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## Stress Assessment during Pre-Disaster Phase in Kiziba Village, Democratic Republic of Congo

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*Abstract:*
*Empirical studies talk about vulnerability of rural/remote communities. (Bart Weijs et al, 2012; Gunn, KM; Kettler, 2012; Juliet Hassard and Kevin Teach, 2013) Psychological problems are significant in these communities leading to high rate of suicide in rural and remote areas as oppose to urban areas.(Gunn, KM; Kettler, 2012) Isolation, poor infrastructure and poor access to health care services are found to be the contributing factors to this. (Juliet Hassard and Kevin Teoch, 2013) Kiziba village has been experiencing volcanic eruptions over the years and a threat of a limbic eruption on the top of the vulnerabilities stated above. Such a complexity recalls scientists and policy makers to take appropriate actions. That's how I decided to carry out this descriptive and cross sectional study titled Stress Assessment during pre-disaster phase in Kiziba village, democratic Republic of Congo.  Two specific objectives are followed: to assess the stress of people in Kiziba Village and to identify demographic and socioeconomic factors that strengthen this stress. 380 people (males and females) aged 18 to 77 years participated in this research.*

*The following key lessons emerge from the literature:*
*•	The disaster affects people's mental at all stages of the disaster (Pre-disaster phase, during the disaster and post-disaster phase)*
*•	In pre-disaster stage, people are more concerned about the risk of losing their houses and properties that they struggled to put in place as well as inability of protecting their family members and beloved ones. This brings a feeling of uncertainty about the future.*
*•	Stress is a normal reaction to a threat or disturbing change in an environment. Therefore it can affect a human positively or negatively. Even when it affects us negatively, it's important to differentiate mental distress with mental disorders. Distress always disappears some days after the shock and does not need a psychological support but for mental disorders it needs to identify the type of the illness and requires a therapy. This paper will be referring to mental disorder.*

*This study shows that a big majority was found either with high stress or moderate stress and only 5.7% had a low stress. Gender had a positive relationship with stress while educational level had a negative relationship with stress. The assumption is that in case of other stressors considering as a confounding factor to this study such as war, political instability, it will lead some people with moderate stress to have a high level of stress.*

*Therefore i recommend the government to come up with an intervention of psychosocial support for disasters. The psychosocial support will be of a great help for the community during the warning period and in the evacuation process. It will be about to bring psychologists expert at the household level to give counseling and educate people how to control fear and to make critical decision despite the panic during and volcanic eruption or gas explosion, spreading regularly information in radio and public places on the volcano and the potential risks.*

*Keywords: Stress, stress assessment, pre-disaster phase*

## 1. Introduction

Natural disaster is seldom a single event; a flood, volcanic eruption, exposure to toxic substances, explosion, or tornado is almost always the dramatic beginning of a cascading series of consequences. These events usually involve the loss of function of self, work, important relationships; the death of others; disruptions in social cohesion and goals; and/or financial instability. These are further affected by the degree of preparation before the event and the presence of helpers and/or exploiters after event. (Field, 1991)

Scientists and clinicians have studied the effects of stress from natural disasters on survivors' psychological and physical health since the 1940s. They recognized that some people who have been exposed to various natural disasters could develop psychological injuries such as major depression, stress, chronic anxiety, and post-traumatic stress disorder. (Gunn, KM; Kettler, 2012)

Psychological impacts of disasters would also depend on other factors such as the social vulnerability. These impacts may occur before the event "pre-disaster phase", during the hazard itself and even after the occurrence of the event "post-disaster phase". (Eveline Favero, 2012)

That's why researchers emphasize that it is essential to organize locally appropriate mental health and psychosocial supports that promote self-help, coping and resilience among affected people.

In Democratic Republic of Congo, people have been experiencing various natural disasters such as floods, earth quakes, volcanic eruption and epidemic diseases. These contributed to insecurity, environment degradation, migrations, loss of life, destruction of infrastructure and properties.(Republique, 2012)

From 1962 to 2003, volcanic eruptions have killed 342 people, caused injuries of 400 people, destroyed 170 000 houses and affected 170.400 people. (Mapilanga Julien M, 2018)

Kiziba village, an area located in the Eastern part of Democratic Republic of Congo is far from being excluded from this theory. It has experienced two volcanic eruption from Mount Nyiragongo and the latest one (2002) left 80% of the community homeless. (Mapilanga Julien M, 2018)

There is no data on people affected mentally by the eruption in Kiziba village because the mental assessment done in 2002 was broad and included other cities affected by Nyiragongo eruption as well. Therefore it does not specify psychological problems recorded in each area.

