será protegida en todo momento. Si participa en la discusión grabada, nos aseguraremos que los archivos o las notas no incluirán su nombre o información de identificación. Los archivos de audio y las notas se guardarán en un armario cerrado, con acceso sólo al equipo de investigación. Una vez que los archivos de audio de los grupos focales se hayan transcrito, y los datos hayan sido analizados, los archivos se borrarán.

Derechos del paciente: La participación en este proyecto es completamente voluntaria y podemos parar en el momento que usted lo indique. De igual forma podrá retirarse si así lo quiere. La participación no supone beneficio o perjuicio alguno para usted.

Si tiene alguna queja o duda respecto a su participación, lo invitamos a comunicarse con los investigadores principales del estudio: Elaine Flores, a la dirección de correo electrónico: elaine.flores.r@upch.pe o al teléfono 932190739 y Andrés G. Lescano a la dirección andres.lescano.g@upch.pe o al teléfono: 947619799.

Si usted tiene preguntas sobre los aspectos éticos del estudio, o cree que ha sido tratado injustamente puede contactar a la Dra. Frine Samalvides, presidenta del Comité Institucional de Ética de la Universidad Peruana Cayetano Heredia, teléfono 01- 3190000 anexo 2271.

CONSENTIMIENTO. Acepto voluntariamente participar en este estudio, comprendo que cosas le pueden pasar si participa en el proyecto, también entiendo que puedo decidir no participar aunque yo haya aceptado y que puedo retirarme del estudio en cualquier momento. Recibiré una copia firmada de este consentimiento.

Participante
Nombre:
DNI:

Fecha

Investigador
Nombre:
DNI:

Fecha

APROBADO
F. APROBACIÓN: 26/04/17

Appendix K Qualitative study topic guides (English) - IDIs - Residents

Researchers from London School University of Hygiene and Tropical Medicine and Universidad Peruana Cayetano Heredia are looking at ways to provide an innovative approach for people affected by *El Niño* related heavy rains and floods. They need to understand more about their life experiences with *El Niño* event, and how do they perceive this phenomenon may influence the mental well-being of the affected communities and how was their individual and community response. Also, they want to know what support systems and mental health services are currently implemented in Tumbes, and how is their availability and access to them. Finally, they want to explore the participant's thoughts on the strategies aimed to strengthen their community ties for speeding their resilience and recovery in a future *El Niño* event. The plan is to use the information from these discussions to develop an intervention to help people vulnerable to these environmental disasters to recover and get back to their usual activities, preventing, whenever possible, the development of mental issues and strengthening their community ties. We are interested in your points of views on these ideas.

1. Life Experiences and mental Health impact with latest *El Niño* event

How was *El Niño* event for you? Can you tell us about this?

1. Can you provide us any examples of how was your experience during and after *El Niño*?

2. In what measure has *El Niño* affected your home life?

During or after *El Niño* event did you experienced any changes in your work or completing your usual activities?

Many people experience emotional distress related to environmental disasters. Some of these persons require attention for mental health many days after the event has ended, or other type of support

During or after *El Niño* event did you or any family member experienced any change in your usual behaviour or mood, which affected your usual activities? Please describe these changes.

2. Individual and Community responses during or after latest *El Niño*

From your point of view, how was your response to this *El Niño* event? Which were the first actions you took at your home when some of the *El Niño* effects started?
In your opinion, how was the community response to this event? Could you describe it to us?

3. Support systems in place at Tumbes

In your neighbourhood and locality, are you aware of the organizations and systems that offer support in *El Niño* event? Please describe them to us and what kind of support do they provide.
Do any of these organizations provide mental health support? Did you or your family members went or accessed them? How was this support?

4. Strengthening community engagement for resilience

In your experience or your family members, which would be a good strategy to face a situation of a natural disaster as *El Niño*? Could you describe it to us?

Providing mental health services during or after a disaster as *El Niño* or other events usually require that trained health professionals (as psychiatrists, psychologists, nurses, etc.) mobilize to the affected communities in relief brigades. The limitations to this approach are that this service will not always be available when is required, or cannot reach all of the affected people or will not last the time that people need it, and that it depends from the provision of external organizations, as the provincial direction of health or the ministry of health, not from community itself. An alternative

approach, that we would like to explore, aims to re-build and strengthen the existing community social ties and organizations, providing and sharing information to reconstruct their livelihoods as a strategy to promote resilience and psychological well-being for these types of events.

What do you think on this type of approach? Would it be something feasible to implement the communities you live? Do you think this topic would be interesting for you or your neighbours?

Appendix L Qualitative study topic guides (English) - IDIs - Authorities

Topic guide for Representatives of Governmental Institutions

Researchers from London School University of Hygiene and Tropical Medicine and Universidad Peruana Cayetano Heredia are looking at ways to provide an innovative approach for people affected by *El Niño* related heavy rains and floods. They need to understand more about the resident's life experiences with *El Niño* event, and how do they perceive this phenomenon may influence the mental well-being of the affected communities and how was their individual and community response. Also, they want to know what support systems and mental health services are currently implemented in Tumbes, and how is their availability and access to them. Finally, they want to explore the participant's thoughts on the strategies aimed to strengthen their community ties for speeding their resilience and recovery in a future *El Niño* event. The plan is to use the information from these discussions to develop an intervention to help people vulnerable to these environmental disasters to recover and get back to their usual activities, preventing, whenever possible, the development of mental issues and strengthening their community ties. As someone who has experience of working in governmental institutions, we are interested in your views on how best to develop this intervention.

1. Life and Mental Health effects of latest *El Niño*

When *El Niño* event happened, were you working at your current position in Tumbes?

If the response is yes, please describe how was the experience of your organization faced upon this phenomenon.

In your opinion, do this *El Niño* event affected the population mental well-being? Please describe.

For future similar events, how do you think your organization will be able to prevent these effects?

2. Individual and Community responses during or after latest *El Niño*

As you may be aware, in these types of events there are some valuable responses, both individually and from the communities that are not publicly known.
Could you describe the ones that you got to know?
Could you provide any suggestions for future authorities to optimize these types of responses?

3. Support systems in place at Tumbes

Many people experience distress and anxiety related to environmental disasters. Some of these persons will require emotional support many days after the event has ended, or other type of accompanying aid.
Are you aware of the support systems to tend mental health needs of the Tumbes population? Do you know how was their availability during or after *El Niño*? How has it been the offer of attentions to the people who needed them? Please describe the ones that in your opinion, works best providing mental health attentions and support to the communities?

4. Strengthening community engagement for resilience

Providing mental health services during or after a disaster as *El Niño* or other events usually require that trained health professionals (as psychiatrists, psychologists, nurses, etc.) mobilize to the affected communities in relief brigades. The limitations to this approach are that this service will not always be available when is required, or cannot reach all of the affected people or will not last the time that people need it, and that it depends from the organization or coordination of organizations external to the communities, not from the residents themselves.
A different approach, that we are interested to explore would be to test and implement, among residents of vulnerable areas to these types of disasters an intervention aimed to build and strengthen the existing community social ties, to promote resilience and psychological well-being for these types of events.

In your opinion, which would be the best proceedings to strengthen the community ties and engagement to face these kinds of events? Would this affect the community well-being please describe?

Please mention, which actions would your organization be able to perform towards reaching this goal?

