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The Association between Internal Displacement Status and Violent Injuries in Jaffna

District, Sri Lanka: *A Retrospective Population-based Survey*

By

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District, Sri Lanka: *A Retrospective Population-based Survey*

By

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M.D
Damascus University, Syria
2007

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An abstract of
A thesis submitted to the Faculty of the
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Abstract

The Association between Internal Displacement Status and Violent Injuries in Jaffna District, Sri Lanka: *A Retrospective Population-based Survey*

By Lana Meiqari

Introduction Injuries account for 12% of the global burden of disease. Forced displacement is one of the effects of complex humanitarian emergencies, and little is known about the burden of injuries among vulnerable populations such as internally displaced persons (IDPs).

Objectives To describe the burden of violent injury during the complex humanitarian emergency in Sri Lanka by estimating the annual incidence of violent injury; and to examine the association between internal displacement and violent injuries during the conflict in Jaffna District, Sri Lanka.

Methods Between July and September 2009, a multistage cluster sample survey was conducted among 1494 households (HHs) in Jaffna District including 2 IDP camps. The study participants included 8,096 people; 30% of them were displaced since April 2000. The head of the household was asked to report if any HH members had a violence-related injury since April 2000. Bivariate analysis and multivariable logistic regression methods were used to determine the association between displacement status and reporting a violent injury.

Results The overall incidence of violence-related injuries among Jaffna residents is 130 cases per 100,000 persons per year. IDPs were more likely to report a violent injury than non-IDPs (OR=3.1; 95% CI, 2.0-4.7). After adjusting for age, current status, religion and access to health care facility, the odds of reporting a violent injury is still significantly higher among IDPs compared to non-IDPs (OR=2.9; 95% CI, 1.9-4.5).

Conclusion Among residents of Jaffna District in Sri Lanka, the odds of reporting a violence-related injury is significantly associated with displacement status.

Key Words Complex humanitarian emergency, internal displacement, forced displacement, population displacement, refugee, epidemiology of injury, violence-related injury.

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LIST OF ABBREVIATIONS

AOR   : Adjusted Odds Ratio
CA   : Community Assessment
CDC   : US Centers f Disease Control and Prevention
CHEs   : Complex Humanitarian Emergencies
CMR   : Crude Mortality Rate
COR   : Crude Odds Ratio
EAs   : Enumeration Areas
EMS   : Exhaustive Mortality Survey
ERW   : Explosive Remnants of War
HH   : Household
ID   : Internal Displacement
IDP   : Internal Displaced Person
IERHB   : International Emergency and Refugee Health Branch
LTTE   : Liberation Tigers of Tamil Eelam
MOH   : Ministry of Health
MR   : Mortality Rate
NGO   : Non-Government Organization
OR   : Odds Ratio
PHM   : Public Health Midwives
PSU   : Primary Sampling Unit
RDHS   : Regional District Health Service
SSU   : Secondary Sampling Unit
U5MR   : Under 5 Mortality Rate
UNHCR   : United Nations High Commissioner for Refugees
UNICEF   : United Nations Children's Fund
UXO   : Unexploded Ordnance
WHO   : World Health Organization
WTD%   : Weighted Percent

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CHAPTER I: INTRODUCTION

BACKGROUND

Throughout history, armed conflict has been a major cause of fatal and non-fatal health outcomes for both armed forces and civilians.[1] While previous research has focused on studying the effects the effects of war on armed and military forces, the effects on civilians and other vulnerable groups such as refugees and displaced have been hard to document and study.[2] Civilians suffer both direct (e.g., mortality and morbidity caused by missiles and landmines) and indirect (e.g., epidemics, food shortages, population displacement, and destruction of health care services) effects of conflicts.[3, 4] Looking at the broader picture of the political, economic, and social effects of violence on civilians, armed conflicts are considered to be complex humanitarian emergencies (CHEs).[1, 3]

Population movements to safe areas carry other kinds of risks and challenges in the face of humanitarian agencies and responses. Refugees and displaced populations suffer high mortality and morbidity rates, particularly during the immediate period after their migration.[2] Some known risks which influence the health status of displaced population include: i) prior health status of population; ii) access to basic food, water, sanitation, shelter and health services; and iii) length of being exposed to the risks.[2]

Refugees are protected by international law, but there is no international agreement on the rights of the internally displaced populations (IDPs).[5] The first document that discussed internal displacement was presented by the UN in 1998. The "Guiding Principles on Internal Displacement" defined IDPs as: "Persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized State border".[6]

Experts agree on two components of this definition: "forced migrations", and "not crossing an internationally recognized state border". The later aspect keeps the IDPs under the authority of their government and makes them inaccessible for the international relief agencies.[5, 7] In addition, experts question two other dimensions in the IDPs definition:

- Broader vs. narrower view to the causes of the displacement:

    o Is it only violence and conflict?

    o What about natural disasters and developmental projects?

    o Can we include rural-urban displacement or poverty and economic-related migration as well? and

- Specifying duration:

    o When would an internal displacement status end?

Furthermore, in studying the effects of internal displacement, some experts discuss the importance of providing a special category to IDPs, and whether the characteristics and experiences of this population would be different from those of refugees, asylum seekers and migrants.[5]

The confusion in defining IDPs reflects on the international policies and interventions offered to assist this population; in 2006 the United Nations Higher Commission of Refugees (UNHCR), which is mandated to work with refugees, was authorized to provide assistance for IDPs. Another affected area was the quality of data gathered, presented and compared around this population.[5] For example, the Internal Displacement Monitoring Center (IDMC) has been publishing the "Internal Displacement Global Overview of Trends and Development" every year since 2003, providing information on those internally displaced by armed conflict, generalized violence, and human rights violations. The latest figure in 2010 was approximately 27.5 million

IDPs worldwide. As shown in Figure 1, these estimations have been increasing steadily since late-90s. There is no global data available on those internally displaced by natural disasters.[8] According to the 2010 "Internal Displacement Global Overview of Trends and Development", Africa was the most affected region with an 11.1 million identified IDPs living in 21 countries. Five countries had over a 1 million IDPs; these included: Colombia, Democratic Republic of the Congo (DRC), Iraq, Somalia, and Sudan. All these five countries have been suffering from ongoing armed conflicts for years.[8]

Another obstacle facing the work with IDPs is that it is getting harder to reach the IDPs, especially with the rapid increase in the "urban IDPs" which refers to those who stay with relatives, friends or even strangers in villages or cities rather than staying in protected camps. In addition, circumstances which have caused displacement make it sometimes dangerous to locate people and collect data on their health status. Analyzing the causal association of internal displacement and possible outcomes is difficult for several reasons: [9]

➢ There is no unified tool to measure the displacement status, particularly for the use of health researchers.

➢ Displacement itself exacerbates several known risk factors (e.g. poverty, poor access to health care, water and sanitation services and education, and social and political discrimination)

➢ Due to the displacement status it is almost impossible to conduct experimental and quasi-experimental trials.

Indicators of health among displaced populations are needed for planning and providing assistance. To locate displaced populations researchers and organizations use rapid assessments in short term displacement; however, in long term situations, profiling can be used. Profiling IDPs is defined as "a collaborative process whereby data on individuals or groups who have been

internally displaced is collected, with the purpose of informing advocacy on their behalf, improving protection and assistance interventions and, ultimately, finding a durable solution to displacement".[10] The data collection methods include: quantitative (e.g. surveys, surveillance or registration, and census), and qualitative (e.g. focus group discussions and key informants interviews). There are no guidelines for specific data elements to be collected; the general guidelines mention the following: number of households and family member(s) with their basic characteristics (e.g. age, sex); current location of residency, and time arrived there; previous location of residency, and how long he has been living there; cause(s) of displacement; and others such as: protection concerns, key needs and possible solutions.[11]

In order to identify the best public health practices and evidence-based interventions, the risk factors and consequences of internal displacement need to be identified.[2] In 1997, Toole and Waldman did the first and only review on the public health effects on refugees during complex emergencies.[12] Refugees and IDPs suffered of high mortality rates; the most common causes of death were communicable diseases, acute malnutrition, and war-related injuries. The suggested prevention measures to reduce mortality and morbidity were protection from violence; providing adequate qualities and quantities of food, water, and sanitation services; and providing basic health care services and communicable diseases control which include outbreak control, immunizations, and maternal and child health care. A more recent systematic review on the health effects on IDPs during disasters, Uscher-Pines categorized the health outcomes that were under-investigation in the literature as: i) Physical health outcomes: mortality, morbidity (particularly, diarrheal diseases, measles, and acute respiratory infections), malnutrition, women's sexual and reproductive health and rights, gender-based violence, injuries and other health-related human rights violations, HIV, TB, and Malaria; ii) Mental Health Outcomes; and iii) Health care access and quality.[13] Despite the work done in the last decade, research on war-related civilian injuries is still limited, particularly among specific populations such as refugees and IDPs.[1]

Additionally, war-related injury is usually looked at as a secondary objective in the context of the research focusing on death or disability.[1, 14] This thesis attempts to contribute to the research on the relationship between internal displacement and the occurring of violent injuries during conflicts.

STUDY OBJECTIVE(S)

The main goal of this study is to investigate the relationship between internal displacement and the pattern of injuries during the complex humanitarian emergency in Sri Lanka. The specific objectives to be addressed in this study are:

1) To describe the burden of violent injury during the complex humanitarian emergency in Sri Lanka.

2) To examine the association between violent injuries and internal displacement.

ARMED CONFLICT IN SRI LANKA

In the course of 30 years, Sri Lanka had suffered of several emergencies of different mechanisms: the civil conflict with the militias of Liberation Tigers of Tamil Eelam (LTTE) (1983 – 2009) and Asian Tsunami (2004).

Civil conflict in Sri Lanka started between government forces and the militias of LTTE in 1983. LTTE was seeking the independence for the northern and eastern provinces inhibited by persons of the Tamil ethnicity. [15] The conflict went through a number of phases of war and ceasefire: Eelam War I (1983-1987); Indian Peace Keeping Force Intervention (1987-1990); Eelam War II (1990-1995); Eelam War III (1995-2002); ceasefire phase (2002-2006); and Eelam War IV (2006-2009).[16] Starting from January 2009, the government underwent a wide military action against the LTTE; gained control over all the lands previously held by LTTE; and declared its victory in 19 May 2009. [15] Table 1 shows the estimated numbers of deaths and displaced people caused by the conflict, particularly the final phase during October 2008 and 2009.

It is hard to tell the exact number of deaths and causalities caused by the war. According to government officials, 4,264 confirmed deaths for the period January to May 2009. The U.S. Department of State estimated 6,710 deaths between January and April 2009. Other estimations from international agencies reach 40,000 deaths.[17]

Additionally, many people were displaced at different phases of this longstanding conflict, either voluntarily or involuntarily. In 2009, Sri Lanka was one of eight countries globally with at least 200,000 people newly displaced. By the end of that year, the total number of displaced people reached 400,000 people.[18] The IDPs were living in government-run camps or with host families. Those who were related to the LTTE were kept in detention closed camps, with no freedom of movement outside the camps and their provinces.[15] These camps were run by military, and they failed in keeping the minimum international standards; camps were over-crowded and suffered of poor sanitation, insufficient water supplies; and inadequate food and medical care. No independent or international organizations were allowed to work in them.[15]

By the end of 2009, the government, in collaboration with other partners, started the operation of resettling IDPS back to their homes; this operation is still in progress.[19] Increasing numbers of IDPs were allowed to return to their provinces. However, many of them were not able to go back home due to different reasons: i) damaged homes; ii) lack of immediate living assistance; and iii) lands' contamination with mines, unexploded ordnance (UXOs), and other explosive remnants of war[18]. These people remained internally displaced in their original districts, living either in other temporary camps or with host families.

Numbers of injured and disabled people in Sri Lanka are unknown. However, UN OCHA estimated that the confirmed hazardous area remaining in five districts in the country is 109,737 km2.[20] Few surveys have been done in different districts to estimate the prevalence of injuries in the country.[21, 22] Furthermore, in 2010 The Sri Lankan Ministry of Healthcare & Nutrition

has formulated the draft of the National Policy on Injury Prevention and Management, yet more work on injuries surveillance and epidemiology is needed; the data of such epidemiological initiatives can be used by public health professionals in designing more effective and targeted preventive measures.

STUDY SETTING: JAFFNA DISTRICT

Jaffna District is located in the Northern Province of Sri Lanka and occupies most of Jaffna Peninsula (Island). This province was greatly affected by the war. The population of Jaffna varied greatly over the period of the conflict. Jaffna has a population of 738,788 persons in 1981. The enumeration of 2007 estimated the population of Jaffna District to be 559,616 people; this reflects a reduction in the annual population growth rate by -1% as shown in Figure 2. The most recent census in 2011 estimated the population to be 567,229 people.[23, 24] Furthermore, the urban population of the Jaffna District had also suffered a reduction over the period of the war, which reflects the effect of the conflict on the social and economic situation in the district.[23] Female population was greater than male population in 2007 with a sex ratio of 90.1 males per 100 females.[24] As for the ethnicity, 99.9% of the population was Sri Lanka Tamils, followed by 0.1% Sri Lanka Moor. The longstanding conflict and the Tsunami have displaced a total of 130,534 persons in 2007. A scheme of the displaced population is shown in Figure 3. The Health sector was also affected resulting in a lack of medical staff and essential medicines.

CHAPTER II: LITERATURE REVIEW

The objectives of this literature review are:

1. To describe the global burden of injuries.

2. To provide an overview of the epidemiology of injury, apply the causal models on two examples of violence-related injuries, and discuss the epidemiology role in injury prevention.

3. To present a summary of the burden of injuries in CHE situations and among refugees and IDPs, focusing on the potential risk factors that are related to injuries occurrence during population displacement situations.

4. To provide a baseline of injury distribution in different districts of Sri Lanka.

The discussed studies in this literature review will be evaluated for their contributions to the area of research and to identify the gaps they leave in understanding the burden of injuries in CHEs situations.

DEFINITION OF TERMS

➢ Injury is "the physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy. The time between exposure and the appearance of an injury needs to be short (a few minutes)".[25]

➢ Intent refers to the purpose and awareness of the risk of injury played by the person(s) involved in the incident that cased the injury.[26]

➢ Violence-related injury or violent injury or intentional injury is defined as "the intentional use of physical force or power, threatened or actual, against oneself, another person or against a group or community, which either results in or has a high likelihood of resulting in physical

(injury, death, mal-development, or deprivation), sexual, and/or psychological abuse of civilians".[26] This can be categorized into:[2, 27]

- o Interpersonal violence: directed towards family (e.g. domestic violence, child maltreatment, youth violence, etc.), or acquaintance or strangers (e.g. physical assault, homicide, sexual violence, etc.).

- o Self-directed violence: includes suicide or self-harm (e.g. self-mutilation).

- o Collective violence: includes war, civil conflict or other types of organized or institutional violence (e.g. explosion, landmines, etc.).

- ➢ Fatal injury is "any injury which results in death within 30 days of the incident".

- ➢ Internally displaced persons (IDPs) are defined as "persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized state border". [6]

- ➢ Host community is a community in which displaced persons are living after leaving their home.

- ➢ Host family is a family of the host community with which displaced persons are living.

GLOBAL BURDEN OF INJURY

To examine the burden of injuries, the world health organization (WHO) utilizes two measures: mortality rate (MR) and the disability-adjusted life year (DALY) which measures the years of life lost from premature death and years of life lived in less than full health.[28] Worldwide, injuries accounted for 10% of the deaths in 2004, and 12% of the burden of disease.[28] The share of the

intentional injuries in the global burden is increasing dramatically. This trend made intentional injuries one of the leading causes of death in many countries and communities.[29]

As shown in Figure 4, which illustrate the DALYs per 1000 adults aged 15-59 years in 2004, divided by WHO region, sex and cause of injury; suicide is the main contribution for the intentional injuries in developed countries (e.g. Europe), while interpersonal violence and war are the main contributions in developing countries (Africa, and Eastern Mediterranean).[28]

In 2002, it was expected that the intentional injuries may rank among the leading 15 causes of death and disease burden in 2020.[29]

By 2004, the list of the leading 20 causes of death among all ages included self-infliction injuries which caused 1.4% of total deaths and ranked the 16th. [28] Moreover, the list of the 20 leading causes of burden of disease (DALYs) among all ages in 2004 included violence which caused 1.4% of total DALYs and ranked the 18th, in addition to self-inflicted injuries which caused 1.3% of total DALYs and ranked the 20th.

Men are at higher risk than women of dying due to an injury (MR, 12% vs. 7%) or having a higher injury burden (DALYs, 16% vs. 9%). The 2004 estimation of the deaths and burden of injury in DALYs by cause and sex are presented in Table 2. This sex disparity remains the same when comparing intentional and unintentional injuries.