In addition, these available assessment report do not give information about the psychological health of people living in high risk areas before the occurrence of the hazard (Cambridge University Press, 2015; Peter J Baxter, 2002; Republique, 2012; Returns & Nfis, 2012).  Yet such information (baseline survey) could give us an idea about vulnerability to the disaster and to know the kind of assistance/ interventions (psychological, technical, medical, etc.) that is needed in disaster preparedness.

We therefore believe that it's crucial to assess the mental health status of people in Kiziba village during this pre-disaster stage in order to early detect psychological problems and refer them, come up with strategies to strengthen the ability of the community to respond to a potential eruption.

## 1.1. Research Objectives

### 1.1.1. Broad Objective
To assess the mental health status of people living in Kiziba village during a pre-disaster phase

### 1.1.2. Specific Objectives
- To assess the stress of the people in Kiziba village
- To identify demographic and socio-economic factors associated with stress

## 2. Materials and Methods
The study was descriptive cross-sectional using both quantitative and qualitative methodologies. Data was collected through administration of a questionnaire to household members in Kiziba village and interviews of key informants. This research was conducted in Kiziba village, located in the eastern part of Democratic Republic of Congo specifically in North-Kivu province.

### 2.1. Sampling Design
Purposive sampling was applied in selection of the study participant. According to Patton, the logic and power of purposeful sampling lies in selecting information-rich cases, which are those from which one can learn a great deal about issues of central importance to the purpose of the research. (Becker et al., 2011) These were assumed head of institutions involved in natural disasters for qualitative data.

For quantitative data, the village was divided into clusters that correspond to the estates. As global population of the village is 31561 people, the neighborhood that has more population will definitely have a big number of respondents based upon the sample size of the study.

### 2.2. Sample Size
The statistical Fisher's formula is used to get the sample size because the population with characteristic was unknown. (Israel, 1992)

n= (Zpq)d$^2$ for population greater than 10.000.(Israel, 1992; Jung, 2014)

n= 380

The sample size that came from this formula is 380 individuals for quantitative data.

### 2.3. Inclusion and Exclusion Criteria
This study will include:
- Both male and female 18-77 years old

- People living in Kiziba  at least a year before the survey
- People without physical or mental disabilities

Respondents who correspond to these criteria will be excluded from our study.

10 enumerators were selected in clinical psychology of Université Libre des Pays de Grands Lacs (ULPGL). All enumerators were in their last year of bachelor's degree. This group was chosen due to their knowledge on mental health challenges as well as their experience in surveys involving human beings. The selection covered all students with stated criteria to avoid subjectivism. Enumerators were trained on the aim of the study, the questionnaire.

### 2.4. Ethical Consideration

An ethical clearance was soughed at the Great Lakes University of Kisumu Research center (GREC) in Kenya as well as at the Nyiragongo territory in DR Congo.

Local authorities in Village Office and the health center were also seen for obtaining their co-operation before the data collection.

Research assistant were reading the consent for the respondents who -in return- gave verbal consent before starting the interview.

### 2.5. Data Procedure

A tool was administered to 380 people with 18-77 years of age. It covered risk perception (threat appraisal).Data collection was conducted by independent and trained enumerators recruited in a local university (ULPGL), faculty of psychology to reduce bias.

Face to face interviews were conducted by trained enumerators for people with lower level of education (secondary incomplete and below) while for respondents with at least secondary complete level, we used a self-administered questionnaire approach. It's important to mention that even for self-administered approach; enumerators were moderating the filling of questionnaires.  The questionnaire was made with five closed-ended questions written in French and sometimes translated in appropriate local languages for easier comprehension.