Appendix M Qualitative study topic guides (English) – Focus Group Discussions

Topic guide for participants – affected communities

Researchers from the London University of Hygiene and Tropical Medicine and the Universidad Peruana Cayetano Heredia want to know how the community experience was with the heavy rains and floods related to *El Niño* and what support and aid services they had available related to the disaster. In particular, they need to understand more about their life experiences with *El Niño*, how this phenomenon can affect the well-being of the affected communities and how in their opinion was the response, both individually and as a community, to this event. In addition, they want to know which support systems and mental health and health services are currently operating in Tumbes, and how is their availability and access to them by the population. The plan for the future is to be able to use the information from these conversations to develop a program, that may help people who are in risk to these environmental disasters to recover and return to their usual activities, preventing, when possible, the development of mental issues and strengthening their community ties We are interested in knowing your points of views on these issues and what was your personal experience or those who are close to you.

Please, tell each one your name, location where do you live and your main occupation

1. Support systems in Tumbes

When do you need help, who or where do you go first?

In your neighbourhood and locality, are you aware of the organizations and programs that offer help when an *El Niño* event happens?

What kind of support do they provide?

Do any of these organizations provide mental health support? As?

2. Life experiences and impact on mental health with *El Niño*

As we know, recently Tumbes experienced El Niño events. I understand that you all live in areas where there were severe or high impact from rains and floods, and that historically, suffer the effects of the El Niño.

Could you all briefly mention how was this experience for you?
Did the *El Niño* affect the family life in your home? How?
During or after *El Niño*, did you have difficulties or experienced any changes in your work? Were you able to complete your usual day-to-day activities? How?

Many people experience distress as a normal response after disasters. However, some of these people may require mental health care even many days after the event is over, or they would need other support.

• During or after *El Niño*, did you or any person close to you, (or any family member) experienced any change in their behaviour or mood that affected your usual activities? Please describe these changes and what you did about it.

• Now, each one of you please write the 3 things, in your life or in your health, or on the people close to you that were most affected by the *El Niño*. Then, let's compare and discuss what we all share.
*** Now I will write on this board and we will compare what each one considers as the most topics that were most affected and we will talk about it. Ask if everyone agrees with the selection, or what could be changed.*

3. Individual and community responses during or after latest *El Niño*

Considering the points identified by the group as the ones most affected by *El Niño*, which you or people close to you experienced:
• What were the easiest issues to solve and which were the most difficult?
• What were the first actions you took at home when this happened?

And how was the community's response to this situation?

• Which were the easiest issues to solve for the group and which were the most difficult?

• Did they have the necessary resources to face this situation? Could you describe how?

4. Strengthening / empowering the community

As we know, the department of Tumbes is in an area vulnerable to El Niño events. In your experience or that of your family members with the last or previous events:

What do you think would be a good strategy that could generate or increase the mental well-being to face future events? How would it be possible to feel better emotionally in a situation as difficult as in these events? Could you give us some examples?

Perhaps you have heard of the mental health brigades that the ministry of health displays in cases of disaster? *They provide mental health services during or after El Niño or other disaster events. Usually, they will mobilize trained health professionals to the affected communities in relief brigades.* What do you think of these brigades?

An alternative approach, which we would like to explore, could be a future program whose objective is to rebuild and strengthen the existing social ties and organizations that were affected by the disaster. The neighbours would share information that would help them rebuild their communities and livelihoods, and mutual support and cooperation would be reinforced, as a strategy to promote psychological well-being for these types of events.
• What do you think of this type of approach? • Do you think it would be something feasible to implement in the communities where you live? • Do you think this topic would be interesting for you or your neighbours to talk about?

That would be all, thank you very much for your time and participation.

Appendix N Leaflet Mental Health and Disasters (Spanish version Approved by UPCH EC) (Page 1 of 4)

Perú / Es un país localizado en una zona climática y geográfica muy vulnerable a desastres naturales. Los desastres tienen un efecto negativo en la salud mental de las personas afectadas

"El Niño" / Sus efectos de lluvias extremas, inundaciones y sequias, ocurren desde hace varios siglos, sin embargo, su asociación al cambio climático global los hará cada vez más intensos, frecuentes e impredecibles.

Salud Mental y bienestar / Los desastres afectan la salud mental individual y comunitaria. Se debe prevenir el desarrollo de desórdenes mentales y fomentar la recuperación de las personas afectadas.

¿Cómo prevenir estos desórdenes? / Necesitamos informarnos del tema, acudir a nuestras redes de apoyo (Familia, amigos, vecinos, autoridades) y buscar ayuda tan pronto lo necesitemos.

LA SALUD MENTAL EN DESASTRES

Los desastres, como el fenómeno "El Niño", afectan a comunidades y poblaciones enteras, directa o indirectamente. Todas las personas afectadas por estos eventos requerirán cuidados de salud pública. Sin embargo, algunas personas tendrán riesgos adicionales para desarrollar desórdenes mentales luego de desastres. Y, es muy probable que estas personas requieran atenciones psicosociales y mentales de manera específica.

La respuesta esperada de las comunidades ante desastres se llama "resiliencia psicosocial"[1]. Que es "la capacidad de una persona para adaptarse, psicológica, emocional y físicamente de manera adecuada y sin perjuicio extendido para sí mismo, sus relaciones interpersonales o su desarrollo personal, ante la adversidad, las amenazas o los desafíos"

Esta respuesta puede desarrollarse, pero no siempre ocurre, y en situaciones adversas como desastres puede verse afectada. Las emergencias y los desastres naturales, a pesar de ser eventos trágicos y adversos para las personas afectadas, también son oportunidades para construir mejores sistemas de salud mental para aquellos que lo necesitan.

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>> CONT. PAG. DO 8

311

¿Qué pasa con la salud mental en desastres?

Las personas sufren de una amplia gama de problemas de salud mental durante y mucho después de que un desastre ocurre.

Algunas personas desarrollan nuevos trastornos mentales después de un desastre. Aquellos con trastornos mentales preexistentes a menudo necesitan más ayuda que antes.

Los afectados tendrán más probabilidades de recuperarse si se sienten seguros, conectados socialmente, tranquilos y esperanzadas; Si tienen acceso a recibir apoyo social, físico y emocional; Y si encuentran maneras de ayudarse a sí mismos.

Algunas maneras en que la gente muestra su angustia en reacción a un desastre son:

Síntomas físicos: dolores de cabeza, fatiga, pérdida del apetito, dolores y dolores;
Llanto, tristeza, dolor;
Ansiedad, miedo;
Estar en guardia, o nervioso;
Tener Insomnio y pesadillas;
Mostrar Irritabilidad, enojo; o sentirse Confundido, aturdido;

No todas las personas que el mundo que experimenta un desastre necesitará o querrá apoyo. La mayoría de las personas se recuperan bien con el tiempo, si son capaces de restablecer sus necesidades básicas, encontrar maneras de volver a la normalidad, y obtener algún apoyo cuando lo necesitan.

> "La salud mental es crucial para el bienestar general, el funcionamiento y la resiliencia de los individuos, las sociedades y los países, que se recuperan de desastres."

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Otros factores en los desastres

Existen factores de estrés secundarios que provienen o son consecuencia de del desastre en la vida de las personas, como pérdidas económicas, perdidas de empleo, falta de acceso a atención médica. Dependiendo de las circunstancias, estos factores pueden ser tan impactantes como los ocasionados por el evento del desastre en sí, y en consecuencia, algunas personas pueden requerir asistencia y apoyo durante largos períodos de tiempo.

Sentir angustia después de los desastres y eventos agobiantes (como con el fenómeno de "El Niño") es algo muy común.
En la mayoría de los casos, esta angustia es transitoria y las personas se recuperan. Sin embargo, en algunas personas esta angustia puede durar más y ser más incapacitante.
La mayoría de las personas no requieren acceso a atención médica especializada, pero una minoría de personas si puede necesitarlo.
Por esto, es necesario que acudan a los servicios médicos y psicológicos, las personas que sientan (o si personas cercanas lo notan) que necesitan más ayuda para sobrellevar este impacto.
Una pequeña proporción de personas afectadas puede requerir de atenciones en salud mental a largo plazo en respuesta a sus necesidades.
Se sabe que quienes cuentan con una red de apoyo en sus familias, amigos, vecinos y en su comunidad, tienen una ventaja adicional de protección frente a problemas de salud mental y bienestar psicológico.