Besides male sex, young aged people are more affected by injuries. Among those aged 15-44 years, interpersonal violence injuries and self-inflicted injuries had a more advanced ranking in the list of the leading causes of burden of disease, 6th and 8th, respectively. [28]

Looking at the war-related injuries in particular, in 2002 the cause-specific mortality rates ranged between > 1 death per 100,000 people in high-income countries, and 6.2 deaths per 100,000 people in low- and middle-income countries.[2] Overall, the world health organization estimated that almost 301,000 deaths of war-related injuries occurred in 2000; the highest rate

was in Africa with 32 deaths per 100,000 people.[2] In 2004, this estimation increased to 184,000 deaths of war-related injuries; the highest rate was in Eastern Mediterranean region with 19 deaths per 100,000 people (a total of 99,000 deaths).

No estimations have been presented for injuries among vulnerable populations such as refugees and IDPs, although injuries in these populations are expected to have a negative impact on their live and health. Most of the estimations on injuries among refugees and IDPs are presented by reports of NGOs such as International Committee of Red Cross (ICRC).[30] However, war-related injuries were accounted for at least 10% of deaths in conflict zones among refugees.[31] More information about these estimations is described below.

EPIDEMIOLOGIC BASIS OF INJURY

The epidemiological framework of injuries is different from the standard epidemiological studies. Although the etiology of injuries follows the standard epidemiological triangle that includes agent, host, and environment, it is complicated to analyze injuries due to the multifactorial causes and mechanisms; that is to say, studying multiple injuries collectively needs different epidemiological analysis for each one of these injuries, in order to establish the risk factors, and then to develop appropriate preventive measures.[32] As a result, few researchers chose to focus their work on fixed risk factors, such as age, gender, ethnicity, and socioeconomic status, which will help in developing a better targeted intervention programs; although this is not always a good or possible approach in designing programs.[33]

The following analysis studies the relationship between the different factors that interact with each other to increase the likelihood of two events as examples of intentional injuries during conflicts and population displacement; these include:

	Physical assault as a cause of an interpersonal violent injury	**Explosion as cause of a war-related injury**
Host	The assaulted person	The targeted group of people/civilians
Agent	Mechanical/physical force (e.g. a gun)	Bomb
Vehicle & vector	The person who committed the assault	Soldiers or fighters
Environment	the lack of resources that may lead to a disagreement between these two people, and the societal norms or values that make this behavior acceptable	The conflict; population movement and displacement in search of sage areas

The relationship between the four described factors is usually illustrated using different models; the most used in ones are epidemiologic triangle, injury spectrum and Haddon's matrix. Although these modeling techniques are useful in identifying causality, their major use is related to find the appropriate ways to deal with the injury in the future by preventing the occurrence of the event or by reducing the harm caused by the event after its occurrence.[34]

EPIDEMIOLOGIC TRIANGLE

An example of a standard epidemiologic triangle is shown in Figure **5**5. This model is used to identify the different factors involved in an injury, in order to plan for the appropriate prevention and harm reduction activities.[25] For instance, in the assault example, the injury could be caused by factors related to the host (i.e. the assaulted person) or the vector (i.e. the person who committed the assault), or the environment (i.e. the disagreement that lead to the fight between these two people). This will help in identifying changes needed to prevent the occurrence of similar events.

INJURY SPECTRUM

An example of a standard injury spectrum is illustrated in Figure **6**6. The additional value of this model compared with the epidemiologic triangle is that the injury spectrum takes into account the role of time and explains the possible outcomes (i.e. full recover from the injury, disability and/or

death).[25] Consequently, the injury analysis is helpful in analyzing the prevention of these different outcomes.

HADDON'S MATRIX

The most recent development in the field of injury analysis and prevention was made in 1970, when Haddon designed a matrix to combine the features of both the epidemiologic triangle and the injury spectrum.[25] In other words, Haddon's Matrix, also called the Haddon phase-factor Matrix, presents both the epidemiologic factors (i.e. host, agent, vector, and environment), and the time phase (i.e. pre-event, event, and post-event). The standard is listed in Figure **6**7.

The following table provides an example of the physical assault between two displaced people, the assaulted is suffering of malnutrition which makes him in a bad physical shape and the assaulted is traumatized due to being abused by the warring parties which makes him easily irritated. The lack of resources results in a fight between these two stressed people. The availability of the arms makes it easier for the assaulting person to get a gun and shot the other person. Due to their displacement, access to health care facilities is limited.

Phase / Factor	Human / Host	Agent & Vector	Environment	
			Physical	**Sociocultural**
Pre-event	Being an IDP looking for a safer area; physical and psychological trauma	Assaulting person is traumatized physically and psychologically	Unsafe transportations during displacement	Social acceptance of violence as a mean of solving disagreements
Event	Lack of food supplies causing mal-nutrition	Easy access to guns	Crowded camps	-
Post-event	Penetrating injury which leads to hemorrhage	Location of bullet fragments	Limited access to health care facilities	-

The following table analyzes the type of injury caused by a bomb explosion targeting groups of IDPs. The warring parties are not following the international humanitarian law and

using civilians as human shields. In their travel, IDPs pass through unsafe areas. In this case as well, access to health care is problematic.

Phase / Factor	Human / Host	Agent & Vector	Environment	
			Physical	Sociocultural
Pre-event	Being IDPs looking for a safer area	Availability of highly destructive bombs; warring parties are using civilians as human shields	Passing through unsafe areas	Racial / religious / political difference and disagreements
Event	Presence of big groups of people	Deliberate targeting for civilians by warring parties	Aggregation of large numbers of people in a single area/camp	-
Post-event	Injured severely; amputations	Follow-up explosions	Limited access to health care facilities	-

As noticed in reviewing the discussed examples, the two injuries have some common factors and mechanisms, even though they are caused by a completely different mechanical power.

Using the same Haddon's Matrix, possible control measures to prevent injuries and/or reduce their harm can be produced cell by cell. Moreover, this method helps in identifying the relevant available research and gaps in knowledge for future studies. It also provides the ability to take into account the cost-effectiveness and efficacy of the proposed or studied prevention measures. [34]

INJURY PYRAMID

Injury indicators used in research differs. According to the selected indicator, injury estimation may vary due to underestimations, because it would be impossible to design a research that includes all occurred injuries with different injury indicators.[26] As shown in Figure **8**8, the

majority of injuries are not reported, smaller proportion is caused by hospitalization or long-term disabilities. Fatalities are the smallest proportion of all injuries.

INJURY PREVENTION

A number of models can be used to identify possible prevention measures.[32] The three levels of prevention (primary, secondary, and tertiary) are highly correlated with the time phases of the injury spectrum and Haddon's approach; these levels are explained as the following:[25]

➢ Primary prevention can be achieved by preventing the event or preventing the event from leading to an injury (e.g. insuring the availability of safe areas and camps for IDPs; and providing the IDPs with enough resources and needs on different physical and psychological levels).

➢ Secondary prevention can be achieved by early diagnosis and providing good management of an injury (e.g. applying first aid at the scene of the incident).

➢ Tertiary prevention can be achieved by improving the final outcomes of an injury and preventing its possible complications (e.g. rehabilitation).

Moreover, Haddon presented a list of ten basic strategies for injury control; these strategies are intended to provide a complete tool for possible harm reduction measures from all environmental hazards (e.g. weapons, regimes that causes wars and violence) that take into account the multifactorial nature of the injuries and.[34] The list includes: [32, 35]

1. Prevent creation of the hazard:

➢ prevent production of weapons; ban wars

2. Reduce amount of the hazard:

   ➢ limit the arm market and production, especially in conflict areas and to warring parties;

   ➢ ban landmines

3. Prevent inappropriate release of the hazard:

   ➢ insure the application of international humanitarian law which demands the protection of the civilians during conflicts

4. Modify rate or spatial distribution:

   ➢ provide safe areas/camps for civilians with no arms/weapons policy

5. Separate release of the hazard in time or place:

   ➢ insure the safety of the roads used by civilians during their displacement journey;

   ➢ mandate cease of fires to evacuate civilians from hot spots

6. Put a barrier between the hazard and people at risk:

   ➢ UN or other peacekeeping forces to protect civilians;

   ➢ provide civilians with personal protection methods such as flak jackets, bullet proof helmets, ear plugs, gas masks, and effective shelters

7. Change basic nature of the hazard:

   ➢ ban use of nuclear, chemical, or biological weapons

8. Increase resistance of people to the hazard:

   ➢ provide appropriate psychological and social support to reduce stress among traumatized civilians

9. Begin to counter damage already done:

    ➤ provide first aid services;

    ➤ land's demining

10. Stabilization , definitive care, and rehabilitation:

    ➤ provide wheelchairs or artificial limbs;

    ➤ provide long-term psychological treatment for post-traumatic stress disorder

In his paper, Haddon emphasize that these basic and theoretical approach cannot be considered a complete "guide for action" or "mean for choosing policy", rather than an aid in identifying and studying possible control programs or "choosing the various means by which policy might be implemented".[34] On the other hand, the previous list is not intended to be comprehensive and locals usually create approaches that fits their realities and that should be collected and published.[32, 35] Furthermore, it is so complicated to implement effective interventions especially that "both international and local efforts are necessary" on the ground, in addition to the importance of political actions and negotiations.[35]

INJURY DURING COMPLEX HUMANITARIAN EMERGENCIES (CHES)

As discussed in the introduction, although wars and conflicts have increasingly caused higher levels of morbidity and mortality over the course of history, measuring the health impacts of such wars and conflicts did not receive appropriate attention from public health professionals until the 90s.[36] Most of the previous studies focused on military medicine and military planning. In 1997, Aboutanos and Baker published the first article that discussed the role of epidemiology in wartime civilian injuries. The mentioned justifications for their interest in this field included: i) Examples from the wars in Lebanon, Bosnia, Croatia and Rwanda; ii) the rapid development of more powerful weapons and arms which has increased the numbers of affected populations and

civilians in particular, and has changed the patterns of public health impact and priorities during CHEs; and iii) the research and policy focus was directed at the secondary results of CHEs, such as water and sanitation, nutrition, shelter, and mental health conditions, whereas for the direct results of CHEs, the majority of research has focused on mortality, with limited or no research directed towards injuries and trauma.[35, 37]

The role of epidemiology during emergencies include defining health risks, suggesting feasible means to reduce these risks, and monitoring the capacity and reconstruction of the public health system. In case of injuries, these roles can be achieved by: i) carrying out active surveillance of injury conditions; ii) implementing well-defined injury control interventions; iii) assessing the capacity of health services facilities to provide injury prevention and control services; vi) establishing a long-term injury surveillance and investigation programs in the war-affected areas.[35]

Few limitations made it difficult to collect data or conduct useful studies on injuries and their control during CHEs; these include: relying on hospital-based data or controls versing population-based surveys or community-based controls; the difficulty in collecting the data due to logistical, political and military barriers; the difficulty in estimating denominators due to out- and in- migration (either voluntarily or forced); the difficulty in numerator classification for example how to separate at-risk civilians from military personnel, another example is related to defining the outcome as how to classify injuries in CHEs and war situations.[35]

In a reply letter to a critique to their findings, Aboutanous and Baker emphasize that their aim is to "advocate that a proper understanding of injury epidemiology, and proper studies by injury epidemiologists, who would risk becoming actively involved in war situations, during the exacerbation and remission phases, among the populations in active war zones, as well as among the displaced and the refugees, must be undertaken".[38] Since the publication of this paper, few

studies were published to look at burden of injuries and landmine injuries among civilians in more recent CHEs; these studies took place in different countries all around the world, such as Cambodia, Afghanistan, Nepal in Asia, Chechnya in Russia, and Uganda in Africa. [14, 39-45]

In the case of the chronic conflict in Afghanistan, many studies were conducted mostly in the major cities of the country to describe the civilian's overall burden of injuries and of landmine injuries in particular; due to the instability and security risks, the majority of these studies used hospital-based data or ICRC's clinic-based surveillance data.[39, 41] Micheal et al [41] investigated the injuries patterns among 608 patients with different injuries excluding landmine injuries. Among all injuries, 33% were civilians; 51% of injuries among civilians were caused by fragmenting munitions. When breaking down the injuries into combat vs. non-combat, 65% of the non-combat injury is caused by firearms; the authors concluded that "weapon availability and social breakdown accompanying conflict may be important factors in the occurrence of weapon injuries that persist independently of conflict". However one of the limitations of the study was not having an exact measure of the availability of weapons.

Furthermore, injuries from landmines and unexploded ordnance (UXO) were also investigated in Afghanistan using surveillance data from the United Nations Mine Action Center for Afghanistan (UN MACA); 70% of this data is collected from clinic-based surveillance operated by ICRC.[43] The analysis of UN MACA data during 1997 and 2002 showed that the total number of reported injuries was 6,114. The injuries were divided approximately equal between landmines (48%) and UXO (45%). The case fatality proportion was 7%. Males were 10 times more affected than females; younger people were more affected than older. Children were mainly injured by UXO while playing or tending animals; on the other hand, adults were mainly injured by landmines while travelling or engaging in military activities. Similar patterns were observed analyzing the ICRC data during 2001-2002 and 2002-2006, except for the case fatality rates which showed higher case fatality proportions 9.4% and 17%, respectively.[42, 45]

Civilians, males, younger ages remained the most important risk factors among landmines and UXO injuries. All these studies were mainly based on clinic-based data which only counts those with nonfatal major injuries seeking medical care and have access to medical facilities. That is why these studies show underestimated results than population-based studies.

A population-based study was undertaken in Uganda to estimate the burden of injury during the CHE.[14] Forty six percent of the sample was made of displaced civilians. The majority of those injured was among IDPs, males, and peasant farmers. The overall prevalence of injury was 44.6 injuries per 1000 per year. Among injured people, those recovered from their injury formed the higher proportion, while the ratio of deaths to disabilities is 1.5:1. The leading causes of injury were intentional such as gunshots, cuts, and landmines (63.2%).

As expected, studies are showing that civilians are at higher risk of being injured during CHEs. The most important risk factors include male sex, younger ages, displaced status, and low socioeconomic status. Preventive interventions such as landmine clearance are needed, especially as soon as the CHE situation ends.

INJURY AMONG REFUGEES AND IDPS

Injuries are expected to have a great impact on the health status of in vulnerable populations, such as refugees and IDPs. The factors influencing this effect are the refugee's experience in their locations of origin, behavioral trends and adoption of risk factors in their camps and new locations.[46] Although their importance, few studies were done to explore the burden of injuries among these vulnerable groups. A summary of these studies is presented in Table 3. Patterns of injuries among Afghan refugees were previously investigated using hospital-based data during the 80s and 90s; one recent population-based study measured the injury patterns among long-term Afghan refugees in Pakistan camps.[30, 46] On the other hand, injuries among IDPs were mostly

explored as a secondary outcome while exploring their general health status; these include three studies that took place in Burma, Uganda, and Angola.

Early studies on injuries among Afghan refugees showed that explosives such as landmines were the leading cause of war injuries. The anatomical site of the injury was also investigated, and the results showed that extremities were the most frequent injury. However, these studies did not provide any prevalence or incidence estimations due to the difficulty in defining the denominator.[46] An all-injury incidence of 50.8 per 1,000 persons per year was estimated among Afghan refugees, which is higher than the incidence among the host Pakistani population. Males, young ages and those with < 6 years of formal education had an increased risk of injuries. Still, other potential related factors were not investigated in this analysis such as SES and access to health care services. The highest proportions of injuries resulted from falling (39%), road accidents (19%), and assaults (15%). Among this long term refugee population, only one case of war injury occurred during the recall period. On the other hand, the study suggests that culture and society affects the injury patterns, particularly in work-related injuries; these include two factors: females were at lower risk of work-related injuries because a small proportion of females actually worked outside the camp; in addition, children < 15 years were at higher risk of work-related injuries due to child labor. No comparison between intentional and unintentional injuries was presented; however, the study showed that road accidents caused the highest burden of injuries among this long-term refugees. Thus, preventive measures should focus on road accidents by taking into account the cultural differences of the transport system. [30]

Generally speaking, forced displacement has a negative association with negative health outcomes. A survey in Burma found that 1 in 10 households were subject to forced displacement. An increase in landmine injury was noticed among displaced people (2.3%) compared with non-displaced people (0.6%) (OR=3.89; 95%CI: 1.01-15.0). However, limited potential risk factors

were collected; for example, the survey did not include any information on SES, other environmental exposures, and access to health care services.