-Perceived stress (10 questions)

The Perceived Stress Scale (PSS) is a classic stress assessment instrument. This tool, while originally developed in 1983, remains a popular choice for helping us understand how different situations affect our feelings and our perceived stress. (Cungi, Bouhana, Degoul, & Bibollet, 1997)

Agreements and rating scales are as follow:

0= "Never"; 1= "Almost never"; 2= "Sometimes"; 3= "Fairly often", 4= "Very often"

Before distributing the questionnaires, investigators introduced themselves to the object, explained the purpose of the research, guaranteed confidentiality and anonymity, asked consent, provided instructions on filling of the questionnaire, and answered the questions asked by participants. Then debrief was done on a daily basis with enumerators in order to clarify areas of confusion in the instrument and data collection procedures.

### 2.6. Data Analysis

The SPSS (Statistical Package for Social Science) software version 16.0 was used to code and analyze the data collected through the questionnaire. The statistical analyses methods used were   descriptive statistics, reliability test and regression analysis.

Descriptive analysis was utilized to understand the overall profiles of respondents as well as to analyze the mean and standard deviation of independent variables and dependent variable. As for demographic data, the frequency and percentage was for computation.

For Perceived stress scale, we first reversed scores for questions 4, 5,7 and 8. On these questions, scores were changed like this: 0=4, 1=3, 2=2, 3=1, 4=0

Then, we added up the scores for each item to get the total. Individual scores on PSS ranged from 0 to 40. We included respondents who answered at least to 7 out of the 10 items.

Interpretation: 0-13 (low stress), 14-26 (moderate stress) and 27-40 (high stress). (Kenneth B. Matheny, Ph.D., ABPP and Christopher J. McCarthy, 2000)

Validity tests and reliability were crucial for testing the goodness of measures. They were done automatically by SPSS using Cronbach's Alpha value.

## 3. Results

In this chapter the researcher presents the results on psychological status of people towards volcanic eruption and gas release in pre-disaster phase in Kiziba village, Democratic Republic of Congo. The researcher starts by describing the context in which the study was conducted, providing a brief demographic description of participants of the study and sketching the context. The researcher then goes on to discuss the practical issues related to the implementation of the study. This ends by presentation of findings.

| Subject's Location | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Bishusha 1 | 60 | 15.8 | 15.8 | 15.8 |
| | Bishusha 2 | 65 | 17.1 | 17.1 | 32.9 |
| | Hewabora | 51 | 13.4 | 13.4 | 46.3 |
| | Kashongo | 32 | 8.4 | 8.4 | 54.7 |
| | Matovu | 35 | 9.2 | 9.2 | 63.9 |
| | Munanira | 100 | 26.3 | 26.3 | 90.3 |
| | Pole-Pole | 37 | 9.7 | 9.7 | 100.0 |
| | Total | 380 | 100.0 | 100.0 | |

*Table1: Location*

Data were collected purposively in seven estates in Kiziba village (Bishusha1, Bishusha2, HewaBora, Kashongo, Matovu, Munanira and Polepole) out of the 13 existed. Munanira had the highest respondents or 26.3% and Polepole was the last estate in terms of respondents with 9.7%.

| Independent Variables | Total Population (N=380) | |
|---|---|---|
| | Frequency (N) | Percent (%) |
| Gender | n (380) | |
| Male | 184 | 48.4 |
| Female | 196 | 51.6 |
| Age | n (380) | |
| 18-24 | 94 | 24.7 |
| 25-39 | 137 | 36.1 |
| 40-49 | 78 | 20.5 |
| 50-59 | 52 | 13.7 |
| 60-77 | 19 | 5.0 |
| Marital Status | n (380) | |
| Married | 232 | 61.1 |
| Married (Polygamy) | 14 | 3.7 |
| Widow | 20 | 5.3 |
| Widower | 14 | 3.7 |
| Single | 100 | 26.3 |
| Relationship with head of Household | n (380) | |
| Head of household | 134 | 35.3 |
| Spouse | 142 | 37.4 |
| Child by birth | 49 | 12.9 |
| Grand child | 21 | 5.5 |
| Child by relation | 30 | 7.9 |
| House help | 1 | 3 |
| Other | 3 | 8 |
| Level of education | n (380) | |
| None | 70 | 18.4 |
| Primary incomplete | 61 | 16.1 |
| Primary complete | 83 | 21.8 |
| Secondary complete | 123 | 32.4 |
| Post-secondary school | 43 | 11.3 |
| Counseling session | n (380) | |
| None | 258 | 67.9 |
| Independent Variables | Total Population (N=380) | |
| | Frequency (N) | Percent (%) |
| Individual counseling | 74 | 19.5 |
| Group counseling | 48 | 12.6 |
| Source of Income | n (380) | |