> " El ser humano es un ser social. Podrá afrontar mejor los problemas si tiene una red de apoyo (amistades, familiares, vecinos) "

En todos los grupos humanos, existen personas que tienen un mayor riesgo a sentir angustia o malestar de manera significativa, dificultando sus tareas de la vida diaria o sus metas.

A nivel comunitario, es importante intercambiar información que sirva para la recuperación de todos los afectados, fomentar actividades que ayuden a normalizar las tareas del día a día y las reacciones frente al desastre, y proteger a las personas que tengan más riesgos, o sean más vulnerables. (Ver abajo).

¿Quiénes tienen más riesgo?

Edad y género
Niños y Adolescentes. Personas ancianas o adulto mayores. Mujeres.

Salud y recursos
Personas con problemas de salud pre-existentes (como enfermedades del corazón, presión alta, diabetes, colesterol, etc.).
Personas de bajos recursos y en desventaja social.

Riesgos adicionales
Personas expuestas a situaciones traumáticas (Ej. vieron fallecimientos o escenas violentas). Personas que sufrieron mucha destrucción de sus comunidades. Personas que tienen poco apoyo social. Personas que hayan tenido o tengan una enfermedad de salud mental.
Personas que sufrieron un riesgo para sus vidas en el desastre (o lo vivieron a través de personas cercanas). Personas que sufrieron daños o lesiones físicas por el desastre. Personas que tienen que vivir con la posibilidad de volver a sufrir el desastre (Ej. Viven en zonas de alto riesgo). Personas que sufrieron muchas pérdidas con el desastre: materiales o propiedades, familiares, amistades cercanas.

" Para tener una vida plena, se debe tener una buena salud mental y bienestar emocional."

Foto: Morfi Jiménez

" No dude en buscar ayuda cuando sienta que lo necesite"

Si necesita conversar de temas sensibles para usted, como crisis emocionales, depresión, suicidio, entre otros, puede contactar por teléfono a profesionales dedicados, de manera gratuita, confidencial y anónima:

LA VOZ AMIGA: 0800-4-1212
El Teléfono de la Esperanza: 51-1- 273-8026

¿Tiene seguro médico?

Si necesita ayuda para usted o una persona cercana, solicite una cita para atención psicológica en su Centro de Salud local.
Este puede ser administrado por el Ministerio de Salud (MINSA) o por EsSalud (Seguridad Social de Perú, si es asegurado.

En las postas o centros médicos del Ministerio de Salud, existe el Seguro Integral de Salud (SIS), al que puede afiliarse para cubrir sus atenciones y medicamentos. Esta afiliación puede ser gratuita o bajo la modalidad independiente, de acuerdo a su clasificación.

¿Cómo puedo obtener más información sobre atenciones en Salud mental?

En persona, en su posta o Centro de Salud más cercano.

Por teléfono, a la línea gratuita INFOSALUD: 0800-108-28

Por internet, solicitando información al correo electrónico: sis@sis.gob.pe

En este enlace busque más

información sobre cómo y dónde

afiliarse al SIS:

http://www.sis.gob.pe/nuevoPortal/in

dex.html

Ministerio de Salud
Personas que atendemos Personas
EsSalud
MÁS SALUD PARA MÁS PERUANOS

SIS Seguro Integral de Salud

Appendix O Standard Operating Procedures for Distress Protocol for Qualitative procedures participants

Effective Date: 23Apr2017	Written by Elaine C. Flores

I. PURPOSE. To provide all research staff involved in the study with a uniform and standard way of proceeding in cases of distress experienced by the selected participants of in-depth interviews and focus group discussions in the study area.

II. METHOD. The selected participants will be told during the informed consent process that at any time during the interview or focus group discussions they are free to share information or respond to questions only when they feel comfortable doing it and that confidentiality measures are in place to ensure their anonymity. If, nevertheless, a participant appears to be distressed about the information shared or discussed, the research staff will either pause or stop the qualitative procedure and will offer to refer him or her for help as appropriate or desired.

III. SUPPLIES AND MATERIALS

- Specific leaflet created for the study on Mental Health and disasters including referral information.

- Informed Consent Form approved for the study.

- Notepad

- Pens

- Audio recording device

IV. PROCEDURES. After the informed consent process has been completed and the form signed by the potential participant, study procedures will take place.

- **For the In-depth Interviews:** Inform the participant that the interview is about to begin and request them to share their life experiences related to El Niño, the support systems in place at Tumbes for these events and the additional questions contained in the topic guides. Remind them about their voluntary participation in the voice recording and that special confidentiality measures are in place to ensure his or her anonymization. In addition to this, say that you understand that some things may be difficult to talk about and that they do not need to speak about anything they do not feel comfortable about.

- **For the Focus Group Discussions:** Inform the participants that the main aim is to acquire the participant's range of views on the discussion topics, so highly personal or socially sensitive topics are not expected to be shared during the group discussion. A name substitution system will be in place, as a precaution for confidentiality. Also, emphasize at the beginning and end of each session that participants should respect each other's privacy and anonymity. At the end of the session, and once outside the FGD setting, the participants should not reveal the identities of other participants nor indicate who made specific comments during the FGD. Assure the participants that special precautions to protect participant's identities and collected data are in place for the study. In case any of the participant's express additional concerns, refer them to

the study consent form, so they can directly contact the study researchers and the local ethics committee chair for more specific information.
- Ensure that the space provided for the interview and the Focus group discussion is private; with low levels of noise and proper lighting, and that is likely to provide minimal interruptions or disturbances from others. Make sure the participants are comfortable and personal space is adequate. Keep in mind safety rules before beginning.

Distress or Discomfort during the study procedures

- Be especially aware if any of the participants show or express any discomfort or distress while speaking of certain matters and may start crying or display their emotions.

  Things that can be done during this event: Listen with empathy to what the participant shares. Speak comfortingly if required: you may say, for example that you understand that he/she is upset and is going through a difficult time. Get the participant a glass of water and some tissues. You may pat the participant's hand or shoulder, if you are of the same gender as the participant. Try to avoid being profuse in your sympathies, getting distressed or uncomfortable or prepare to leave in a hurry as this may only discomfort the participant further. Do not hug or demonstrate a greater degree of physical contact than what is appropriate.

  If it happens to a participant during a Focus group discussion, pause or stop the discussion, and offer the participants a few minutes break, while either the main facilitator or the research assistant approaches the participant in distress and repeat the steps mentioned above, offering to accompany he or she to a separate area if required or desired.

Suicide ideation or past suicide attempts disclosed during the study procedures

- If any of the participants admits having suicide ideation or discloses a previous suicide attempt:

  Things to do: Listen carefully, allowing the participant to tell you what he/she wants to tell you without interrupting or panicking. Try to understand, in as far as possible, the circumstances that are relevant to the incident/s (so that appropriate action can be taken later by health professionals, if necessary)
  Advise the participant to confide in a relative or a close friend and recommend the participant to seek professional help- to confide in his/her doctor or seek a mental health professional.

Referrals

- Advise the participants who are distressed and in need of treatment to attend their local health center, and appoint a psychological attention there, or in cases of suicidality ideation, the regional hospitals administered by the Ministry of Health and EsSalud, the social security network at Tumbes, Peru.

  Also, refer the participants to the local information contained in the study Informative leaflet that will be provided to all the study participants, that also includes information on how to obtain free of charge medical insurance by the SIS insurance of the Ministry of Health, local health information and referral hotline and suicide prevention telephone lines. Review with the participant the information available to them and answer any questions that the participant has.