To explore the disease profile among poor people in the context of war, displacement and HIV/AIDS, the discharge hospital records were reviewed in northern Uganda.[47] Gulu District has been affected by the civil war since 1986; as a result, 70% of its population was subject to internal displacement. Injury was the 8th leading cause of the overall admissions (n=3,886; 2.5%) and a 4.3% of the overall number of bed-days; in addition, injury came in the 2nd leading cause of average length of stay in hospital (ALOS) (20%). When looking at the time trend of admission for war-related injuries, the analysis showed that it fluctuated with the war intensity. Injuries (mostly war-related) had two periods of a sharp increase after the civil conflict in 1997 and then in 2002. A similar pattern was noticed among the displaced former UNITA members and their families when mortality causes were investigated for the periods pre- and post-displacement.[48] War or violence was one of the three frequently reported causes of death along with malnutrition and fever or malaria; between 2001 and up to 2002, the leading cause of death was war or violence (34%), then it was replaced by malnutrition (34%).

In summary, refugees and IDPs were not a priority in terms of injury research. There is a need for conducting more specific studies on injuries in these vulnerable populations. The main objectives of these studies would be determining health priorities, planning preventive strategies, monitoring trends over time, and evaluating the already-implemented interventions.[49]

INJURY IN SRI LANKA

Injuries in Sri Lanka have been a major public health problem; however, it is hard to set baseline estimations for the burden of injuries due to the different political and social characteristics between the different districts in the country. A summary of studies on injuries conducted in Sri Lanka is presented in Table 4.

In 1996, Jaffna District was going through a peaceful period of the conflict. The Sri Lanka government invited the IDPs to return to their home; however, they faced the risks of landmine injuries as no efforts were taken to remove the left-over landmines. A study using the data of the Jaffna Teaching Hospital was conducted to describe the civilian landmine injuries during the period of 20-months (May 1996 and December 1997).[50] The incidence of landmine injuries was approximately 72 per 100,000 persons per year. Other investigated factors were the anatomic location, amputations, mortality, group injuries, gender, age, operative procedures, length of hospitalization, time of year, and number of injuries. Mortality rate during the last 12 months was 29%; most of them were dead-on-arrival (80%). Factors related to the higher risk of landmine injuries were civilians returning home, agriculture occupation, male sex (76%), and people being in groups (49%). Children (< 15 years old) were also at higher risk of being injured; they composed 20% of all landmine injuries. On the other hand, men in the working age group showed fewer incidences, which may be a result of the war militarization and losses in the society. In addition, women were at higher risk of being injured compared with previous landmine studies. In summary, this study showed that displaced civilians who are returning to their homes are facing a high risk in obtaining a serious injury due to the wide distribution of landmines.

Two population-based studies took place in the calmer districts of Sri Lanka which were not affected by the conflict. The first one was conducted in rural areas.[51] The incidence of major (intentional and unintentional) injury was 82.6 per 1,000 person years. The working age group 25-45 years old had higher proportion of injuries. This incidence was three times compared with the incidence of hospital-based data. No detailed information about the intent of the injuries was presented. The second study was conducted in a southern district of Sri Lanka.[21] Injuries were divided by their mortality status; the adjusted incidence of non-fatal injuries was 24.6 per 100 persons per year, and mortality rate was 177 per 100,000 people per year. The leading risk

factors for non-fatal injuries were males, and rural area of residency. Among all injuries, 11.8% were related to war (n=2), and 5.8% were due to assault (n=1). In this study, assault injuries were most probably underestimated due to the sensitivity of the subject in the Sri Lankan community. However, none of these studies investigated the effect of SES, displacement status, occupation, access to health care and household and environmental characteristics on injuries.

SUMMARY

As expected, there is limited volume of literature on injuries during CHEs and among refugees and IDPs. Less research is population-based compared to hospital-based. In addition, the discussed studies varied in their definition of injury which opens the door for possible misclassification bias, and the parameters investigated which resulted on a poor-documentation of the relationships between the potential behavioral and environmental risk factors and burden of injuries. On the other hand, despite the focus on war-related injuries during CHEs, their incidence and prevalence are not well-documented. Furthermore, only one study investigated the non-war related injuries among refugees and IDPs, especially those who have been living in camps for long times. Despite the observed need for working on preventing injuries among refugees and IDPs, no information about specific prevention programs was mentioned; as well as, no information on evaluating any intervention programs either for prevention or rehabilitation care, if any were implemented. Despite the importance of quantitative studies to describe the epidemiology of injury during CHEs, qualitative research is as important in investigating the relationship between injuries and violence among the affected vulnerable populations. In summary, more research is needed in the field of epidemiology of injury among refugees and IDPs.

CHAPTER III: METHODS

RESEARCH QUESTION

- ❖ **Question:** Are internally displaced persons more likely than non-IDPs to be at risk of suffering of violent injuries (fatal or non-fatal) during the complex humanitarian emergency in Jaffna District, Sri Lanka?

- ❖ **Null Hypothesis:** IDPs are just as likely as non-IDPs to be at risk of suffering of violent injuries

- ❖ **Alternative Hypothesis:** IDPs are more likely than non-IDPs to be at risk of suffering of violent injuries

DATA SOURCE

The data for this secondary analysis were obtained from the International Emergency and Refugee Health Branch (IERHB) at the Centers of Disease Control and Prevention (CDC). In collaboration with the United Nations Children's Fund (UNICEF) in Sri Lanka and the Sri Lankan Ministry of Health, the CDC conducted a retrospective community and household survey at July through September of 2009. The overall purpose of that survey was to measure the health status of the residents of Jaffna district which was heavily affected by the conflict in Sri Lanka. The survey was based on a stratified multi-staged cluster sample design.

STUDY POPULATION

The study population comprised all residents of Jaffna District whose age is 15 years or older. The sampling frame was based on two sources: firstly, the data from the Sri Lanka 2007 Special Census conducted by Sri Lankan Government (Each district was divided into census enumeration areas (EAs). The information on each EA included: i) names of villages and larger communities; ii) the total population of each location; & iii) the proportion of IDPs living in each community), and secondly, a list of all IDPs camps and their data provided by UNHCR.

SURVEY DESIGN

The overall sample size was based on an estimated prevalence of 50% for mental health conditions and of 4% for injury. Assuming a design effect[1] of 2 and an 80% response rate, a sample size of 1280 people (1 person per household)[2] was calculated to achieve a ± 4.4% precision around the estimates of all key measures (mental health, disability, injury, sexual violence, mortality, and vaccination) with 95% CI. The estimated prevalence for injury was assumed to be 4%.

The survey was based on a stratified multi-staged (40x40) cluster sample design. Jaffna District consists of 435 enumeration areas. To obtain adequate health data on displaced individuals, EAs were divided into 4 strata based on the percentage of IDPs (i.e., IDP camps with 100% displacement, ≥ 60% displacement, 10-59% displacement, < 10% displacement); those with larger IDP populations were oversampled.

In the first stage of sampling, 40 EAs were randomly selected with the probability of selection proportional to population size (PPS); the selected EAs included two IDP camps with 100% displacement. The EAs were further subdivided into geographical segments; each segment contains approximately 200-250 households; in the second stage of sampling, one segment per cluster was then chosen by PPS as well. In the third stage, a systematic sample of 40 households was randomly selected from each geographical segment. Participants requesting assistance were referred for follow-up and monitored by UNICEF protection staff. No identifying information was recorded on the survey tools. Ethnicity was self-reported using categories provided by the investigators and assessed because of its underlying premise for civil conflict.

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[1] Design effect is the ratio of the variance of the estimate under the actual complex design to the variance of the estimate assuming that the same data have been collected by simple random sampling

[2] A household is defined as a domestic unit consisting of members who live together and share the same cooking facility.

DATA COLLECTION

TOOLS

The questionnaire used in this study is a multicomponent survey. The survey tools were developed based on standardized and previously tested tools and on the inputs of experts, stakeholders, and key informants in Jaffna. An overview of the survey components and tools is outlined below:

1. **Community Assessment Tool (CA)** *Purpose:* To assess the overall living condition in each of the sampled communities.
2. **Exhaustive Mortality Survey (EMS)** *Purpose:* To evaluate a novel method of collecting mortality data during the second stage of sampling.

3. **Household Component (HH)**
Purpose: To assess general health and injuries characteristics on a household level and individual level.
Section A: General Health and Mortality
    Household Background Information
    Immunization Status
    Ten-Year Violent Injury Mortality and Morbidity (TM)
    General Mortality and Morbidity (GM)
Section B: Injury
Section C: Disability
Section D: Mental Health
Section E: Child Sexual Violence

For the purposes of this analysis, we used data from two components: the Household Background Information, and the Ten-Year Violent Injury Mortality and Morbidity. Mortality data tables were based on the SMART methodology (Standardized Monitoring and Assessment of Relief and Transition program) used to collect death events[52]. Questionnaires were translated into Tamil and then translated back into English by different translators to ensure accuracy. Translated questionnaires were reviewed by UNICEF-Jaffna field staff and were pretested.

RECALL PERIOD

Recall period was 9 years for the Ten-Year Violent Injury Mortality and Morbidity (TM) component. This period covers the time from the beginning of the Second Battle of Elephant Pass (April 22, 2000) until the survey date (August 1, 2009). The timeline for the recall period is illustrated in Figure 9.

PROCEDURES

Interviewers were females who spoke Tamil fluently. They were either recent graduates from the University of Jaffna or working as public health midwives. Forty interviewers were selected by UNICEF staff and the Regional District Health Service (RDHS), and trained by the CDC and UNICEF staff. A one day pilot study was conducted in a randomly selected EA in the sampling frame which is not part of the sample. Minor adjustments to the survey instruments were made as deemed necessary.

The interviewers were divided into 8 teams comprising 1 team leader and 2 interviewer pairs. Then, the 8 teams were sub-divided into two teams; each of them carried out one component of the survey: Exhaustive Mortality Survey (EMS) Team and Household Team.

The EMS teams visited 39 of the 40 selected geographical segments or primary selection unit (PSU) to conduct the CA and EMS components; they also visited each household (HH) in the PSU to assign an ID number to the HH, identify the head of HH[3] and fill the mortality tables. HHs, who were absent at the initial visit and at the revisit, were registered as absent and were not included in the third stage of sampling. The HH teams conducted the HH component. They used the HH ID numbers and locations registered by EMS teams to systematically select and visit a sample of 40 HHs in each PSU. To insure the confidentiality of the interviews, they were

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[3] Head of Household is applied to one whose authority to exercise family control and to support the dependent members is founded upon a moral or legal obligation or duty. This person may or may not be the primary wage earner, but is representing or acting as the head of household at the time the survey is administrated.

conducted in private and informed consent was obtained from every participant prior to start of each section. The head of HH provided the mortality, general health and background information on all members of the HH[4].

Data of the HH component were double-entered into an Epi Info database – version 3.5.1 *(CDC, Atlanta, GA)* in the field by local staff under the supervision of CDC team. While cleaning the data in preparation of the analysis, paper questionnaires were used to check any mistakes or inconsistencies found. Sample weights were calculated by the expert statistician at the CDC/IERHB.

SAMPLE SIZE

A total of 1494 households were visited; these included 8096 HH members who lived in the household since the start of the recall period. One cluster was omitted because of security concerns. The overall response rate was 96%. The sampling scheme is illustrated in Figure 10.

MEASURES

PRIMARY STUDY VARIABLES

An explanatory scheme for the questions used in defining the primary study variables are illustrated in Figure 10. The primary study variable of interest for this study is the internal displacement status. This variable was measured in the "Household Background Information Survey Component" by asking the family if it has ever been displaced from its home; according to this question, participants were divided into two categories: IDPs and non-IDPs.

Other study variables of interest subdivided IDPs into different categories depending on displacement frequency, displaced place and displaced current residency. These variables were

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[4] Household members are defined as persons who stayed continuously in the selected household for a period of 1 month or more.

derived from the complementary questions answered by those who were previously or currently displaced. The first one aimed to identify the number of times the family has been displaced from its home since the beginning of the recall period; this question divided the participants into four categories: displaced once, displaced 2-4 times, displaced 5 or more times, and non-IDPs. The second question aimed to identify if the family has ever been displaced outside Jaffna; according to this question; participants were divided into three categories: displaced outside Jaffna, displaced inside Jaffna, and non-IDPs. Finally, using the defined strata, participants were categorized according to their current residency: displaced living in camps (IDPs living in stratum 1), displaced resettled within the community (IDPs living in strata 2, 3, & 4), and non-IDPs (non-IDPs living in strata 2, 3, & 4).

OUTCOME VARIABLES

The primary outcome of interest was if a participant had suffered of a violent injury or not; this outcome variable was defined as dichotomous variable: "yes" or "no". This measure was derived from the "Ten-Year Violent Injury Mortality and Morbidity Survey Component". Participants who were reported to have died of a violent injury or to have suffered of a non-fatal violent injury since the start of the second battle of Elephant Pass in April 2000 were categorized as "yes" for violent injury; otherwise their violent injury status was categorized as "no".

COVARIATES

Demographic and social variables used in the analysis were identified from related literature and previous studies; the included variables can be divided into: "individual characteristics" and "household characteristics".

The individual characteristics include: sex, age, current status and membership to the household during the time period. All of them were registered at the "mortality data tables". Sex was reported as a binary variable: male vs. female. Date of birth for each individual was reported; then, their ages were calculated and categorized into five levels: ≤ 15 years, 16 – 24 years, 25 –

34 years, 35 – 59 years, and $\geq$ 60 years. Current status of each individual was reported with four choices: alive and living in household, alive and living elsewhere, died, and unknown or missing. The mortality data tables are divided into three tables: table 1 includes persons living in the household at the start of the recall period (April 2000); table 2 includes persons born into the household since the start of the recall period; and table 3 includes persons who moved into the household since the start of the recall period. According to their membership type to the household during the recall period, the individuals were divided into three levels: long-time member, born to HH during time period, and migrated to HH during time period.

The household characteristics include: demographics, access to health care, and socioeconomic status. Each household was asked to report their ethnicity, religion, sex of the head of household, number of people living in the household at time of survey, and the length of their stay in their current house. Ethnicity was categorized as a binary variable: Sri Lankan Tamil and Sri Lankan Moor. Religion was categorized as a binary variable: Hinduism and Christianity. The sex of the head of household was also registered as a binary variable: male vs. female. The number of people currently live in the household was reported as a numeric variable; for the use of the analysis, this variable was categorized into two levels: $\leq$ 4 members and > 4 members. The length of the household's stay in their current house was registered in years; for the use of the analysis, this variable was categorized into four levels: $\leq$ 6 years, 7 – 12 years, 13 – 30 years, and > 30 years. The survey contained categorical questions to assess the household's access to health care; one question asked the head of HH to identify where the HH's members primarily go for health care; another question asked for an estimation of the length of time it takes the HH's members to get to the nearest health care facility. The health care facilities had three levels: hospital, health clinic, and health post. The length of time required to get to the nearest health care facility was categorized into two levels: < 1 hour and 1 – 5 hours. Furthermore, another two questions were used to represent the socioeconomic status of the family; these questions assessed

the HH's access to clean water and to food. The head of HH answered with (yes or no) if the HH treats water before drinking it. To assess the HH's access to food, the head of HH was asked to estimate the numbers of times it get enough eat by choosing one of the following five choices: none of the time, a little of the time, half of the time, most of the time, and all of the time. For the purpose of this analysis, the food security variable was categorized into four levels: none or a little of the time (0 to 25% of the time), half of the time (50% of the time), most of the time (75% of the time), and all the time (100% of the time).

STATISTICAL ANALYSIS

To adjust it for the complex sampling design, weighted data were analyzed using SUDAAN 9 *(RTI International, Research Triangle Park, NC)* to produce proper variance estimates. The results are presented as unadjusted frequencies and weighted percentages. Proportions may not add to 100% due to rounding.

Descriptive analysis and differences with regard to selected demographic and social characteristics and injury outcomes were explored by using Chi-square tests between:

- ➤ IDPs and non-IDPs (primary study variable).

- ➤ Displaced once, displaced 2-4 times, displaced 5 or more times, and non-IDPs.

- ➤ Displaced outside Jaffna, displaced inside Jaffna, and non-IDPs.

- ➤ Displaced living in camps, displaced resettled within the community, and non-IDPs.

Bi-variable logistic regression analyses were conducted and crude odds ratios were calculated to assess the unadjusted relationship between covariates, primary study variables and injury outcomes.

Multivariable logistic regression models were used to adjust for variables that demonstrated statistically significant associations with both ID status and injury outcomes.

Interaction terms could not be assessed because they caused instability in the models; therefore, the model was only checked for confounding. To identify the final model, confounding was assessed by comparing the odds ratio for ID status at each step of the backward elimination process to the odds ratio for ID status in the fully adjusted model using criteria of $\pm$ 10%. An alpha level of 0.05 is used to assess statistical significance.

ETHICAL APPROVAL

The CDC's Institutional Review Board (IRB) approved the original survey. The researcher and faculty advisors determined that is not necessary to submit an application to Emory IRB, because the dataset used for this secondary analysis does not meet criteria for Title 45 of the Code of Federal Regulations Section 46.102(f)(2) for human subjects research.