| Agriculture | 147 | 38.7 |
|---|---|---|
| Business | 112 | 29.5 |
| Employment | 54 | 14.2 |
| Other | 67 | 17.6 |

*Table 2: Total Population Frequency and Percentage of Independent Variables*

- Gender: In our sample, females were many compare to males. They were 196 or 51.6% while men were 184 or 48%.
- Age: When comes to age  almost half of the respondents or 36.1%  were 25-39 years of age followed by youth (18-24) with 24.7%, then 40-49  with 20.5% and 50-59 with 13.7%. Lastly, elders (60-77) were only 5.0% of the respondents.
- Marital status: More the half or 60.1% of the respondents were married to one partner followed by single who were 26.3% then widow with 5.3%. Lastly, polygamous were 3.7% of the respondents and widower 3.7%.
- Relationship with the head of household: 37.4% of our respondents were spouses, 35.3% were head of household, 12.9% were child by birth, 7.9% were child by relation, 8% of the respondents had other relationship with the head of the household (friends, colleagues,…) and only one respondent (3%) was a house help.
- Level of Education: A big number of the respondents or 32.4% have completed their secondary school followed by 21.8% who completed their primary school then 18.4% who didn't go to school and 16.1 who did not complete their primary school. Only 43 respondents or 11.3% went to university.
- Counseling session: More than half or 67.9% of the respondents have never gone for a counseling session while 19.5% have done an individual counseling and 12.6% went for a group counseling.
- Source of Income:  More than half of the respondents (147) or 38.7% while 29.5% are doing business, 14.2% are employed and 17.6 are doing informal work.

|  | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| PSS.Score | 380 | 4.00 | 39.00 | 22.5737 | 5.81621 |
| Valid N (listwise) | 380 |  |  |  |  |

*Table 3: Descriptive Statistics for Perceived Stress Score*

The perceived stress scale had a mean score was 22.5.  The minimum score was 4, the one who scored the highest score was 39 with a standard deviation of 5.8.
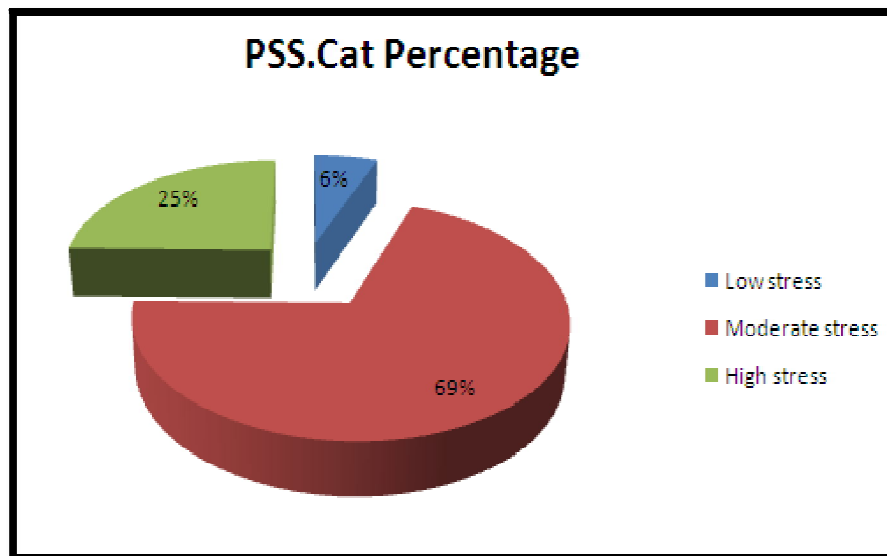