Appendix P Public Engagement activity: "*Life between water and Sand".* Carapongo, Huachipa, Peru

Public Engagement Case Study

Life between water and sand

Overview and context

The coastal El Niño of March 2017 developed rapidly, bringing heavy rains which burst river banks and triggered flash floods and landslides in west and north Peru. *Life between water and sand* sought to promote post-disaster resilience and mental wellbeing among communities in Carapongo, Peru through workshops on photography and art therapy. Carapongo is a low-income district located on the eastern side of the Lima Province, accessible only by a single unpaved road and situated beside the Rimac River. Through a two-day photography workshop based on the photovoice methodology and one day of art therapy activities, affected residents used non-verbal tools to select and portray their own resilience motifs, identify which factors have been most helpful for them in overcoming difficulties as a result of the El Niño and to promote their wellbeing. Participants created their own photography and art projects and presented them alongside their experiences during and after the coastal El Niño to the group, and were encouraged to share their experiences with the wider community.

Project Coordinator:
Elaine C. Flores Ramos, PhD Candidate

The project

Workshops included presentations from facilitators and participants, group discussions, ice-breaker activities, training and hands-on practical sessions, which were conducted at the local health centre, Virgen de Carapongo. Topics discussed included:

· Mental health and disasters.

· The coastal El Niño event.

· What is resilience, and how can we increase it?

15 participants took part in the two-day photovoice workshop, of which the majority had some or minimal experience using a camera. They were taught how to use cameras and, through individual and group practical exercises, shown how to express their feelings and emotions through photography. Following this each participant was given 3 days to take their own photos, for which they chose scenes including a combination of portraits, places or topics, reflecting on what they considered their own resilience motifs. On the second day of the workshop participants were given a printed set of their photos, from which they chose 2-5 photos to develop a caption for. The images were then shared and discussed as a group.

The one-day art therapy workshop involved a new group of 13 participants, of which the majority reported some or minimal experience using art materials. The participants were shown how to use art techniques to express their feelings and emotions, which they then used to create self-portraits; draw personal memories of the El Niño event and relate their feelings with those recollections; and to identify and draw resilience motifs as their personal hopes for the future. The drawings were shared, described and presented to the group, and participants were encouraged to share and discuss the topics with their families and neighbours.

The basics

Who: Adults affected by El Niño-related flash floods & landslides

What: Explore and promote resilience & mental wellbeing

When: Dec 2017 – Jan 2018

Where: Carapongo, Peru

How: Photovoice and art therapy

Funder: LSHTM Small Grants Scheme

By the numbers

Development time: 4 months

Project duration: 3 days

No. of participants: 28

LSHTM staff involved: 1

Other professional staff: 7

No. of volunteers: 8

Project budget: £1,200

Project aims

- To provide the means and tools for non-verbal personal expression of positive and negative experiences among Carapongo's shantytown adults.
- To raise awareness of mental health and resilience-promoting factors.

The audience

The primary audience was Carapongo residents aged 18-70 who were affected by flash floods and landslides related to the coastal El Niño event. Participants were recruited with the support of our collaborators and volunteers, who conducted home visits and displayed invitation posters within the Carapongo health centre.

In addition, the project aimed to reach the wider public and scientific communities through blog posts and appearance on two major Peruvian media channels.

Before the project

Major planning and development tasks

Developing content: Workshop materials and activities were developed over four months. As it was anticipated that participants would not have previously used these materials and/or techniques, materials were written in simple language, containing several examples and reinforcement exercises to ensure adequate understanding of the workshop aims and expectations. Following each workshop a meeting was held with the facilitators to discuss what worked well and what could be improved.

Participant recruitment: Volunteers and Virgen de Carapongo health staff identified and invited potential participants through home visits a week before the workshop. In addition, posters were displayed in the health centre and disseminated through social media, targeting residents of the area. All potential participants were called a day before the workshop to confirm their attendance.

Main challenges

Attendance of participants: Participants commonly forgot about the workshop, assignments, or showed up late, due to other work or family-related commitments. Participants were called to confirm their attendance the day before and on the day of the activity. Sometimes this took significant time as phones were shared among family members and the participants were hard to reach.

Solution: Participants' commitment and availability to comply with the assignments should be confirmed at the start, especially in communities with high rates of informal employment who depend on daily work. Participants suggested in future we contact neighbourhood representatives, many of whom work closely with the community and could be used to disseminate information on workshop schedules.

Scheduling of workshops: The only time that the Project Coordinator could be in Lima coincided with Christmas and the collaborators' holidays. Additionally, unexpected issues prompted the rescheduling of two days of workshop activities.

Solution: We had to be flexible and reschedule sessions according to the challenges that arose. In future it would be preferable not to schedule workshops during December or early January, due to holidays in Peru.

Workshop logistics: Film cameras were used for the photovoice workshop. As the films had to be collected and processed over the Christmas period, this was time consuming and difficult to achieve.

Solution: A vendor helped process the films within the time-frame, however, digital cameras could be used to simplify logistics.

Project outcomes

Overall, the project was successful in meeting the proposed objectives. The participants expressed positive feedback about participating in the activities, and gained additional knowledge of mental health and resilience topics. Common themes emerging from the participants' work in the photovoice workshop, were that instead of identifying personal resilience motifs or factors to help them 'overcome adversities', the majority of the photos depicted the Rimac river, or activities occurring nearby or in the riverbed. Notably, this is the same river where the flash floods and landslides occurred. In addition, photos depicted the harsh living conditions still present more than 8 months after the coastal El Niño event, e.g. lack of basic services such as running water and sewage treatment. We think the participants chose to use their cameras and photographs as tools to protest against their hardships and express concern about similar events occurring in the future as they lived near the river. With art therapy, the paintings showed the participants' expectations linked to neighbourhood changes, e.g. parks, open spaces, paved roads and houses built with durable materials. It was clear that their hopes to rebuild their lives needed to start with tangible developments in their surroundings.

What worked?

The photovoice and art therapy workshops allowed participants to express themselves and discuss sensitive topics among strangers in group discussions. The use of imagery gave participants the ability to express their hardships, thoughts and emotional needs, highlighting that they all shared similar experiences during and after the El Niño event. Additionally, by participating in group activities and receiving feedback on their work, they received validation of their unrecognised skills and abilities, as well as improving their photography and drawing skills.

Collaboration and external partners

- **Dr Elba Ramos and artist Annie Flores:** supported project design and implementation, presented topics related to resilience and art techniques, and conducted the art therapy workshop.

- **Oliver Elorreaga, Percy Soto and Ricardo Galvez (EMERGE-UPCH):** provided coordination with volunteers and the Carapongo health centre.

- **Dr Patricia Bueno and Julia Huachua (Carapongo health centre):** provided key logistical support at the centre and supported participant recruitment.

- **Joaquin Rubio and Kurt Van Aert (photographers):** provided training and feedback to participants.

- **Manuel Flores and Jean Paul Vaudenay** provided logistical support. **Veronica Atala** supported the implementation of the project and took photographs of two workshop sessions.

- **Walter Navarro, Camila Zaa, Alondra Quispe, Alison Limaylla, Georgette Vetanzo (EMERGE-UPCH):** supported the recruitment process and the delivery of the first photovoice workshop.

- **AELUCOOP – Cooperativa de ahorro y credito:** donated art sets as gifts for the art therapy workshop participants and their families.

Key costs

PhotoVoice materials: £344

Art Therapy materials: £111

Meals (participants & volunteers): £262

Services (transport, film processing & printing): £290

What did not work?

Workshop timing: Running the workshop during the Christmas period proved to be significantly harder as many of the local vendors were closed, and both participants and local collaborators had busy schedules.