CHAPTER IV: RESULTS

The overall demographics of the study sample stratified by displacement status are presented in Table 5. A total of 1,494 households completed the survey; 8,096 persons are counted in the 9 years household census. Thirty percent (i.e., weighted percentage adjusted for sampling) of the participants were members of HHs reported ever being displaced since the start of the recall period and are categorized as IDPs (n=3,530), and 70% of the participants were members of HHs reported never being displaced (n=4,566) and are categorized as non-IDPs. Fifty two percent of the participants are females (n=4,222). IDPs had more individuals in the ≤ 15 years group (27%, n=841), and non-IDPs had more individuals in the 35 to 59 years group (28%; n=1,241); however, the difference in age categories between IDPs and non-IDPs is not statistically significant (p=0.07). The majority of participants are members of Tamil (100%; n=8,087), Hindi (84%; n=6,684) and female headed (63%; n=5,099) households; religion is the only statistically significant difference (p=0.05). Only 47% of the sample answered the question of the length of time the HH have been living in current house (n=3,767). Aside from religion, no statistically significant differences in demographics and social characteristics are observed among the IDPs and non-IDPs groups.

Displacement Patterns

The displacement patterns for IDPs based on frequency, place and current residency are illustrated in both Table **6** and Figure **12**. IDPs show a decrease in their displacement frequencies; most of IDPs have been displaced once (72%; n=2,512), followed by displaced 2 – 4 times (25%; n=861), then displaced 5 or more times (3%; n=149). Furthermore, almost 82% of the IDPs have been displaced inside Jaffna (n=2,894), and only 18% have been displaced outside Jaffna (n=575). In addition, the majority of IDPs are currently resettled within the community compared to those living in IDP camps (94% vs. 6%).

The overall demographics of the study sample stratified by the displacement variables can be found in Appendix C. Looking at the displacement frequency, besides religion, there are five variables that show statistically significant differences between IDPs and non-IDPs; these include age (p<0.001), current status (p<0.001), access to health care facility (p<0,001), length of time to nearest health facility (p=0.001), and frequency of getting enough to eat (p=0.3) (Table 10). When stratifying the IDPs by the displacement place, aside from the household characteristic of access to health care facility (p=0.04), none of the individual characteristics shows statistically significant difference between IDPs and non-IDPs (Table 11). One the other hand, both number of people living in the current HH (p<0.001) and treating drinking water (p=0.02) are statistically significant with displaced residency (Table 12).

<u>Injury Outcomes</u>

As illustrated in Table 7, the majority of the participants are currently alive either in the HH or elsewhere (83%; n=6,686). Almost 5% of the cohort died during the recall period (n=395). Chronic diseases is the most reported cause of death (72%; n=272). Injuries accounted for almost 16% of the total deaths (n=82). The causes of death differed significantly between IDPs and non-IDPs (p<0.001).

Overall, the incidence of violent injury (fatal or non-fatal) is 1.2% during the recall period of 9 years (95% CI: 0.9%-1.6%); this equals an incidence of 130 violent injuries per 100,000 persons per year. The incidence of violent injury among IDPs (2.3%; 256 per 100,000 persons per year) is higher than the incidence among non-IDPs (0.8%; 89 per 100,000 persons per year); this difference is statistically significant (p<0.001). Among the 133 violently injured participants, bomb and explosions are the most frequent causes of the violent injury (46%; n=68), followed by unknown reasons or missing responses (20%; n=26). The case fatality proportion of violent injury is 33.6% (95% CI: 25%-43%); this was calculated by dividing the number of those

died due to a violent injury over the number of those who were violently injured. The case fatality proportion of violent injury are higher among non-IDPs (43%) compared to IDPs (26%); however, this difference is not statistically significant (p=0.08)

Bi-variable Analysis

The relationship between covariates and violent injury occurrence is examined in Table 8. Being a male, age category between 25 to 34 years, dead, and joined the HH during the recall period are associated with suffering of a violent injury. In addition, being member of a HH with an access to a health clinic compared to a hospital and which report having enough to eat only a little of the time (25% of the time or less) are also associated with reporting a violent injury.

IDPs are more likely to report suffering of a violent injury compared with non-IDPs (OR=3.1; 95% CI, 2.0-4.7). Moreover, the association between displacement frequency and reporting a violent injury showed a dose-response relationship compared with non-IDPs. IDPs reporting being displaced outside Jaffna are almost 5 times more likely to report a violent injury than non-IDPs (OR=4.9; 95% CI, 2.8-8.5). IDPs living in camps also have a higher odds to report a violent injury compared with non-IDPs (OR=16.6; 95% CI, 11.0-25.0). In addition, the odds of reporting a violent injury among IDPs resettled with host community are two times those odds among non-IDPs (OR=2.2; 95% CI, 1.3-3.8).

Multivariable Analysis

Logistic regression analysis is used to assess the association between displacement status and reporting a violent injury, as shown in Table 9. The included covariates are age, current status, religion and access to health care facility.

Participants who are in the age group of 25-34 years were more likely to report a violent injury compared with those in the oldest age group ($\geq$ 60 years) (OR= 8.5; 95% CI, 3.5-21.0); the following age groups that are more likely to report a violent injury are 16-24 years and 35-59

years compared with those in the oldest age group (OR=5.9; 95% CI, 2.0-17.5 vs. OR=5.1; 95% CI, 2.4-10.7). HHs reported that dead members of the family are more likely to suffering or dying of a violent injury compared with those who are currently alive in HH (OR=31.3; 95% CI, 12.1-81.2). Those who have access to a health clinic are more likely to report violent injury than those who have access to a hospital (OR=3.1; 95% CI, 1.4-6.8). After adjusting for these covariates, the odds of reporting violent injury are significantly higher among IDPs than non-IDPs (OR=2.9; 95% CI, 1.9-4.5).

Appendix C contains the results of the logistic regression analysis used to assess the association between other displacement variables and reporting a violent injury. All previously discussed covariates have the same relationship with reporting violent injury. After adjusting for age, current status, religion, sex of the head of HH, access to health care facility, length of time to nearest health facility, and frequency of getting enough to eat, the odds of reporting a violent injury is significantly higher among displaced ≥ 5 times, displaced 2-4 times, displaced once compared to non-IDPs (OR=5.4; 95% CI, 3.1-9.4 vs. OR=4.3; 95% CI, 2.6-7.3 vs. OR=2.2; 95% CI, 1.4-3.6) (Table 13). After adjusting for access to health care facility, the odds of reporting a violent injury is significantly higher among displaced outside Jaffna and displaced inside Jaffna compared to non-IDPs (OR=4.7; 95% CI, 2.7-8.5 vs. OR=2.6; 95% CI, 1.5-4.5) (Table 14). After adjusting for age, current status, religion, access to health care facility, length of time to nearest health facility, and frequency of getting enough to eat, the odds of reporting violent injury are significantly higher among IDPs currently living in camps and IDPs currently resettled with hose community compared to non-IDPs (OR=11.3; 95% CI, 6.2-20.6 vs. OR=2.3; 95% CI, 1.4-3.9) (Table 15).

CHAPTER V: DISCUSSION

The study found that the overall incidence of violent injuries among Jaffna residents to be 130 cases per 100,000 persons per year. The incidence of violent injuries was higher among ever displaced people.

The results showed that the odds of reporting a violent injury were higher among the young and working age groups (16 to 24, 25 to 34, 35 to 59 years old). These age groups are more likely to be involved in the military action and/or outside activities which put them at a higher risk of being injured in general or due to violence-related causes in specific.

Similar to other injury studies, male individuals and those who belong to a household headed by a female are at higher risk of being violently injured. In addition, SES is associated with being at higher incidences of violent injury. In this study, access to health care and frequency of getting enough to eat were used as proxies of SES. This study showed that those with limited access to a more advanced health care facility are at higher risk of reporting a violent injury.

The results of this study showed that forced internal displacement due to a complex humanitarian emergency is associated with increased violence-related injuries. This is the first study that investigated other patterns of internal displacement. Previous study on IDPs compared other health outcomes between IDPs living in camps and IDPs resettling in the community; they found that in general IDPs living in camps have worse health outcomes although they have better access to primary health care. The findings of this study showed that the odds of reporting a violent injury were higher among those who were who are currently living in camps. This could be explained by either IDPs living in camps are more exposed to negative physical environment and living conditions, or IDPs living in camps themselves have inherited risk factors compared

with other populations. These results show that any internal displacement is associated with an increased risk for a violent injury.

<u>Limitations</u>

There are several limitations to this study. No detailed data is collected on the injury mechanism and date. Moreover, there is no national baseline data or previous studies in order to compare our findings.

It is hard to investigate risk factors related to different causes of violent injuries and their mortality because each cause has its own mechanism; in addition, a much larger sample size is needed to analyze specific causes. Furthermore, this study also did not investigate the specific events in which the injury occurred.

Information on non-responders was not collected. Consequently, it is not possible to investigate the probability of selection bias.

This survey is based on self-reported data with a long recall period which leaves it subject to recall bias. In addition, the overall burden of violent injuries may be underestimated due to the participant's fear of reporting violent injuries or due to survivor's bias as only those who reached camps or safe areas were included.

In terms of the displacement status, more detailed information is needed to explain the relationship between internal displacement and the health outcome. Such displacement factors may include when the displacement occurred, why the displacement happened, distance and time that the journey took, and the displaced person's ability or inability to return home.

In addition, there is no information on the temporal relationship between internal displacement and injury; that is to say did injury happen before or after being displaced. As a result, this study cannot provide causal relationships between the primary study variable and

outcome. There are other variables that would have been important to control for in this study such as occupation, especially if related to military, and education.

Conclusion

This is the first study to investigate the relationship between internal displacement and the occurring of violent injuries. As there is no detailed information on what the IDPs experience during their journey, it is not possible to find out what factors can explain the documented association. That is why a longitudinal study will help in understanding the immediate and long-term effects of internal displacement associated with violent injury; however, in CHEs settings, it is really hard to implement such studies.

The findings show the importance of starting to implement interventions against injuries as part of IDPs and refugees health care services, during the emergency, displacement and relocation phases. This may also help implementing operational research in order to measure the impact of interventions, strategies, or tools that can test the impact of the proposed interventions.

CHAPTER VI: REFERENCES

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APPENDIX A: TABLES

Table 1. Estimations on the victims of the Sri Lanka conflict, 1983 – 2009.[5]

Consequences	Estimations in conflict situations	Overall estimations in Sri Lanka conflict, 1983 - 2009	Estimation of the last phase of Sri Lanka conflict, 2009
Deaths	Many	More than 70,000 killed [53]	Numbers ranged between: 4,264 [17] 6,710 [54] 40,000 [15]
Internal Displacement	Common	800,000 people [55]	250,000 new [18] 400,000 all [18]
Injuries	Many	Unknown	Unknown

Table 2. Deaths and burden of injury in DALYs by cause and sex, estimated for 2004 [28]

	Mortality rate			DALYs		
Cause	Overall	Sex		Overall	Sex	
	(%)	Male (%)	Female (%)	(%)	Male (%)	Female (%)
Injuries	**9.8**	**12.3**	**7.1**	**12.3**	**15.5**	**8.8**
Unintentional	**6.6**	**8.1**	**5.0**	**9.1**	**10.9**	**7.1**
Intentional	**2.8**	**3.8**	**1.7**	**3.2**	**4.6**	**1.8**
Self-inflicted	1.4	1.7	1.1	1.3	1.5	1.1
Violence	1.0	1.6	0.4	1.4	2.2	0.5
War	0.3	0.5	0.1	0.5	0.8	0.1

[5] Layout is based on presentation by Anderson M. on "Disasters, Emergencies and Refugees"; GH 510: Health in CHEs; Emory University; Spring 2012; Atlanta, GA, USA

Table 3. Studies on Injuries among Refugees and IDPs

Study Details	Study Objectives	Study Type	Measures of injuries	Key Findings
Grein *et al* (2003) IDPs Angola	To measure mortality and major causes of death among former UNITA members and their families during 2001 and 2002	Population-based retrospective survey (n=6,599)	Secondary outcome ▪ Mortality due to war or violence injury	- War or violence was one of the top three most frequently reported causes of death
Accorsi *et al* (2005) IDPs (70% of the population) North Uganda	To describe disease patterns and trends using discharge records from the main hospital in Gulu District in the period of 1992-2002	Hospital-based study (n=155 205 records)	Secondary outcome ▪ Number of admissions and bed-days and average length of stay	- Injury was the eighth most frequent cause - There was also a trend of increase for admissions related to injuries (mostly war-related)
Mullany *et al* (2007) IDPs Burma	To describe the association between mortality and morbidity and the household-level experience of human rights violations in rural areas in eastern Burma during October & December 2004	Population-based retrospective survey (n=1,834 HH; n=9,853 participants)	Primary outcome ▪ Prevalence of landmine injuries	- Forced displacement was associated with increased landmine injury
Hyder *et al* (2009) Refugees Afghanistan	To describe the impact of injuries in the Afghan refugee population residing in Pakistan during June to July 2002	Population-based survey (n=8,809)	Primary Outcome ▪ Unintentional and intentional injuries ▪ Morbidity and Mortality	- All-injury incidence was 50.8 per 1,000 persons per year

Table 4. Studies on Injuries in Sri Lanka

Study Details	Study Objectives	Study Type	Key Findings
Meade and Mirocha (2000)	To describe the injuries sustained by displaced people returning home after a military conflict when landmines were not removed, over the period of 1996 and 1997	Hospital-based study for records at Jaffna Teaching Hospital	- The incidence of landmine injuries was approximately 72 per 100,000. - Higher incidences of mine injuries could be associated with two important activities: returning home and agriculture.
Lamawansa and Piyathilake (2008)	To determine the community incidence of major intentional and unintentional physical injuries in a rural community in Sri Lanka during August and October 2005	Population-based retrospective survey (n=1,029)	- Injury incidence of 82.6 per 1000 person years
Navaratne *et al* (2009)	To assess the incidence of various types of injuries in the Galle district, Southern Sri Lanka.	Population-based retrospective survey (n=9,568)	- Age-sex-urban-rural adjusted incidence of non-fatal injuries is 24.6 per 100 persons per year. - The leading causes of non-fatal injuries were falls, mechanical injuries, and road traffic injuries - Injury mortality rate and disability rate were 177 and 290 per 100,000 persons per year.