Solution: Allow for a longer period of time on-site and use alternative dates outside of local holidays to ease the implementation of workshops and logistics.

Feedback from participants

Feedback was positive, and participants were keen to know if similar activities would be organised in the near future. Participants enjoyed learning through the medium of photography and art, which they had not previously considered as a tool to express their personal experiences or emotions. Participants also mentioned they had a relaxing time away from their busy work days or domestic tasks.

Future potential or plans

Members of EMERGE-UPCH plan to implement similar workshops in the Carapongo communities where they are currently working. They plan to absorb all running expenses and we will jointly continue to disseminate the project results, while promoting post-disaster mental wellbeing. Plans to exhibit the pictures and drawings from the participants are still ongoing. In addition, we will disseminate the results obtained via academic and public websites and blogs.

Advice for other researchers

- Having a motivated group of local collaborators with experience in mental health topics, workshop techniques and volunteers who had access to the area and population of Carapongo was key for this project's success. Having frequent contact also helped to solve the challenges that arose during the planning stage.

- Carefully consider project timing (e.g. try to avoid holiday periods and unexpected bank holidays and confirm expected availability of local collaborators involved).

- Where possible, set-up longer periods for on-site coordination, additional training time, and dedicated bonding activities for workshop groups to strengthen the project impact and outcomes for all involved parties. In addition, simplify logistics and consider all available financial resources to avoid time-consuming activities.

- Prioritise the participants' preferences, needs and points of views. Dialogue-engaging opportunities (as this project was), allow important changes in perspective and participants' opinions, and perceptions should be taken into account in future research projects to reach achievable objectives.

Further information

You can find out more about the project at the following links:

- The project website (under construction) contains details about Carapongo, the workshop activities and samples of the participants' photos and drawings.

- To read publications related to the project please visit: Canal N, Wayka.pe, LSHTM Student Blog, and photovoice guest blog.

Contact

For further information, please contact Public Engagement: publicengagement@lshtm.ac.uk

f   lshtm.ac.uk/facebook

y   lshtm.ac.uk/twitter

in   lshtm.ac.uk/linkedin

o   lshtm.ac.uk/instagram

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Appendix Q Data Management Plan

Data Management Plan for Research Students

Name	Elaine C. Flores
Email	**Elaine.flores@lshtm.ac.uk**
Title	**Mental health outcomes and possible resilience strategies associated with El Niño Southern Oscillation (ENSO) in the north coast of Peru**
Date	**12 Jan 2017**
Supervisor	**Dr Victoria Simms**

In addition, it's useful to consider the approximate time period when you will perform each action (e.g. data capture in month 2, data cleansing in month 4, etc.).

Quantitative (secondary) data from SALT trial:

Data will be collected by the SALT research teams using specific designed capture forms, and will then be stored on a password-protected, secure server at the University of Cayetano Heredia. All participant's identifying details will be removed prior to data being entered into the data management systems. Data will be cleaned by members of the SALT research team and are expected to be available for analysis from May 2017 onwards.

Data will be downloaded and stored on the LSHTM secure server, to be accessed by myself on LSHTM computers. In case of needing access whilst travelling to areas with limited internet access that do not allow remote access, this will be downloaded to my personal laptop (which will be password-protected with up-to-date antivirus software installed). All data stored on my laptop will be encrypted using Bitlocker. These data will be processed using STATA 14, between May 2017 and June 2018. If necessary, prior to any analyses, I will use Microsoft Excel to format the data. The data will be deleted from my personal laptop and the LSHTM server when the project is completed, and will remain the property of the University of Cayetano Heredia after this point.

To preserve participant's anonymity, location data will be aggregated to the locality and district level when results are presented.

SENAMHI climatological data: All obtained data will also be downloaded and stored on the LSHTM server and – if necessary – on my personal laptop.

Qualitative (primary) data: Interviews will be recorded using a dictaphone, to be kept in a locked room when not in use for data collection. Qualitative data will also be encrypted and will be transferred from the dictaphone to the LSHTM secure server. After that, recordings will be deleted from the device.

Recordings and interview transcripts – both in their original language (Spanish) and the English translations

– will be saved on LSHTM server and University Cayetano Heredia secure servers, which are password- protected with up-to-date antivirus software installed systems. Also, they will be copied to my personal laptop and uploaded into NVivo 11 for analysis. It is anticipated that transcription and translation will take approximately two months, and the analysis an additional two months.

3. What data formats or standards will you use to store data produced by your project?

Outline the data formats, encoding standards, or software tools that you will use to create, analyse, or use data. E.g. data will be captured using a MySQL database and analysed using STATA and MS Access.

> Data will be processed and analyzed using the following softwares: STATA 14, Microsoft Excel and NVivo 11.
> Versions control will be managed by saving any data downloaded from either the University of Cayetano Heredia or SENAMHI servers adding the date of download and numbering the versions consecutively.

4. What quality controls and thresholds will you establish to ensure that your data is fit for purpose?

Quality controls may be applied prior, during and following data capture and processing. Possible QC practices include: testing instrumentation to ensure it is correctly calibrated, recording multiple measures, double-entry of information, checking validity of entered values

> SALT trial collection forms and data entering tools have been piloted in a prior formative research study with the residents from the same area. Current version (in use) was updated prior to data collection. The SALT team research workers responsible for data collected have undergone extensive and ongoing training in the correct use of these study instruments and capture forms. All entered data is double checked by a second team member, to avoid gross errors and missing items.
> The data are continuously monitored by the research trial Data manager and the statistician team as these are received, to check for outliers and potential errors. Data values of all follow ups assessments are also compared to the baseline data to ensure that these are within the expected range.
>
> For qualitative data, the topic guide for residents and organizations representatives will be piloted and adapted as necessary before data collection starts. Transcripts and translations will be double checked for consistency and fidelity to the original data by a research assistant who speaks both Spanish and English, and will support the qualitative research work.

5. What documentation or metadata is needed to understand your data?

Describe the documentation or metadata that you will create to enable the data to be understood and used by your future self and others. It is helpful to consider the following questions:

- What documentation and metadata standards will be used?
- How will potential users find out about your data?

> SALT trial dataset variables are labelled with the question and code they correspond to in the data collection forms and survey questionnaire, and also will be related to any transformation variable, weighs used and cut-off points used, for new variables or categories.
>
> All of this information is contained within the STATA files, and the study forms and surveys, in addition to any relevant information. All of this will be stored on the secure LSHTM server.
>
> Regarding the qualitative research data, each recording transcript and translation will be labelled with the study name, participant code or nick name, interview number, date of interview or FGD and interviewer name. All Identifying details of the participants will be removed from the recordings transcripts.

DATA STORAGE AND MANAGEMENT

6. Where will you store data during the project lifetime? (tick one or more)

School PC local drive (drive C: or D:)		Personal area on School network (drive H:)		LSHTM Shared Network drive (e.g. I: drive)		Dedicated server maintained at partner institution	X
LSHTM-based project server		School laptop or tablet		LSHTM Secure Data Server (for confidential data)	X	LSHTM Novell Filr	
For-cost cloud service (e.g. Amazon S3)		Free cloud service (e.g. Dropbox, Google Docs)		Portable storage (e.g.USB disk or memory stick)		Other. Please indicate	X

Other

> During qualitative research fieldwork data will be stored in my personal laptop. Afterwards, the data will be backed up onto LSHTM network accessing through Remote Desktop.

7. How will you organise and label your data?

Describe the approach you will take to structure and label your data. E.g. files and folders on a storage device, database tables and labels.