Table 5. Demographic and social characteristics of the 9 years census (April 2000 to August 2009) by displacement status, Jaffna District, Sri Lanka, August 2009 (n=8,096)

Variables	All Cohort (n=8,096)		IDPs (n=3,530)			Non-IDPs (n=4,566)			Pearson χ²	P value
	No.	%	No.	%	95% CI	No.	%	95% CI		
Individual Charactristics										
Sex (n=8,092)										
Male	3,870	47.8	1,678	47.5	45.6 49.4	2,192	47.9	46.2 49.6	0.09	0.76
Female	4,222	52.2	1,849	52.5	50.6 54.4	2,373	52.1	50.4 53.8		
Age (n=8,073)										
≤ 15 years	1,835	23.4	841	26.9	24.6 29.2	994	21.9	19.5 24.5	2.35	0.07
16 to 24 years	1,427	17.6	634	17.7	15.7 19.8	793	17.5	15.8 19.4		
25 to 34 years	1,301	16.5	558	15.8	14.0 17.7	743	16.8	15.6 18.1		
35 to 59 years	2,136	27.4	895	25.8	23.8 27.8	1,241	28.1	27.1 29.1		
>= 60 years	1,205	15.2	493	14.0	12.1 16.1	712	15.7	13.6 18.0		
Mean (SD)	33.28 (0.62)		31.49 (0.64)	30.2	32.8	34.06 (0.76)	32.5	35.6		
Current Status (n=8,096)										
Alive in HH	6,686	83.2	2,898	83.8	80.4 86.6	3,788	83.0	81.0 84.7	2.29	0.09
Alive/living elsewhere	991	11.9	435	11.5	8.8 14.9	556	12.1	10.7 13.7		
Dead	395	4.7	177	4.4	3.7 5.1	218	4.8	4.1 5.7		
Unknown/Missing	24	0.2	20	0.4	0.2 0.8	4	0.1	0.0 0.3		
Membership to HH (n=8,096)										
Long-time member	6,758	82.9	2,943	82.1	80.0 84.1	3,815	83.2	81.3 84.9	1.58	0.22
Born during time period	1,019	12.9	452	14.1	12.2 16.4	567	12.3	10.9 13.9		
Joined HH during time period	319	4.3	135	3.7	2.7 5.0	184	4.5	3.6 5.6		
Household Charactristics										
Ethnicity (n=8,093)										
Tamil	8,087	100.0	3,521	99.9	. .	4,566	100.0	. .	1.00	0.32
Religion (n=8,084)										
Christianity	1,400	15.9	792	24.6	11.3 45.3	608	12.1	6.3 22.2	4.05	0.05†
Hinduism	6,684	84.1	2,735	75.4	54.7 88.7	3,949	87.9	77.8 93.8		
Sex of the head of HH (n=8,096)										
Male	2,997	36.6	1,292	35.3	28.9 42.2	1,705	37.2	32.9 41.8	0.27	0.61
Female	5,099	63.4	2,238	64.7	57.8 71.1	2,861	62.8	58.2 67.1		
Number of people living in HH (n=8,096)										
Less or equal to 4	3,339	40.3	1,424	36.1	30.8 41.7	1,915	42.1	36.1 48.4	2.29	0.14
Greater than 4	4,757	59.7	2,106	63.9	58.3 69.2	2,651	57.9	51.7 63.9		
Mean (SD)	5.23 (0.16)		5.42 (0.22)	5.0	5.9	5.15 (0.16)	4.8	5.5		
Length of time living in current house (n=3,767)										
Less or equal to 6 years	1,345	33.7	817	49.0	9.5 58.6	528	24.3	17.4 32.8	4.49	0.01†
> 6 to >= 12 years	925	24.1	422	23.4	17.0 31.3	503	24.6	17.7 33.1		
> 12 to >= 30 years	878	2.6	260	20.0	13.4 28.8	618	30.7	22.7 40.1		
> 30 years	619	15.6	171	7.6	5.2 11.1	448	20.4	15.0 27.1		
Mean (SD)	16.29 (1.07)		11.27 (1.14)	9.0	13.6	19.34 (1.43)	16.4	22.3		
Access to health care (n=8,043)										
Hospital	7,416	93.1	3,167	92.5	89.2 94.8	4,249	93.4	89.4 95.9	0.30	0.59
Health clinic	502	5.1	290	5.8	3.6 9.2	212	4.8	2.7 8.4		
Health post	125	1.8	46	1.7	0.9 3.2	79	1.8	0.8 4.0		
Length of time to nearest health facility (n=8,079)										
Less than 1 hour	7,503	94.0	3,240	93.6	89.8 96.0	4,263	94.2	90.6 96.5	0.08	0.77
1 to 5 hours	576	6.0	285	6.4	4.0 10.2	291	5.8	3.5 9.5		
Treat drinking water (n=8,060)										
Yes	4,773	58.0	2,170	59.9	53.9 65.5	2,603	57.1	51.7 62.3	0.63	0.43
No	3,287	42.1	1,346	40.2	34.5 46.1	1,941	42.9	37.7 48.3		
Frequency of getting enough to eat (n=8,066)										
None or 25% of the time	130	1.7	56	1.9	0.9 4.3	74	1.6	0.9 3.0	1.43	0.25
Half of the time	937	12.9	469	17.9	12.4 25.2	468	10.6	8.4 13.3		
Most (75%) of the time	2,214	26.6	986	27.2	23.6 31.2	1,228	26.4	22.2 31.1		
All the time	4,785	58.8	2,011	52.9	44.2 61.5	2,774	61.3	56.1 66.3		

%: Weighted percentage adjusted for sampling; CI: Confidence interval; χ²: chi square test; HH: Household; IDPs: Internally displaced persons

† Statistically significant.

Table 6. Displacement patterns, Jaffna District, Sri Lanka, August 2009 (n=8,096)

Displacement Status	All Cohort (n=8,096)	
	No.	%
IDPs	3,530	30
Displacement frequency (n=3,522)		
Displaced once	2,512	72
Displaced 2 - 4 times	861	25
Displaced 5 or more times	149	3
Displaced outside Jaffna (n=3,469)		
Yes	575	18
No	2,894	82
Displaced current residency (n=3,522)		
Living in camps	413	6
Resettled within the community	3,117	94
Non-IDPs	4,566	70

%: Weighted percentage adjusted for sampling; IDPs: Internally displaced persons.

Table 7. Causes of death and violent injury by displacement status, Jaffna District, Sri Lanka, August 2009 (n=8,096)

Variables	All Cohort (n=8,096)		IDPs (n=3,530)			Non-IDPs (n=4,566)			Pearson Chi Square	P value
	No.	%	No.	%	95% CI	No.	%	95% CI		
Current Status (n=8,096)										
Alive in HH	6,686	83.2	2,898	83.8	80.4 86.6	3,788	83.0	81.0 84.7	2.29	0.09
Alive/living elsewhere	991	11.9	435	11.5	8.8 14.9	556	12.1	10.7 13.7		
Dead	395	4.7	177	4.4	3.7 5.1	218	4.8	4.1 5.7		
Unknown/Missing	24	0.2	20	0.4	0.2 0.8	4	0.1	0.0 0.3		
Causes of death (n=395)										
Non-violent injury	39	7.4	26	11.6	6.5 20.0	13	5.8	3.2 10.4	8.21	<0.001†
Violent Injury	43	8.7	30	13.7	9.7 19.1	13	6.7	4.4 10.2		
Infectious Disease	14	4.5	4	2.8	0.9 8.5	10	5.1	2.3 11.0		
Chronic Disease	272	71.5	103	63.2	54.9 70.8	169	74.7	65.2 82.3		
Congenital Disease	11	4.2	2	2.6	0.7 9.2	9	4.8	2.3 9.8		
Missing	16	3.7	12	6.0	2.2 15.6	4	2.8	1.1 6.9		
Violent injury (n=8,096)										
Yes	133	1.2	98	2.3	1.6 3.2	35	0.8	0.5 1.1	18.21	<0.001†
No	7,963	98.8	3,432	97.7	96.8 98.4	4,531	99.3	98.9 99.5		
Cause of the violent injury (n=133)										
Beaten, hit, struck	8	9.6	4	8.9	3.3 21.8	4	10.5	2.9 31.2	1.58	0.17
Landmine / UXO	6	3.4	3	2.0	0.7 5.5	3	5.3	1.5 16.6		
Gunshot	15	15.3	9	8.2	4.2 15.7	6	24.6	9.2 51.2		
Poisoning	2	1.5	1	0.7	0.1 5.0	1	2.5	0.3 17.9		
Sexual assault	1	0.4	1	0.7	0.1 5.2	0	0.0	. .		
Bomb / grenade or other explosion	68	46.1	58	53.6	32.6 73.4	10	36.1	16.9 61.0		
Stab or cut	6	2.9	3	2.0	0.6 5.9	3	4.3	1.2 14.0		
Choking, hanging, or strangulation	1	0.9				1	2.2	0.3 15.9		
Unknown/Missing	26	20.0	19	24.0	10.2 46.8	7	14.6	5.6 33.3		
Fatal violent injury (n=133)										
Yes	43	33.6‡	30	26.3	17.1 38.1	13	43.3	29.2 58.5	3.27	0.08
No	90	66.4	68	73.7	61.9 82.9	22	56.7	41.5 70.8		

%: Weighted percentage adjusted for sampling; CI: Confidence interval; χ²: chi square test; HH: Household; IDPs: Internally displaced persons.

† Statistically significant; ‡ Case fatality proportion for violent injury.

Table 8. Bivariate analysis: Association between individual and household characteristics as covariates, displacement status as a primary study variable, suffering of a violent injury as an outcome (N=8,096)

Variables	No.	%	95% CI		Crude OR	95% CI	
Individual Charactristics							
Sex (n=8,092)							
Male	91	1.9	1.3	2.7	3.19†	1.67	6.07
Female	42	0.6	0.4	1.0	1.00 [Reference]		
Age (n=7,904)*							
0 to 15 years	12	0.6	0.25	1.47	0.55	0.19	1.54
16 to 24 years	31	1.4	0.88	2.2	1.27	0.70	2.31
25 to 34 years	36	2.07	1.46	2.94	1.91†	1.13	3.23
35 to 59 years	32	1.25	0.7	2.2	1.14	0.78	1.66
>= 60 years	21	1.1	0.67	1.81	1.00 [Reference]		
Current Status (n=8,096)							
Alive in HH	69	0.7	0.4	1.2	1.00 [Reference]		
Alive/living elsewhere	19	1.9	1.0	3.5	2.8†	1.06	7.38
Dead	44	8.8	6.7	11.5	14.12†	7.85	25.42
Unknown / Missing	1	5.6	0.7	33.8	8.71	0.99	76.85
Membership to HH (n=8,096)							
Long-time member	117	1.2	0.9	1.7	1.00 [Reference]		
Born during time period	5	0.5	0.1	2.3	0.39	0.08	2.06
Joined HH during time period	11	3.8	1.3	10.1	3.23†	1.01	10.28
Household Charactristics							
Religion (n=8,084)							
Hinduism	33	1.8	0.7	4.3	1.00 [Reference]		
Christianity	100	1.1	0.8	1.5	1.63	0.63	4.19
Sex of the head of HH (n=8,096)							
Male	46	1.3	0.9	1.9	1.00 [Reference]		
Female	87	1.1	0.7	1.7	1.15	0.64	2.05
Number of people living in HH (n=8,096)							
Less or equal to 4	64	1.3	1.0	1.8	1.19	0.67	2.09
Greater than 4	69	1.1	0.7	1.8	1.00 [Reference]		
Length of time living in current house (n=3,767)*							
Less or equal to 6 years	39	2.2	0.9	5.4	1.86	0.76	4.59
> 6 to >= 12	4	0.2	0.1	0.7	0.19†	0.04	0.99
> 12 to >= 30	10	1.0	0.5	2.1	0.85	0.24	2.95
> 30	8	1.2	0.5	2.8	1.00 [Reference]		
Access to health care facility (n=8,043)*							
Hospital	100	1.1	0.8	1.5	1.00 [Reference]		
Health clinic	26	3.6	1.7	7.2	3.48†	1.66	7.28
Health post	5	2.6	0.6	10.3	2.45	0.48	12.63
Length of time to nearest health facility (n=8,079)							
Less than 1 hour	121	1.1	0.9	1.4	1.00 [Reference]		
1 to 5 hours	12	2.8	1.1	7.3	2.60	0.98	6.89
Treat drinking water (n=8,060)							
Yes	75	1.2	0.8	1.6	0.88	0.52	1.48
No	58	1.3	0.9	2.0	1.00 [Reference]		
Frequency of getting enough to eat (n=8,066)							
None or 25% of the time	4	4.4	1.2	14.2	4.55†	1.16	17.85
Half of the time	16	1.5	0.8	3.0	1.56	0.65	3.76
Most (75%) of the time	39	1.4	0.8	2.3	1.38	0.66	2.88
All the time	74	1.0	0.7	1.5	1.00 [Reference]		
Primary Study Variables							
Displacement Status (n=8,096)							
IDPs	98	2.3	1.6	3.2	3.07†	2.00	4.71
Non-IDPs	35	0.8	0.5	1.1	1.00 [Reference]		
Displacement Frequency (n=8,088)							
Once	44	1.5	1.1	2.2	2.04†	1.29	3.24
2 - 4 times	42	4.0	2.5	6.4	5.52†	3.10	9.83
5 or more times	12	5.8	3.7	9.0	8.21†	4.62	14.58
Non-IDPs	35	0.8	0.5	1.1	1.00 [Reference]		
Displaced Outside Jaffna (n=8,035)*							
Yes	29	3.6	2.2	5.7	4.91†	2.84	8.51
No	65	2.0	1.2	3.2	2.63†	1.51	4.59
Non-IDPs	35	0.8	0.5	1.1	1.00 [Reference]		
Residency of displaced (n=8,096)							
IDPs living in camps	46	11.1	10.5	11.9	16.58†	11.01	24.96
IDPs resettled with host community	52	1.7	1.0	2.7	2.24†	1.33	3.76
Non-IDPs	35	0.8	0.5	1.1	1.00 [Reference]		

%: Weighted percentage adjusted for sampling; CI: Confidence interval; OR: Odds ratio; HH: Household; IDPs: Internally displaced persons.

* Data contain missing values. † Statistically significant.

Table 9. Multivariable analysis: Association between individual and household characteristics as covariates, displacement status as a primary study variable, suffering of a violent injury as an outcome, Jaffna District, Sri Lanka (N=7,840)*

Variables	Suffered of a violent injury (n=130)**			
	No.	AOR	95% CI	
Individual Charactristics				
Age				
≤ 15 years	12	2.51	0.52	12.10
16 to 24 years	31	5.91†	1.99	17.53
25 to 34 years	36	8.53†	3.46	21.03
35 to 59 years	32	5.05†	2.37	10.74
≥ 60 years	21	1.00 [Reference]		
Current Status				
Alive in HH	69	1.00 [Reference]		
Alive/living elsewhere	19	2.11	0.73	6.10
Dead	44	31.32†	12.08	81.24
Unknown	1	5.10	0.40	64.75
Household Charactristics				
Religion				
Hinduism	33	1.00 [Reference]		
Christianity	100	1.13	0.48	2.64
Access to health care facility				
Hospital	100	1.00 [Reference]		
Health clinic	26	3.10†	1.42	6.77
Health post	5	2.93	0.62	13.88
Primary Study Variable				
Displacement Status				
IDPs	98	2.92†	1.92	4.46
Non-IDPs	35	1.00 [Reference]		

%: Weighted percentage adjusted for sampling; CI: Confidence interval; AOR: Adjusted odds ratio; HH: Household; IDPs: Internally displaced persons.

* The program read 8,096 observations; however, it used in the analysis 7,840 observations. The number of observations with missing data was 256.

** The program used in the analysis 130 observations out of 133 observations. The number of observations with missing data was 3 (1 is missing age; 2 are missing PHC)

† Statistically significant.