DATA ARCHIVING AND SHARING

9. What data do you need to keep after your project ends and for how long?

At the end of the research project, all local copies of the study data will be securely deleted. This will include: my personal laptop and LSHTM secure server and any back copy that may exist in the research files previously described.
SALT research team at the University of Cayetano Heredia will store the original data under the secure proceedings described above, for at least 10 years after the study ends following the standard requirements with data that will be published.

10. Where will data be kept after your project has finished (tick one or more)

Research data may be submitted to a data repository or data archive, which will handle the process of curation, preservation and sharing on your behalf.

I will keep the data myself		My supervisor will look after the data		It will be looked after by the project team
Held in the LSHTM Research Data Repository		Held in a LSHTM-maintained project system		Held in a 3rd party data repository. Please specify in Other field

Other

University Cayetano Heredia will keep in their secure servers the primary and secondary data collected for the study.

11. Can data be made available to anyone? If not state the reason it needs to be restricted and criteria for gaining access.

Can data be made freely available to anyone or do restrictions need to be applied? This question will help you to consider whether access controls need to be applied to limit data access. Potential reasons for restriction include the need to comply with consent agreements, which state:

- Data can only be used by specific users, e.g. researchers working in an academic environment, a specific skill set, etc.
- Data can be analysed only for specific purposes compatible with the consent agreement.

If data does need to be restricted, state the reason and the criteria that users would need to meet to gain access

12. What actions will be performed to prepare your data for access?
(tick one or more)

Removal of personal information	X	Add synthetic data (e.g. pseudonyms)	X	Copyright clearance	
Establish participant consent	X	Develop an access agreement			

Other

RESOURCING

13. What do you consider to be the primary data management challenges in your project?
What problems or issues do you need to address in your project.

During the data transfer and storage, I will ensure that all data is and remains securely protected on the University Cayetano Heredia server and all anonymization procedures are in place. Also, during and after qualitative research, I will ensure that my personal equipment, containing sensitive data (e.g. personal laptop, Dictaphones) remain physically secure.

14. What resources would it be helpful for the School to provide to help deliver your plan?
How can the School help you to manage your data? E.g. training, specific IT Services, etc.

I will contact IT Services to obtain support with any deviation from the above exposed data management plan.

Appendix R Reported damage related to *El Niño* flooding and heavy rain in study trial villages

Table S1 Reported damage related to *El Niño* flooding and heavy rain in study trial villages

Village	Visit Number																				
	0			1			2			3			4			5			6		
	Houses damaged	People Affected	Crops losses	Houses damaged	People Affected	Crops losses	Houses damaged	People Affected	Crops losses	Houses damaged	People Affected	Crops losses	Houses damaged	People Affected	Crops losses	Houses damaged	People Affected	Crops losses	Houses damaged	People Affected	Crops losses
1	0	0	0	3·83	4·78	0	0·93	7·76	0	1·05	4·1	0	0	0	0	0	0	0	55·5	0	22·2
2	0	0	0	4	5	0	2	8	0	1	1·01	0	0	0	0	0	0	0	50	0	22·2
3	0	0	0	3·98	4·98	0	2	8	0	1	47·9	0	0	0	0	0	0	0	50	0	22·2
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6·2	22·4	51·42
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160·87	475·2	0

Appendix S Flowchart of participants in the SALT trial. (Bernabe-Ortiz Et al. Nature Medicine, vol 26, Mar2020, 374- 378)
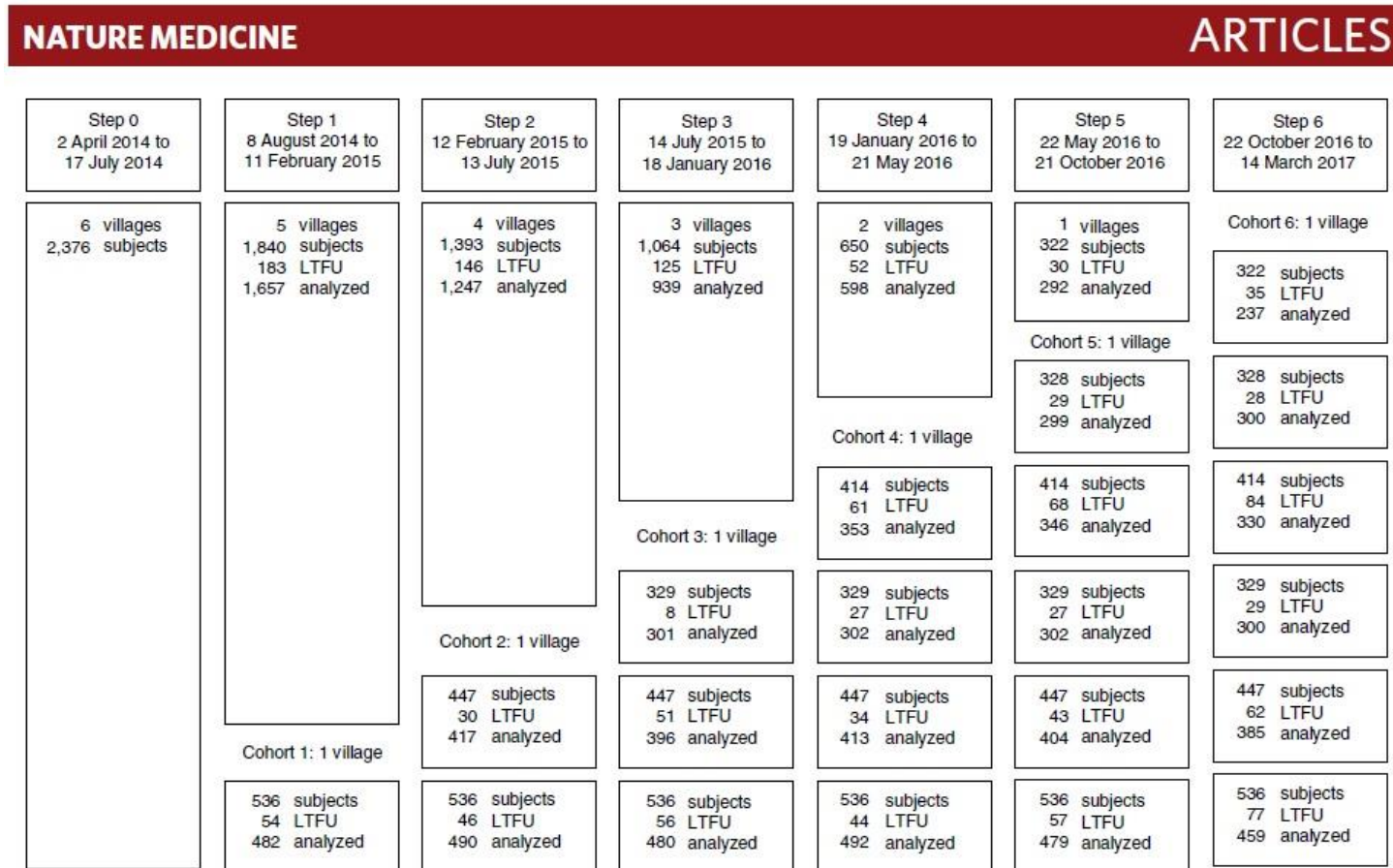

Fig. 1 | Flowchart of participants in the stepped-wedge trial. LTFU, lost to follow-up. Randomization of villages occurred after baseline assessment.