APPENDIX B: FIGURES
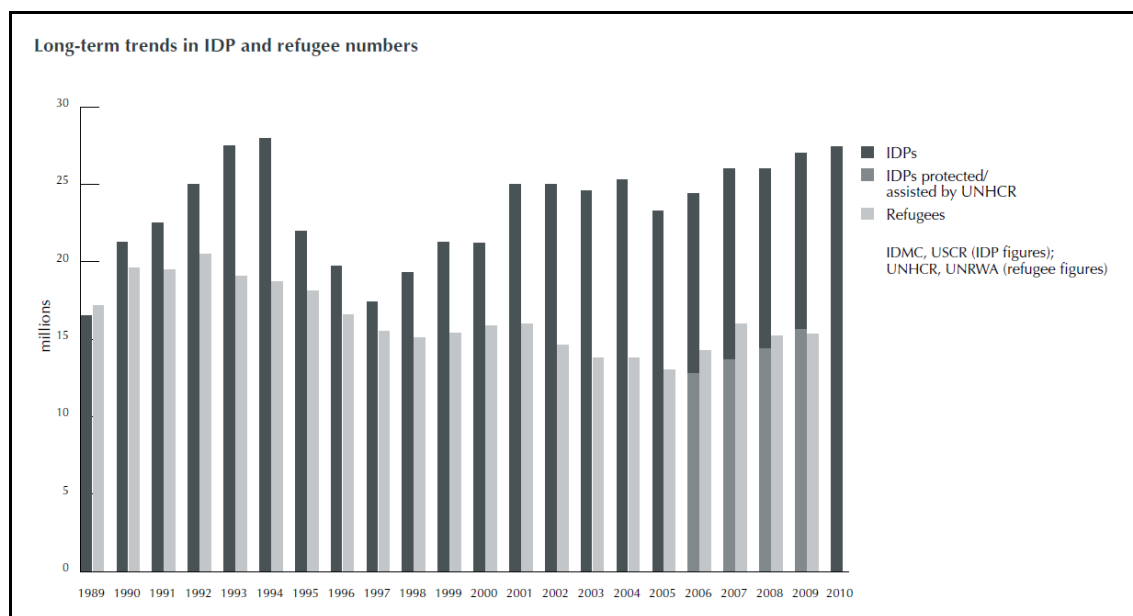
Figure 1. Long term trends in IDP and refugee numbers, IDMC, 2010 [8]
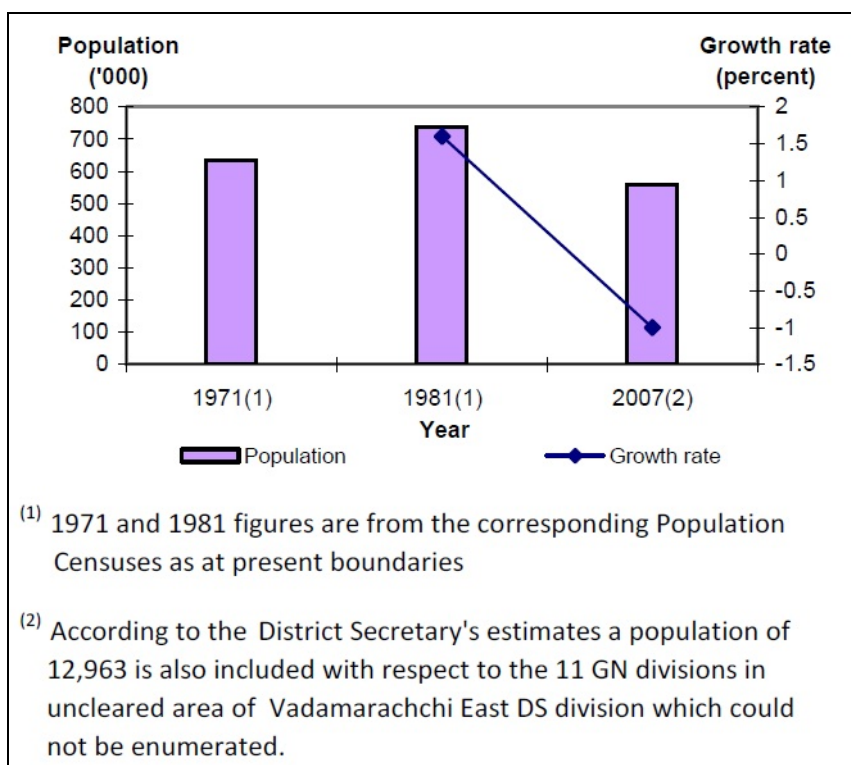
Figure 2. Population size and average annual rate of growth, 1971-2007 [24]
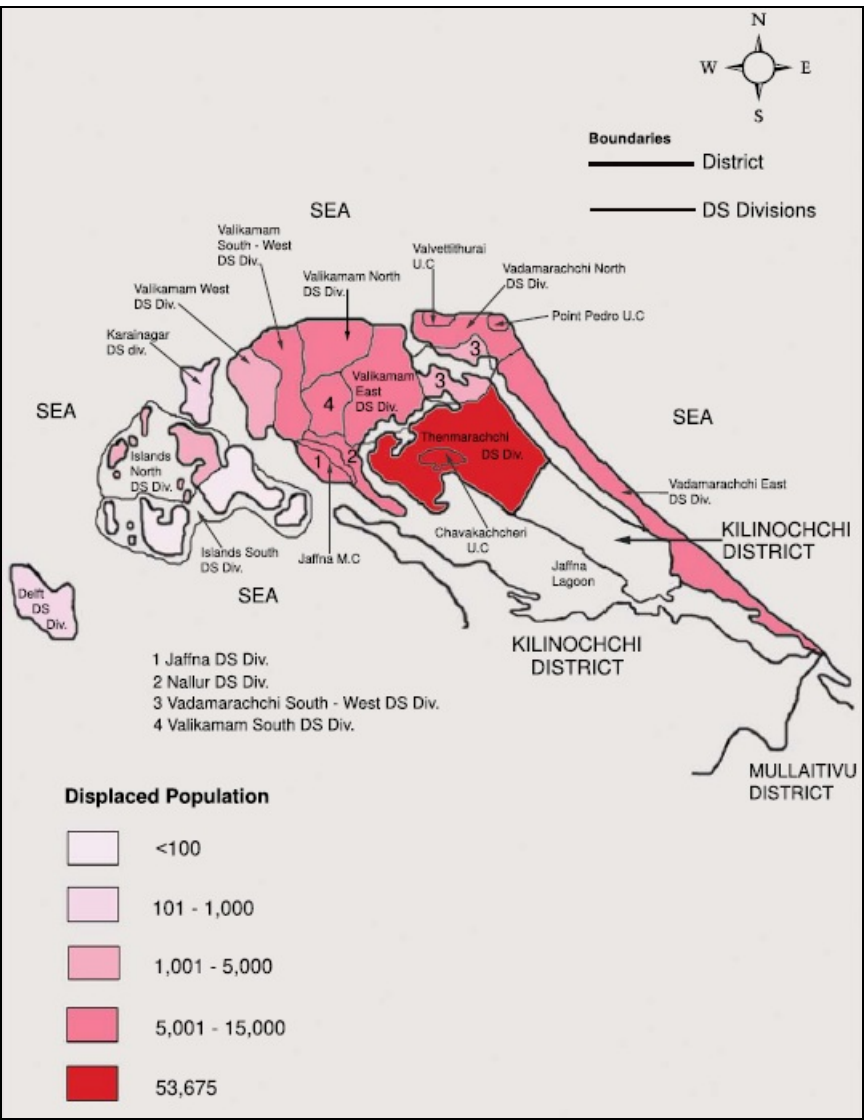
Figure 3. Displaced Population by Divisional Secretary's (DS) Divisions and Urban Areas in Jaffna District, 2007 [24]
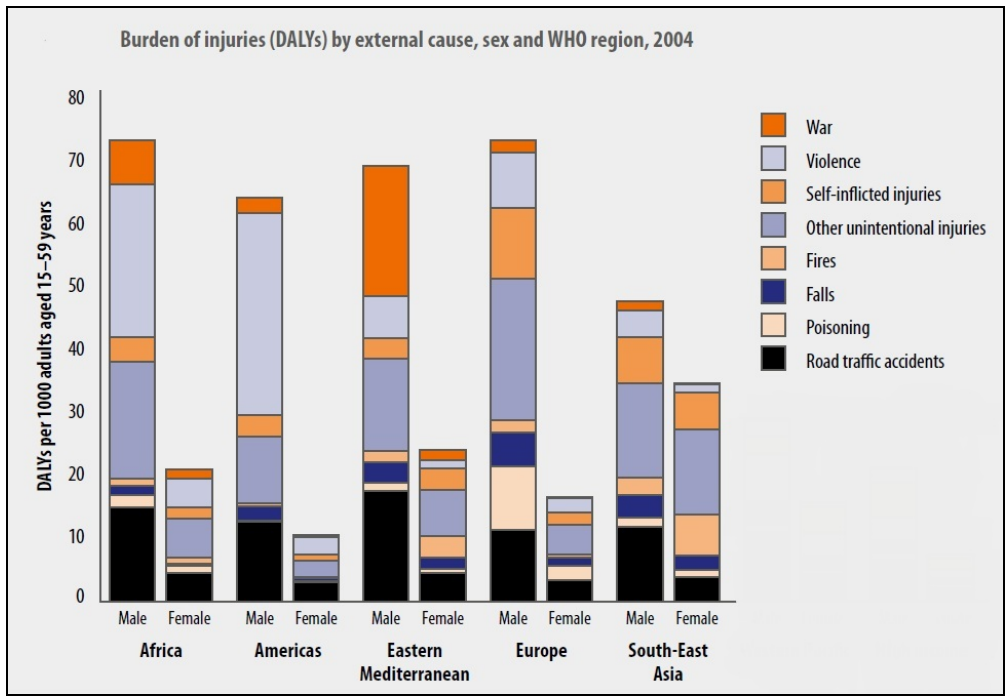
Figure 4. Burden of injuries (DALYs) by WHO region, sex and cause of injury, 2004 [28]
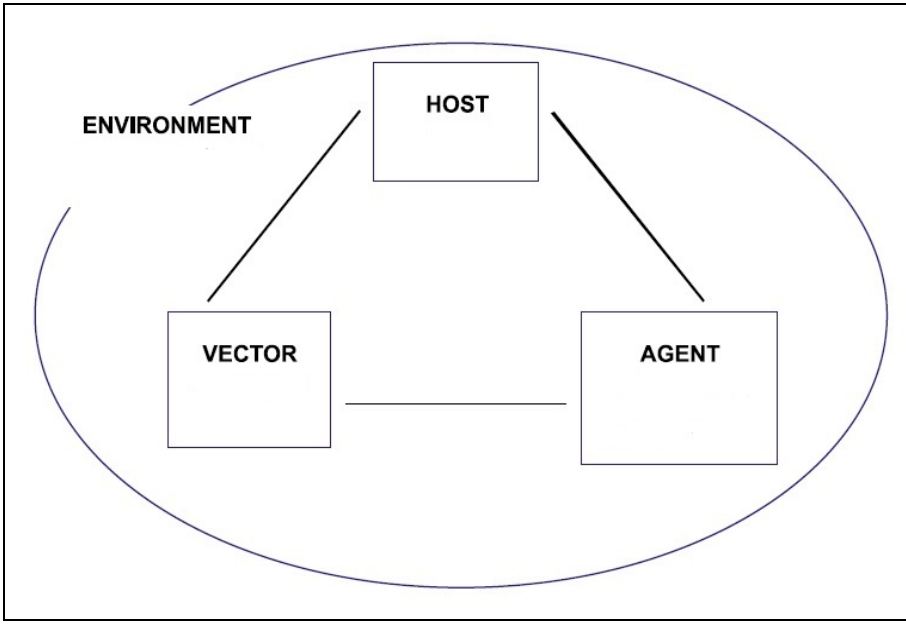
Figure 5. Standard Epidemiologic Triangle of an Injury [25]
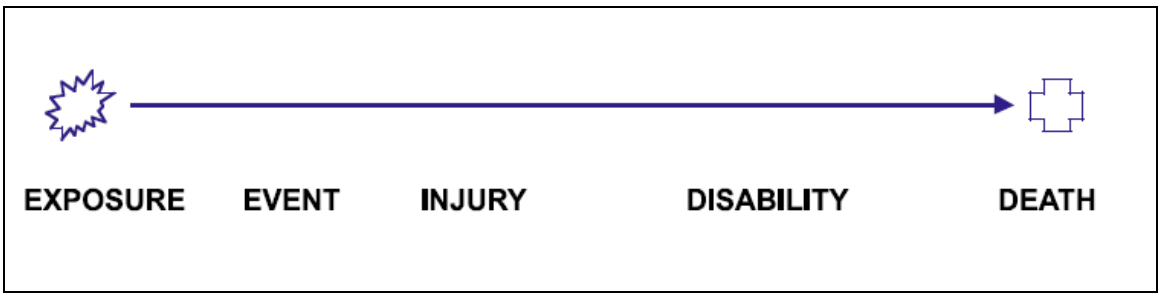
Figure 6. Standard Injury Spectrum [25]

	Human (or host)	Vector	Physical environment	Socio-economic environment
Pre-event	Is host pre-disposed or overexposed to risk?	Is vector hazardous?	Is environment hazardous? Does it have hazard-reduction features?	Does environment encourage or discourage risk-taking and hazard?
Event	Is host able to tolerate force or energy transfer?	Does vector provide protection?	Does environment contribute to injury during event?	Does environment contribute to injury during event?
Post-event	How severe is the trauma or harm?	Does vector contribute to the trauma?	Does environment add to the trauma after the event?	Does environment contribute to recovery?

ᵃ The terms used in the table are modified versions of the terms originally used by Haddon. Source: Haddon (↗)

Figure 7. Haddon's Matrix [25]

The Injury Pyramid

Injury resulting in:

- Death
- Long-term disability
- Hospitalization
- Visit to a 24-hour emergency care facility
- Visit to a health care facility
- Contact with a health care provider
- Report in a health survey
- Injury not recorded or reported

Note: The categories are not mutually exclusive. The relative sizes of the segments are illustrative and are not to scale.

Figure 8. The Injury Pyramid [49]

Figure 9. Timeline for the Recall Period of the Household Component Survey, Jaffna District, Sri Lanka, July – September 2009

Figure 10. Sampling Scheme for the Household Component Survey,
Jaffna District, Sri Lanka, July – September 2009

Figure 11. Scheme for defining the primary study variables

Figure 12. Displacement patterns, Jaffna District, Sri Lanka, August 2009

A. Displacement frequency (n=3,522)

B. Displaced outside Jaffna (n=3,469)

C. Displaced current residency (n=3,522)

APPENDIX C: SUPPLEMENTARY TABLES

Table 10. Demographic and social characteristics of the 9 years census (April 2000 to August 2009) by displacement frequency, Jaffna District, Sri Lanka, August 2009 (n=8,088)

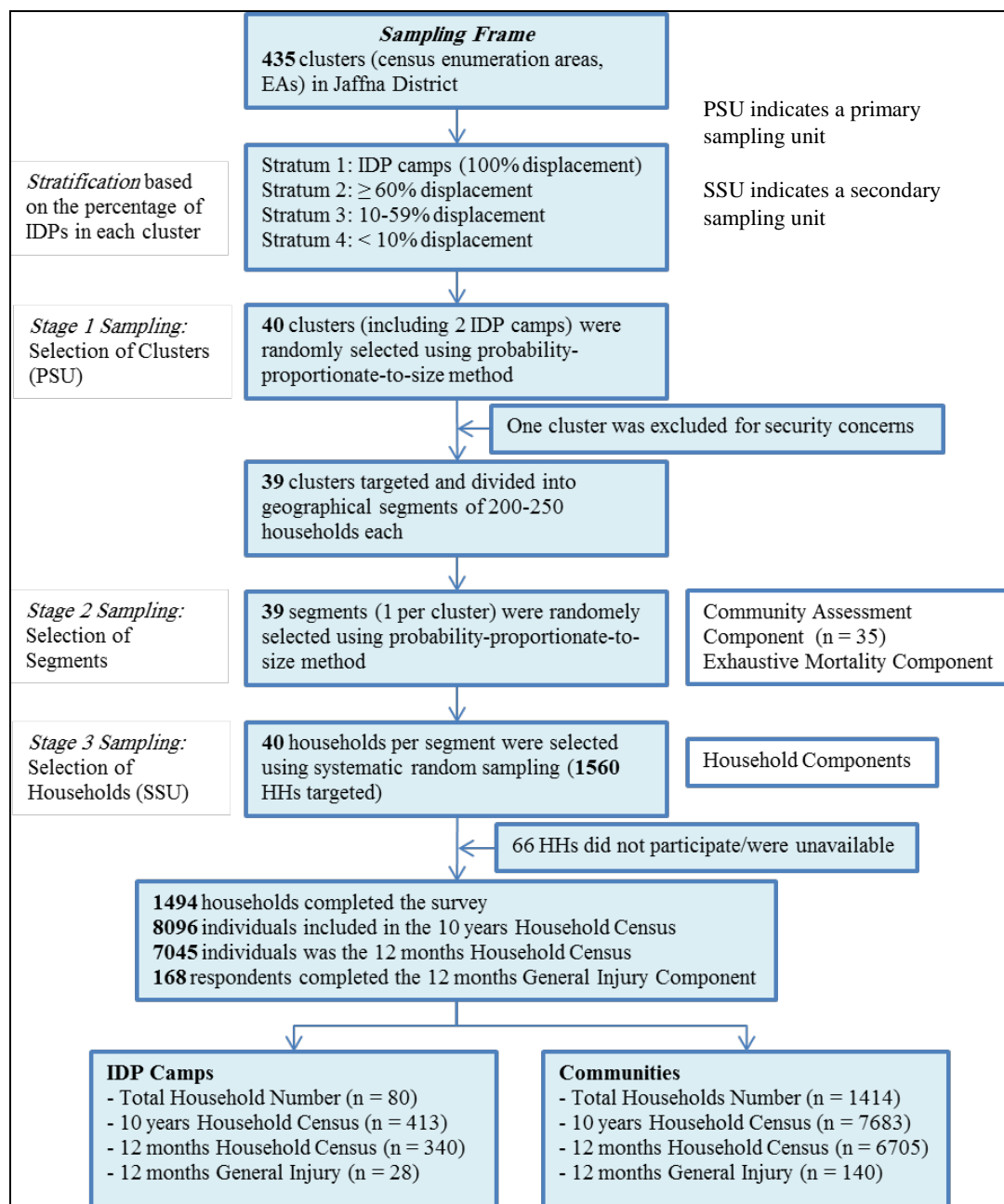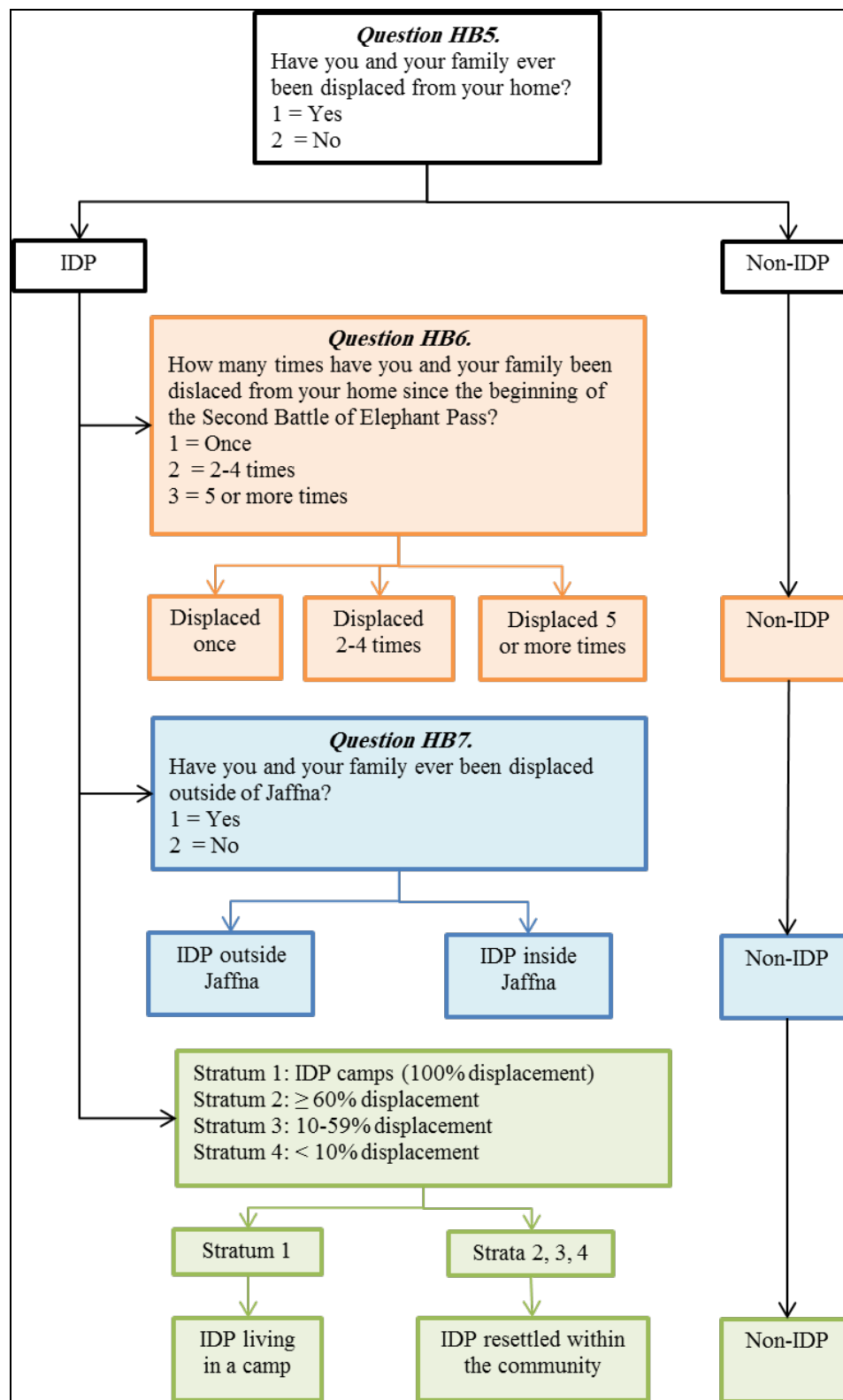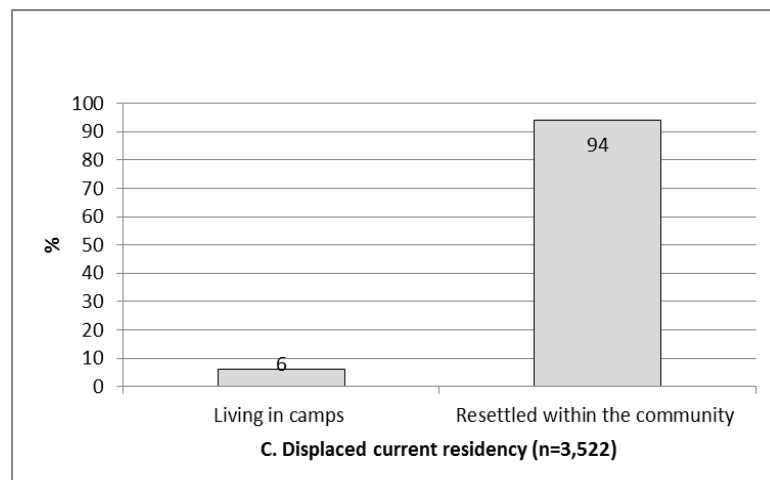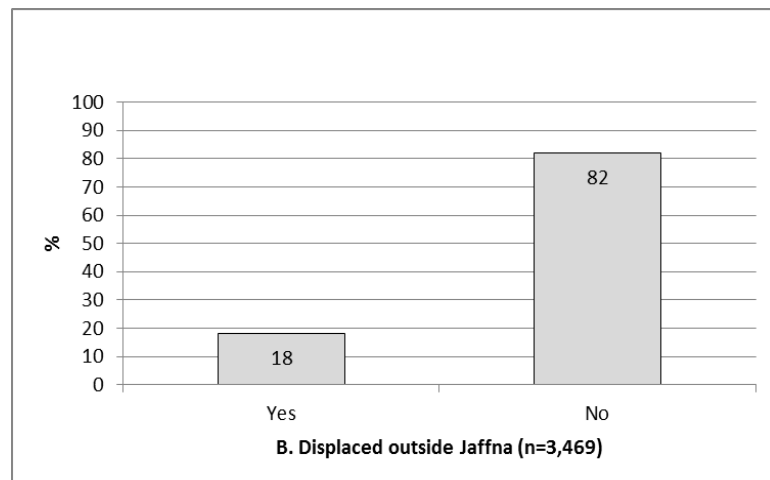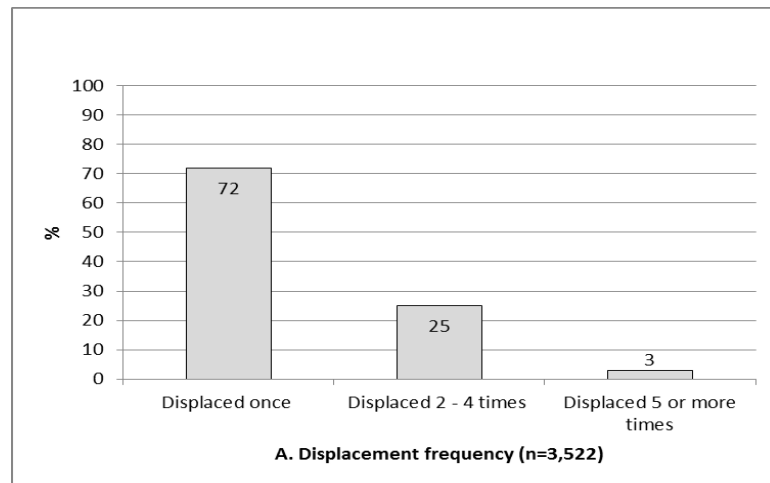| Variables	All Cohort (n=8,088)		Displaced Once (n=2,512)			Displaced 2-4 times (n=861)			Displaced ≥ 5 times (n=149)			Non-IDPs (n=4,566)			Pearson χ²	P value
	No.	%	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI		
Individual Charactristics																
Sex (n=8,084)																
Male	3,866	47.8	1,204	47.8	45.5 50.2	397	46.7	43.3 50.2	73	46.3	37.1 55.7	2,192	47.9	46.2 49.6	0.12	0.95
Female	4,218	52.2	1,305	52.2	49.8 54.5	464	53.3	49.8 56.7	76	53.7	44.3 62.9	2,373	52.1	50.4 53.8		
Age (n=8,065)																
≤ 15 years	1,835	23.4	580	26.2	23.9 28.5	213	28.6	24.4 33.2	48	32.3	21.9 44.9	994	21.9	19.5 24.5	4.15	<0.001†
16 to 24 years	1,423	17.5	432	17.2	14.3 20.6	173	18.8	15.2 23.0	25	16.2	7.7 30.7	793	17.5	15.8 19.4		
25 to 34 years	1,301	16.5	368	14.6	12.5 16.9	159	18.6	15.7 21.8	31	22.3	17.9 27.5	743	16.8	15.6 18.1		
35 to 59 years	2,134	27.4	668	26.6	24.5 28.8	195	23.9	20.6 27.5	30	21.0	17.3 25.3	1,241	28.1	27.1 29.1		
≥ 60 years	1,203	15.2	386	15.5	13.0 18.4	94	10.2	7.2 14.1	11	8.2	2.7 22.5	712	15.7	13.6 18.0		
Mean (SD)	33.27 (0.62)		32.35 (0.78)	30.8 33.9		29.39 (0.93) 27.5 31.3			27.46 (2.48) 22.4 32.5			34.06 (0.76) 32.5 35.6				
Current Status (n=8,088)																
Alive in HH	6,680	83.2	2,089	84.2	80.5 87.3	682	82.6	76.3 87.5	121	84.0	74.8 90.3	3,788	83.0	81.0 84.7	3.68	<0.001†
Alive/living elsewhere	989	11.9	302	11.3	8.4 15.1	119	12.3	7.6 19.5	12	8.2	3.5 18.0	556	12.1	10.7 13.7		
Dead	395	4.7	114	4.3	3.6 5.0	48	4.3	2.7 6.8	15	7.3	4.7 11.1	218	4.8	4.1 5.7		
Unknown/Missing	24	0.2	7	0.1	0.1 0.7	12	0.8	0.3 1.8	1	0.5	0.1 3.4	4	0.1	0.0 0.3		
Membership to HH (n=8,088)																
Long-time member	6,750	82.8	2,109	82.1	79.9 84.0	717	82.5	77.6 86.5	109	79.0	66.8 87.5	3,815	83.2	81.3 84.9	0.88	0.52
Born during time period	1,019	12.9	313	14.0	12.4 15.8	108	14.6	10.3 20.2	31	15.8	10.1 23.9	567	12.3	10.9 13.9		
Joined HH during time period	319	4.3	90	4.0	2.9 5.3	36	2.9	1.6 5.5	9	5.2	1.5 16.5	184	4.5	3.6 5.6		
Household Charactristics																
Ethnicity (n=8,085)																
Tamil	8,079	100.0	2,506	99.9	. .	858	100.0	. .	149	100.0	. .	4,566	100.0	. .	0.34	0.80
Religion (n=8,076)																
Christianity	1,400	15.9	505	23.5	8.1 51.6	221	27.2	17.5 39.5	66	32.0	13.2 59.4	608	12.1	6.3 22.2	3.81	0.02†
Hinduism	6,676	84.1	2,007	76.5	48.4 91.9	637	72.9	60.5 82.5	83	68.0	40.6 86.9	3,949	87.9	77.8 93.8		
Sex of the head of HH (n=8,088)																
Male	2,990	36.6	913	36.2	28.4 44.9	292	28.2	19.6 38.7	80	63.8	44.4 79.5	1,705	37.2	32.9 41.8	2.63	0.07
Female	5,098	63.4	1,599	63.8	55.1 71.7	569	71.8	61.3 80.4	69	36.2	20.5 55.6	2,861	62.8	58.2 67.1		
Number of people living in HH (n=8,088)																
≤ 4 members	3,338	40.3	982	35.0	28.5 42.0	367	38.6	31.0 46.7	74	43.9	24.2 65.7	1,915	42.1	36.1 48.4	0.84	0.48
> 4 members	4,750	59.7	1,530	65.1	58.0 71.5	494	61.4	53.3 69.0	75	56.1	34.3 75.9	2,651	57.9	51.7 63.9		
Mean (SD)	5.23 (0.16)		5.55 (0.29)	5.0 6.1		5.1 (0.21) 4.7 5.5			4.95 (0.39) 4.2 5.8			5.15 (0.16) 4.8 5.5				
Length of time living in current house (n=3,760)																
≤ 6 years	1,345	33.7	481	40.1	28.5 53.0	285	77.0	61.9 87.3	51	75.6	16.4 98.0	528	24.3	24.6 30.7	3.38	<0.001†
7 – 12 years	925	24.2	373	28.7	21.2 37.6	43	6.5	2.2 17.2	6	24.5	2.0 83.7	503	17.4	17.7 22.7		
13 – 30 years	871	26.5	208	22.7	15.5 32.0	45	10.9	4.0 26.3	0	0.0	. .	618	32.8	33.1 40.1		
> 30 years	619	15.6	129	8.5	5.3 13.2	42	5.7	2.4 12.9	0	0.0	. .	448	20.4	15.0 27.1		
Mean (SD)	16.28 (1.08)		12.46 (1.41)	9.6 15.3		7.84 (1.75) 4.3 11.4			3.24 (2.9) -2.6 9.1			19.34 (1.43) 16.4 22.3				
Access to health care facility (n=8,035)																
Hospital	7,408	93.1	2,345	94.6	91.8 96.5	730	89.2	79.9 94.5	84	69.7	31.3 92.1	4,249	93.4	89.4 95.9	5.96	<0.001†
Health clinic	502	5.1	115	3.3	1.8 5.9	125	10.9	5.6 20.1	50	24.8	3.8 73.4	212	4.8	2.7 8.4		
Health post	125	1.8	35	2.2	1.1 4.3	0	0.0	. .	11	5.4	1.2 21.6	79	1.8	0.8 4.0		
Length of time to nearest health facility (n=8,071)																
< 1 hour	7,495	94.0	2,317	95.2	91.2 97.4	766	88.0	80.1 93.0	149	100.0	. .	4,263	94.2	90.6 96.5	6.39	<0.001†
1 to 5 hours	576	6.0	190	4.8	2.6 8.8	95	12.0	7.0 19.9	0	0.0	. .	291	5.8	3.5 9.5		
Treat drinking water (n=8,052)																
Yes	4,773	58.0	1,577	63.6	57.1 69.6	497	49.9	41.2 58.6	96	60.9	30.0 85.0	2,603	57.1	51.7 62.3	2.67	0.06
No	3,279	42.0	921	36.5	30.4 42.9	364	50.1	41.4 58.8	53	39.1	15.0 70.0	1,941	42.9	37.7 48.3		
Frequency of getting enough to eat (n=8,058)																
None or 25% of the time	129	1.7	45	1.7	0.7 4.6	10	2.5	0.6 9.0	0	0.0	. .	74	1.6	0.9 3.0	2.45	0.03†
Half of the time	930	12.8	313	16.6	10.2 25.7	138	20.9	13.4 31.1	11	18.6	3.5 58.8	468	10.6	8.4 13.3		
Most (75%) of the time	2,214	26.7	666	26.5	22.1 31.4	292	31.1	21.6 42.6	28	16.4	4.5 44.9	1,228	26.4	22.2 31.1		
All the time	4,785	58.8	1,480	55.2	43.7 66.2	421	45.6	39.2 52.0	110	65.0	35.1 86.5	2,774	61.3	56.1 66.3		

%: Weighted percentage adjusted for sampling; CI: Confidence interval; χ²: chi square test; HH: Household; IDPs: Internally displaced persons.

† Statistically significant.