Appendix T Sensitivity analysis: a) Time trends depression prevalence across study assessments by village PHQ9≥10 (Figure and Stata output)

Depression Prevalence by Village (PHQ9≥10)
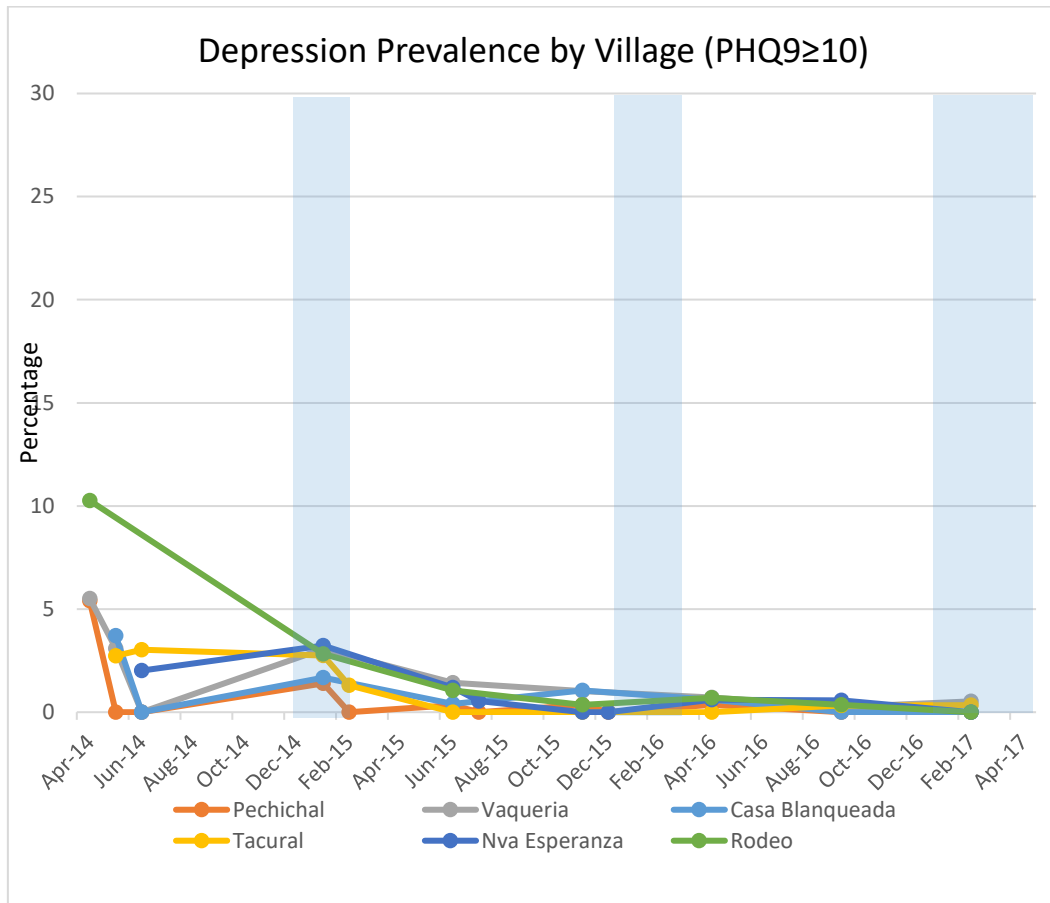
```
. xi: xtmelogit depress_2 i.visit i.entvilla || id:, or
i.visit          _Ivisit_0-6         (naturally coded; _Ivisit_0 omitted)
i.entvilla       _Ientvilla_1-6      (naturally coded; _Ientvilla_1 omitted)


Refining starting values:


Iteration 0:   log likelihood = -972.65072
Iteration 1:   log likelihood = -952.20707
Iteration 2:   log likelihood = -950.48012


Performing gradient-based optimization:


Iteration 0:   log likelihood = -950.48012
Iteration 1:   log likelihood =  -950.4207
Iteration 2:   log likelihood = -950.42065


Mixed-effects logistic regression        Number of obs    =     15,075
Group variable: id                       Number of groups =       2376

                                         Obs per group:
                                                       min =          1
                                                       avg =        6.3
                                                       max =          7

Integration points =   7                 Wald chi2(11)    =     194.85
Log likelihood = -950.42065              Prob > chi2      =     0.0000
```

depress_2	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_Ivisit_1	.464281	.084615	-4.21	0.000	.3248252	.6636087
_Ivisit_2	.1232178	.0353213	-7.30	0.000	.0702539	.2161109
_Ivisit_3	.0917529	.0299923	-7.31	0.000	.0483479	.1741254
_Ivisit_4	.0978838	.030832	-7.38	0.000	.0527953	.1814793
_Ivisit_5	.0409082	.0190508	-6.86	0.000	.0164214	.1019088
_Ivisit_6	.0252623	.0149614	-6.21	0.000	.0079133	.0806474
_Ientvilla_2	1.564358	.4655938	1.50	0.133	.8729636	2.803341
_Ientvilla_3	.9878564	.3012552	-0.04	0.968	.5433913	1.79587
_Ientvilla_4	.7649149	.2722486	-0.75	0.451	.3807618	1.536643
_Ientvilla_5	.9267597	.3026792	-0.23	0.816	.4886132	1.757798
_Ientvilla_6	2.416218	.7300144	2.92	0.004	1.336478	4.368281
_cons	.0182309	.0055274	-13.21	0.000	.0100631	.0330279

```
Note: _cons estimates baseline odds (conditional on zero random effects).
```

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
id: Identity				
sd(_cons)	1.383237	.1668645	1.091977	1.752185

```
LR test vs. logistic model: chibar2(01) = 31.50      Prob >= chibar2 = 0.0000
```

Appendix T Sensitivity analysis: b) Time trends of depression prevalence across study assessments by sex (PHQ9≥10) (Figure and Stata output)

Depression Prevalence by sex (PHQ9≥10)
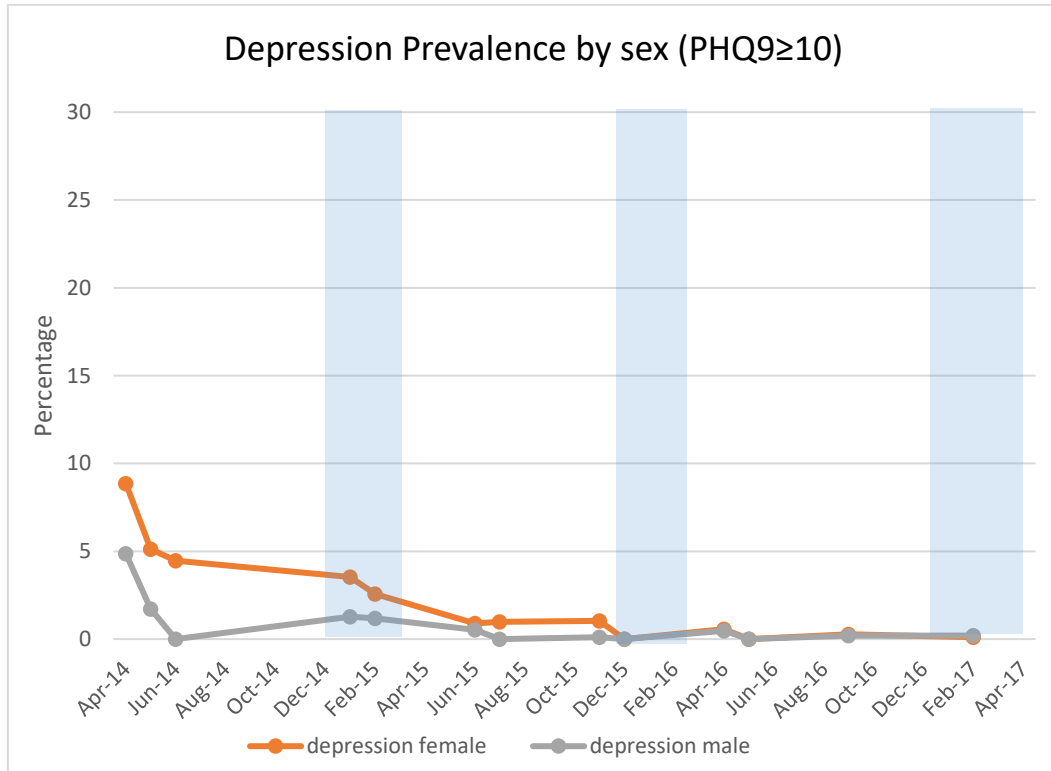
```
. xi: xtmelogit depress_2 i.visit || id:, or
i.visit          _Ivisit_0-6        (naturally coded; _Ivisit_0 omitted)


Refining starting values:

Iteration 0:   log likelihood = -985.06528
Iteration 1:   log likelihood = -963.23812
Iteration 2:   log likelihood = -961.56911


Performing gradient-based optimization:

Iteration 0:   log likelihood = -961.56911
Iteration 1:   log likelihood = -961.24284
Iteration 2:   log likelihood = -961.21046
Iteration 3:   log likelihood = -961.21043

Mixed-effects logistic regression          Number of obs     =      15,075
Group variable: id                         Number of groups  =       2376

                                           Obs per group:
                                                         min =           1
                                                         avg =         6.3
                                                         max =           7

Integration points =   7                   Wald chi2(6)      =      178.46
Log likelihood = -961.21043                Prob > chi2       =      0.0000
```