Table 11. Demographic and social characteristics of the 9 years census (April 2000 to August 2009) by displacement place, Jaffna District, Sri Lanka, August 2009 (n=8,035)

Variables	All Cohort (n=8,035)		Displaced outside Jaffna (n=575)			Displaced inside Jaffna (n=2,894)			Non-IDPs (n=4,566)			Pearson χ²	P value
	No.	%	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI		
Individual Charactristics													
Sex (n=8,031)													
Male	3,839	47.8	284	50.2	46.4 53.9	1,363	46.8	45.0 48.6	2,192	47.9	46.2 49.6	2.32	0.11
Female	4,192	52.3	291	49.8	46.1 53.6	1,528	53.2	51.4 55.0	2,373	52.1	50.4 53.8		
Age (n=8,012)													
≤ 15 years	1,817	23.4	142	28.7	22.6 35.6	681	26.4	23.9 29.2	994	21.9	19.5 24.5	1.35	0.25
16 to 24 years	1,414	17.5	104	16.9	12.1 23.3	517	17.6	15.9 19.3	793	17.5	15.8 19.4		
25 to 34 years	1,294	16.5	92	15.6	12.5 19.3	459	16.0	14.1 18.0	743	16.8	15.6 18.1		
35 to 59 years	2,123	27.4	136	24.2	20.0 29.0	746	26.2	24.4 28.0	1,241	28.1	27.1 29.1		
≥ 60 years	1,196	15.2	84	14.6	11.0 19.1	400	13.9	12.0 15.9	712	15.7	13.6 18.0		
Mean (SD)	33.3 (0.62)		30.94 (1.37)		28.2 33.7	31.66 (0.67)		30.3 33.0	34.06 (0.76)		32.5 35.6		
Current Status (n=8,035)													
Alive in HH	6,634	83.2	445	84.2	77.7 89.1	2,401	83.5	80.0 86.5	3,788	83.0	81.0 84.7	1.55	0.19
Alive/living elsewhere	984	11.9	90	10.7	7.0 16.2	338	11.7	8.8 15.5	556	12.1	10.7 13.7		
Dead	393	4.7	38	4.9	3.3 7.1	137	4.3	3.5 5.2	218	4.8	4.1 5.7		
Unknown/Missing	24	0.2	2	0.2	0.1 0.2	18	0.5	0.2 0.9	4	0.1	0.0 0.3		
Membership to HH (n=8,035)													
Long-time member	6,711	82.8	463	77.8	70.8 83.6	2,433	83.1	81.0 85.0	3,815	83.2	81.3 84.9	1.24	0.31
Born during time period	1,007	12.9	83	16.1	11.2 22.5	357	13.7	11.8 15.9	567	12.3	10.9 13.9		
Joined HH during time period	317	4.3	29	6.1	2.7 13.4	104	3.2	2.4 4.3	184	4.5	3.6 5.6		
Household Charactristics													
Ethnicity (n=8,032)													
Tamil	8,026	100.0	575	100.0	. .	2,885	99.9	. .	4,566	100.0	. .	0.50	0.61
Religion (n=8,023)													
Christianity	1,400	16.0	133	17.8	7.8 35.8	659	26.6	12.3 48.3	608	12.1	6.3 22.2	2.25	0.12
Hinduism	6,623	84.0	442	82.2	64.2 92.2	2,232	73.4	51.7 87.7	3,949	87.9	77.8 93.8		
Sex of the head of HH (n=8,035)													
Male	2,977	36.7	248	41.0	30.4 52.5	1,024	34.1	25.3 44.2	1,705	37.2	32.9 41.8	0.26	0.77
Female	5,058	63.3	327	59.0	47.5 69.6	1,870	65.9	55.8 74.7	2,861	62.8	58.2 67.1		
Number of people living in HH (n=8,035)													
≤ 4 members	3,327	40.4	285	38.3	26.6 51.6	1,127	36.0	30.9 41.5	1,915	42.1	36.1 48.4	1.59	0.22
> 4 members	4,708	59.6	290	61.7	48.4 73.4	1,767	64.0	58.5 69.1	2,651	57.9	51.7 63.9		
Mean (SD)	5.22 (0.16)		5.28 (0.45)		4.4 6.2	5.42 (0.20)		5.0 5.8	5.15 (0.16)		4.8 5.5		
Length of time living in current house (n=3,752)													
≤ 6 years	1,337	33.5	163	51.6	30.6 72.0	646	48.2	37.7 58.7	528	24.3	17.4 32.8	3.49	0.01†
7 – 12 years	925	24.3	41	19.4	9.9 34.7	381	24.6	16.4 35.0	503	24.6	17.7 33.1		
13 – 30 years	871	26.6	46	28.0	15.4 45.3	207	18.3	11.1 28.5	618	30.7	22.7 40.1		
> 30 years	619	15.7	6	1.0	0.2 5.4	165	9.1	6.1 13.2	448	20.4	15.0 27.1		
Mean (SD)	16.34 (1.07)		9.96 (2.01)		5.9 14.0	11.61 (1.28)		9.0 14.2	19.34 (1.43)		16.4 22.3		
Access to health care facility (n=7,989)													
Hospital	7,370	93.1	484	91.4	87.0 94.4	2,637	92.7	88.6 95.5	4,249	93.4	89.4 95.9	2.78	0.04†
Health clinic	494	5.1	80	8.0	5.2 12.3	202	5.3	2.9 9.4	212	4.8	2.7 8.4		
Health post	125	1.8	7	0.6	0.1 4.5	39	2.0	1.0 3.9	79	1.8	0.8 4.0		
Length of time to nearest health facility (n=8,018)													
< 1 hour	7,445	94.0	531	94.5	87.6 97.7	2,651	93.3	89.1 95.9	4,263	94.2	90.6 96.5	0.16	0.85
1 to 5 hours	573	6.0	44	5.5	2.3 12.4	238	6.7	4.1 10.9	291	5.8	3.5 9.5		
Treat drinking water (n=7,999)													
Yes	4,735	58.1	387	69.1	57.5 78.8	1,745	58.3	51.1 65.1	2,603	57.1	51.7 62.3	1.83	0.18
No	3,264	41.9	188	30.9	21.2 42.5	1,135	41.7	34.9 48.9	1,941	42.9	37.7 48.3		
Frequency of getting enough to eat (n=8,005)													
None or 25% of the time	129	1.7	8	1.7	0.4 6.5	47	1.9	0.8 4.7	74	1.6	0.9 3.0	1.18	0.34
Half of the time	927	12.8	53	16.0	6.4 34.9	406	18.3	13.0 25.1	468	10.6	8.4 13.3		
Most (75%) of the time	2,193	26.7	147	21.9	15.2 30.5	818	28.6	24.3 33.4	1,228	26.4	22.2 31.1		
All the time	4,756	58.8	367	60.4	43.0 75.5	1,615	51.2	42.2 60.1	2,774	61.3	56.1 66.3		

%: Weighted percentage adjusted for sampling; CI: Confidence interval; χ²: chi square test; HH: Household; IDPs: Internally displaced persons.

† Statistically significant.

Table 12. Demographic and social characteristics of the 9 years census (April 2000 to August 2009) by displaced residency, Jaffna District, Sri Lanka, August 2009 (n=8,096)

Variables	All Cohort (n=8,096)		IDPs living in camps (n=413)			IDPs living in community (n=3,117)			Non-IDPs (n=4,566)			Pearson χ²	P value
	No.	%	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI		
Individual Charactristics													
Sex (n=8,092)													
Male	3,870	47.8	189	45.9	38.6 53.4	1,489	47.6	45.7 49.6	2,192	47.9	46.2 49.6	0.15	0.86
Female	4,222	52.2	223	54.1	46.7 61.4	1,626	52.4	50.4 54.4	2,373	52.1	50.4 53.8		
Age (n=8,073)													
≤ 15 years	1,835	23.4	119	29.5	25.8 33.4	722	26.7	24.3 29.2	994	21.9	19.5 24.5	37.16	<0.001†
16 to 24 years	1,427	17.6	88	21.8	19.3 24.5	546	17.4	15.2 19.7	793	17.5	15.8 19.4		
25 to 34 years	1,301	16.5	86	21.3	18.1 24.8	472	15.4	13.6 17.4	743	16.8	15.6 18.1		
35 to 59 years	2,136	27.4	75	18.6	15.3 22.3	820	26.3	24.1 28.6	1,241	28.1	27.1 29.1		
≥ 60 years	1,205	15.2	36	8.9	7.9 10.0	457	14.3	12.3 16.6	712	15.7	13.6 18.0		
Mean (SD)	33.28 (0.62)		26.51 (1.07)	24.3 28.7		31.84 (0.71)		30.4 33.3	34.06 (0.76)		32.5 35.6		
Current Status (n=8,096)													
Alive in HH	6,686	83.2	277	67.1	49.7 80.7	2,621	84.9	81.6 87.7	3,788	83.0	81.0 84.7	380.44	<0.001†
Alive/living elsewhere	991	11.9	80	19.4	8.7 37.8	355	11.0	8.3 14.3	556	12.1	10.7 13.7		
Dead	395	4.7	45	10.9	7.4 15.8	132	3.9	3.3 4.6	218	4.8	4.1 5.7		
Unknown/Missing	24	0.2	11	2.7	0.9 7.4	9	0.3	0.1 0.6	4	0.1	0.0 0.3		
Membership to HH (n=8,096)													
Long-time member	1,019	12.9	75	18.2	11.8 26.8	377	13.9	11.8 16.3	567	12.3	10.9 13.9	2.03	0.11
Born during time period	319	4.3	29	7.0	3.3 14.4	106	3.5	2.5 4.9	184	4.5	3.6 5.6		
Joined HH during time period	6,758	82.9	309	74.8	60.3 85.3	2,634	82.6	80.5 84.6	3,815	83.2	81.3 84.9		
Household Charactristics													
Ethnicity (n=8,093)													
Tamil	8,087	100.0	413	100.0	. .	3,108	99.9	. .	4,566	100.0	. .	0.50	0.61
Religion (n=8,084)													
Christianity	1,400	15.9	189	45.8	23.0 70.5	603	23.1	9.6 46.0	608	12.1	6.3 22.2	4.52	0.02†
Hinduism	6,684	84.1	224	54.2	29.5 77.0	2,511	76.9	54.0 90.4	3,949	87.9	77.8 93.8		
Sex of the head of HH (n=8,096)													
Male	2,997	63.4	191	53.8	44.7 62.6	1,101	65.5	58.2 72.2	1,705	62.8	58.2 67.1	1.86	0.17
Female	5,099	36.6	222	46.3	37.4 55.3	2,016	34.5	27.9 41.9	2,861	37.2	32.9 41.8		
Number of people living in HH (n=8,096)													
≤ 4 members	3,339	40.3	273	66.1	65.0 67.2	1,151	34.0	28.7 39.8	1,915	42.1	36.1 48.4	61.53	<0.001†
> 4 members	4,757	59.7	140	33.9	32.8 35.0	1,966	66.0	60.2 71.3	2,651	57.9	51.7 63.9		
Mean (SD)	5.23 (0.16)		3.83 (0.15)	3.5 4.1		5.52 (0.23)		5.1 6.0	5.15 (0.16)		4.8 5.5		
Length of time living in current house (n=3,767)													
≤ 6 years	1,345	33.7	226	100.0	. .	591	45.8	38.4 53.5	528	24.3	17.4 32.8	3.86	<0.001†
7 – 12 years	925	24.1	0	0.0	. .	422	24.8	18.2 32.9	503	24.6	17.7 33.1		
13 – 30 years	878	26.6	0	0.0	. .	260	21.2	14.7 29.6	618	30.7	22.7 40.1		
> 30 years	619	15.6	0	0.0	. .	171	8.1	5.6 11.6	448	20.4	15.0 27.1		
Mean (SD)	16.29 (1.07)		0.53 (0.19)	0.2 0.9		11.94 (0.96)		10.0 13.9	19.34 (1.43)		16.4 22.3		
Access to health care facility (n=8,043)													
Hospital	7,416	93.1	196	47.9	40.6 55.3	2,971	95.5	92.4 97.4	4,249	93.4	89.4 95.9	104.62	<0.001†
Health clinic	502	5.1	206	50.4	39.4 61.3	39	2.8	1.3 6.0	212	4.8	2.7 8.4		
Health post	125	1.8	7	1.7	0.2 13.6	84	1.7	0.9 3.3	79	1.8	0.8 4.0		
Length of time to nearest health facility (n=8,079)													
< 1 hour	7,503	94.0	413	100.0	. .	2,827	93.1	89.0 95.8	4,263	5.8	3.5 9.5	17.01	<0.001†
1 to 5 hours	576	6.0	0	0.0	. .	285	6.9	4.2 11.0	291	94.2	90.6 96.5		
Treat drinking water (n=8,060)													
Yes	4,773	58.0	212	51.3	48.3 54.4	1,958	60.4	54.1 66.5	2,603	57.1	51.7 62.3	4.71	0.02†
No	3,287	42.1	201	48.7	45.6 51.7	1,145	39.6	33.5 45.9	1,941	42.9	37.7 48.3		
Frequency of getting enough to eat (n=8,066)													
None or 25% of the time	130	1.7	0	0.0	. .	56	2.1	0.9 4.6	74	1.6	0.9 3.0	18.82	<0.001†
Half of the time	937	12.9	8	1.9	0.3 12.2	461	19.0	13.2 26.6	468	10.6	8.4 13.3		
Most (75%) of the time	2,214	26.6	78	18.9	10.8 30.9	908	27.8	24.0 31.9	1,228	26.4	22.2 31.1		
All the time	4,785	58.8	327	79.2	72.2 84.8	1,684	51.1	42.1 60.1	2,774	61.3	56.1 66.3		

%: Weighted percentage adjusted for sampling; CI: Confidence interval; χ²: chi square test; HH: Household; IDPs: Internally displaced persons.

† Statistically significant.

Table 13. Multivariable analysis: Association between individual and household characteristics as covariates, displacement frequency as a primary study variable, suffering of a violent injury as an outcome, Jaffna District, Sri Lanka (N=7,814)*

Variables	Suffered of a violent injury (n=130)**			
	No.	AOR	95% CI	
Individual Charactristics				
Age				
≤ 15 years	12	1.91	0.34	10.57
16 to 24 years	31	4.95†	1.71	14.32
25 to 34 years	36	7.26†	3.10	17.01
35 to 59 years	32	4.23†	1.90	9.39
≥ 60 years	21	1.00 [Reference]		
Current Status				
Alive in HH	69	1.00 [Reference]		
Alive/living elsewhere	19	2.18	0.75	6.29
Dead	44	29.06†	11.74	71.93
Unknown	1	5.07	0.41	63.21
Household Charactristics				
Religion				
Hinduism	33	1.00 [Reference]		
Christianity	100	0.95	0.49	1.87
Sex of the head of HH				
Male	46	1.00 [Reference]		
Female	87	0.92	0.52	1.63
Access to health care facility				
Hospital	100	1.00 [Reference]		
Health clinic	26	2.76†	1.30	5.85
Health post	5	3.46	0.66	18.10
Length of time to nearest health facility				
Less than 1 hour	121	1.00 [Reference]		
1 to 5 hours	12	2.97†	1.28	6.86
Frequency of getting enough to eat				
None or 25% of the time	4	3.22	0.60	17.31
Half of the time	16	1.21	0.56	2.64
Most (75%) of the time	39	1.37	0.69	2.71
All the time	74	1.00 [Reference]		
Primary Variable				
Displacement Frequency				
Once	44	2.24†	1.39	3.62
2 - 4 times	42	4.34†	2.57	7.33
5 or more times	12	5.42†	3.13	9.40
Non-IDPs	35	1.00 [Reference]		

%: Weighted percentage adjusted for sampling; CI: Confidence interval; AOR: Adjusted odds ratio; HH: Household; IDPs: Internally displaced persons.

* The program read 8,096 observations; however, it used in the analysis 7,814 observations. The number of observations with missing data was 282.

** The program used in the analysis 130 observations out of 133 observations. The number of observations with missing data was 3 (1 is missing age; 2 are missing PHC)

† Statistically significant.

Table 14. Multivariable analysis: Association between individual and household characteristics as covariates, displacement place as a primary study variable, suffering of a violent injury as an outcome, Jaffna District, Sri Lanka (N=7,989)*

Variables	Suffered of a violent injury (n=129)		
	No.	AOR	95% CI
Household Charactristics			
Access to health care facilities			
Hospital	99	1.00 [Reference]	
Health clinic	26	3.18†	1.52 6.66
Health post	5	2.59	0.58 11.64
Primary Variable			
Displaced Outside Jaffna			
Yes	29	4.73†	2.65 8.45
No	65	2.60†	1.52 4.45
Non-IDPs	35	1.00 [Reference]	

%: Weighted percentage adjusted for sampling; CI: Confidence interval; AOR: Adjusted odds ratio; HH: Household; IDPs: Internally displaced persons.

* The program read 8,096 observations; however, it used in the analysis 7,989 observations. The number of observations with missing data was 107.

† Statistically significant.

Table 15. Multivariable analysis: Association between individual and household characteristics as covariates, displaced residency as a primary study variable, suffering of a violent injury as an outcome, Jaffna District, Sri Lanka (N=7,822)*

Variables	Suffered of a violent injury (n=130)**		
	No.	AOR	95% CI
Individual Charactristics			
Religion			
Hinduism	33	1.00 [Reference]	
Christianity	100	0.90	0.45 1.83
Age			
≤ 15 years	12	1.86	0.36 9.51
16 to 24 years	31	4.43†	1.61 12.16
25 to 34 years	36	6.93†	3.13 15.34
35 to 59 years	32	4.11†	1.96 8.61
≥ 60 years	21	1.00 [Reference]	
Current Status			
Alive in HH	69	1.00 [Reference]	
Alive/living elsewhere	19	2.10	0.72 6.13
Dead	44	25.88†	10.89 61.49
Unknown	1	3.74	0.28 50.65
Household Charactristics			
Access to health care facilities			
Hospital	100	1.00 [Reference]	
Health clinic	26	1.68	0.59 4.74
Health post	5	3.14	0.60 16.50
Length of time to nearest health facility			
Less than 1 hour	121	1.00 [Reference]	
1 to 5 hours	12	3.28†	1.33 8.07
Frequency of getting enough to eat			
None or 25% of the time	4	4.69†	1.16 18.99
Half of the time	16	1.50	0.63 3.55
Most (75%) of the time	39	1.50	0.72 3.13
All the time	74	1.00 [Reference]	
Primary Variable			
Residency of displaced			
IDPs living in camps	46	11.32†	6.23 20.56
IDPs resettled with host community	52	2.31†	1.35 3.94
Non-IDPs	35	1.00 [Reference]	

CI: Confidence interval; AOR: Adjusted odds ratio; HH: Household; IDPs: Internally displaced persons.

* The program read 8,096 observations; however, it used in the analysis 7,822 observations. The number of observations with missing data was 274.

** The program used in the analysis 130 observations out of 133 observations. The number of observations with missing data was 3 (1 is missing age; 2 are missing PHC)

† Statistically significant.