depress_2	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_Ivisit_1	.4645499	.0847025	-4.20	0.000	.3249607	.6641007
_Ivisit_2	.1235306	.0354267	-7.29	0.000	.0704146	.2167137
_Ivisit_3	.0918012	.030022	-7.30	0.000	.048359	.1742687
_Ivisit_4	.0980816	.0309039	-7.37	0.000	.0528917	.181881
_Ivisit_5	.0409524	.019075	-6.86	0.000	.0164363	.1020364
_Ivisit_6	.0253189	.0149965	-6.21	0.000	.00793	.0808378
_cons	.0210509	.0042584	-19.09	0.000	.0141605	.0312939

Note: _cons estimates baseline odds (conditional on zero random effects).

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
id: Identity				
sd(_cons)	1.440185	.1658918	1.149133	1.804955

LR test vs. logistic model: chibar2(01) = 35.66   Prob >= chibar2 = 0.0000

Appendix T Sensitivity analysis c) exclusion of village number 6 impact on persons to assess changes in depression prevalence trends

```
. xtmelogit depress peopleeffect i.visit i.entvilla || id: if entvilla≠6, or

Refining starting values:

Iteration 0:   log likelihood = -2589.6255
Iteration 1:   log likelihood =  -2587.723
Iteration 2:   log likelihood = -2587.6718

Performing gradient-based optimization:

Iteration 0:   log likelihood = -2587.6718
Iteration 1:   log likelihood = -2587.6709
Iteration 2:   log likelihood = -2587.6709

Mixed-effects logistic regression          Number of obs    =     12,094
Group variable: id                         Number of groups =       3054

                                           Obs per group:
                                                         min =          1
                                                         avg =        6.3
                                                         max =          7

Integration points =    7                  Wald chi2(11)    =     276.54
Log likelihood = -2587.6709                Prob > chi2      =     0.0000

---------------------------------------------------------------------------
      depress |  Odds Ratio   Std. Err.     z    P>|z|   [95% Conf. Interval]
--------------+------------------------------------------------------------
  peopleeffect |   .9958245   .0067555   -0.62   0.537   .9826715   1.009153
              |
        visit |
           1  |   .8106514   .099397    -1.71   0.087   .637032   1.030619
           2  |   .2448455   .0390049   -8.83   0.000   .1791811   .3345738
           3  |   .2425573   .0433456   -7.93   0.000   .1708844   .3442914
           4  |   .2594421   .057251    -9.19   0.000   .1765106   .3148851
           5  |   .1585218   .0270952  -10.52   0.000   .1057742   .2142626
           6  |   .2466245   .0388266   -8.89   0.000   .1811460   .3357769
              |
     entvilla |
     Vaqueria |   .822215    .1615843   -1.00   0.318   .5597504   1.207748
Casa Blanqueada |   .6288899   .1225393   -2.38   0.017   .4289934   .9211108
       Tecural |   .4815844   .1077457   -3.27   0.001   .3166216   .7466435
Nueva Esperanza |   .7243828   .1465558   -1.59   0.111   .4871778   1.076844
              |
        _cons |   .0754475   .0129651  -15.04   0.000   .0538731   .1056616
---------------------------------------------------------------------------
Note: _cons estimates baseline odds (conditional on zero random effects).

---------------------------------------------------------------------------
  Random-effects Parameters  |   Estimate   Std. Err.    [95% Conf. Interval]
-----------------------------+---------------------------------------------
id: Identity                 |
                  sd(_cons)  |   1.668726   .0912311    1.499163   1.857467
---------------------------------------------------------------------------
LR test vs. logistic model: chibar2(01) = 989.86    Prob >= chibar2 = 0.0000
```

Appendix U – Qualitative analysis table: Descriptive broad study topics, subtopics and findings subthemes

Study Objetives	Broad study Topics	Broad Sub Topics	Sub themes (Findings)
Study Participants: 1. Residents from areas high to moderately affected 2. Residents from areas low -to no affected			
Explore the impact of *El Niño* in Life experience, mental Health and well being	Life Experience of El Niño	Life / health impact of El Niño	Personal / historical memories related to El Niño
		Psychological impact of El Niño	Psychosocial distress / Chronic and acute effects of El Niño
Assess Individual & community Response to El Niño	El Niño and physical and MH	Perception of community response	Coping and resilience / The interconnected nature of individual and community problems
		Preparedness for El Niño	Blame and responsibilities
		Perception of government response	Blame and responsibilities / Corruption and distrust
Explore perceptions of the offer and access to support systems aimed to prevent mental disorders	Organisations or programs that address or work towards MH needs of the population	Awareness of MH support offer	Fairness in support or aid / Psychosocial distress
		Actors that should be involved	Blame and responsibilities
Explore perceptions of possible strategies to strenghten community ties & resilience in future events	Possible programs of community empowerment	Existing programs for community engagement	Fairness in support or aid
		Need of such programs	Coping and resilience
		Actors that should be involved	The interconnected nature of individual and community problems
Study Participants: Authorities - Regional and Local level			
Assess Institutions response to El Niño	Response upon El Niño	Institutions response to El Niño	Personal / historical memories related to El Niño
		Government response	Blame and responsibilities / Corruption and distrust
Impact of El Niño on community MH	El Niño and MH	Psychological impact of El Niño	Chronic and acute effects of El Niño / Psychosocial distress
		Community impact of El Niño	Coping and resilience
Explore perceptions of the offer and access to support systems aimed to prevent mental disorders	Organisations or programs that address or work towards MH needs of the population	Awareness of MH support offer	Blame and responsibilities
		Actors that should be involved	Fairness in support or aid
Explore perceptions of possible strategies to strenghten community ties & resilience in future events	Possible programs of community empowerment	Existing programs for community engagement	The interconnected nature of individual and community problems
		Need of such programs	Coping and resilience
		Actors that should be involved	Blame and responsibilities / Coping and resilience

MH = Mental Health

Appendix U – Qualitative analysis thematic map: Subthemes and Interrelated pathways

Final Interrelated Pathways	Interaction of previous & current experiences and consequences of *El Niño*	Stories of survival and resilience, focus on personal and close family members' experiences	Shared experiences of trust and distrust, at the regional and local level, breakdown of social trust between community members and between authorities and residents.
Finding's Subthemes	Personal / historical memories related to *El Niño*	Coping and resilience	Fairness in support or aid
	Chronic and acute effects *of El Niño*	The interconnected nature of individual and community problems	Blame and responsibilities
	Psychosocial distress		Corruption and distrust