*Figure 1: Perceived stress category*

The results about stress assessment showed that majority of the respondents (69.4%) have moderate stress followed by 24.7% of the respondents who have high stress. Lastly, only 22 respondents (5.7%) were found with a low stress.
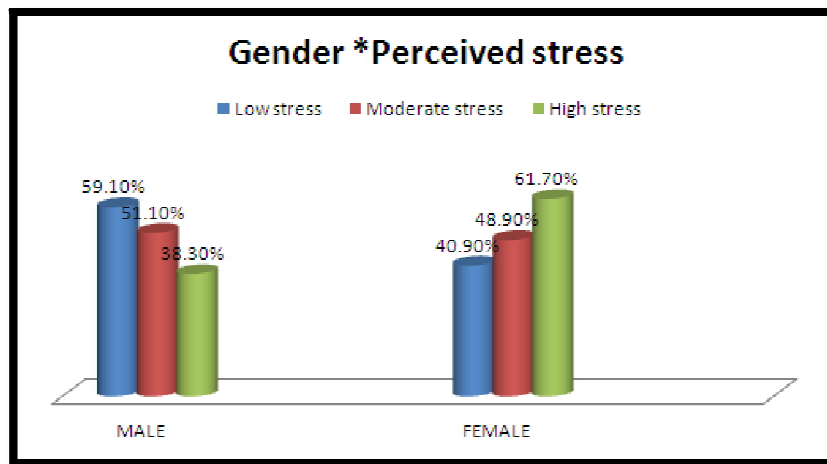
*3.1. Cross Tabulation*

*Figure 2: Gender and perceived stress category*

After grouping gender and the perceived stress, we discovered that: In low stress, more than half of the subjects (59/1%) were male versus 40.9% of female. In moderate stress, male were 51.1% while female were 48.9% of the respondents. Lastly, female were the most found with high stress (61.7%) while male were only 38/9%.
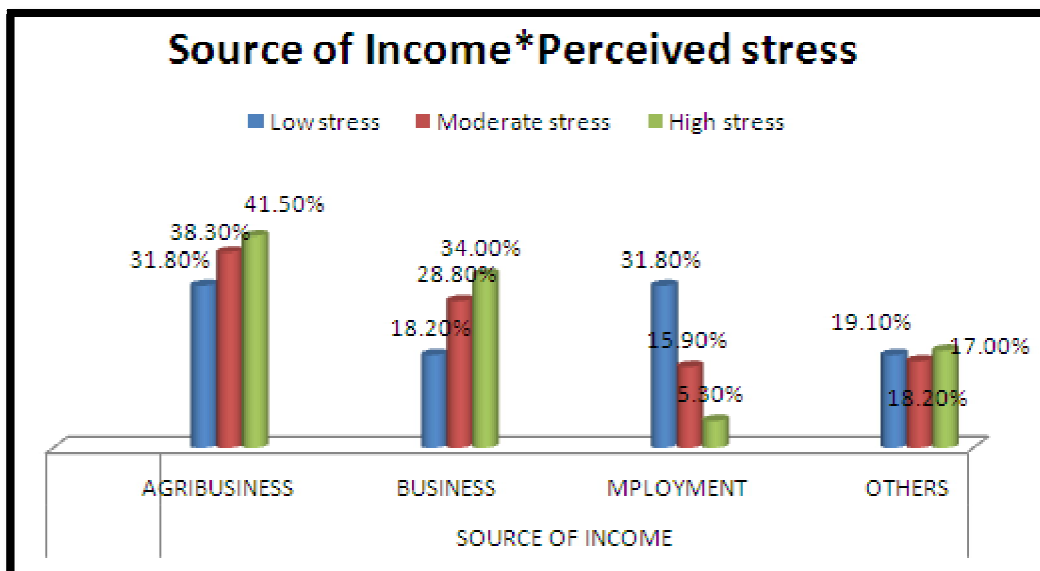


*Figure 3: Source of Income and Perceived stress*

People doing agribusiness (farmers) were the most affected by stress compare to business man, employed people and others. 41.5% were found with high stress compare to business man (34%), employed people (5.3%) and other (17%). When comes to moderate stress, 38.3% were farmers versus 28.8% who were business man, 15.9% employed people and 18.2% who do other work than the one started above.
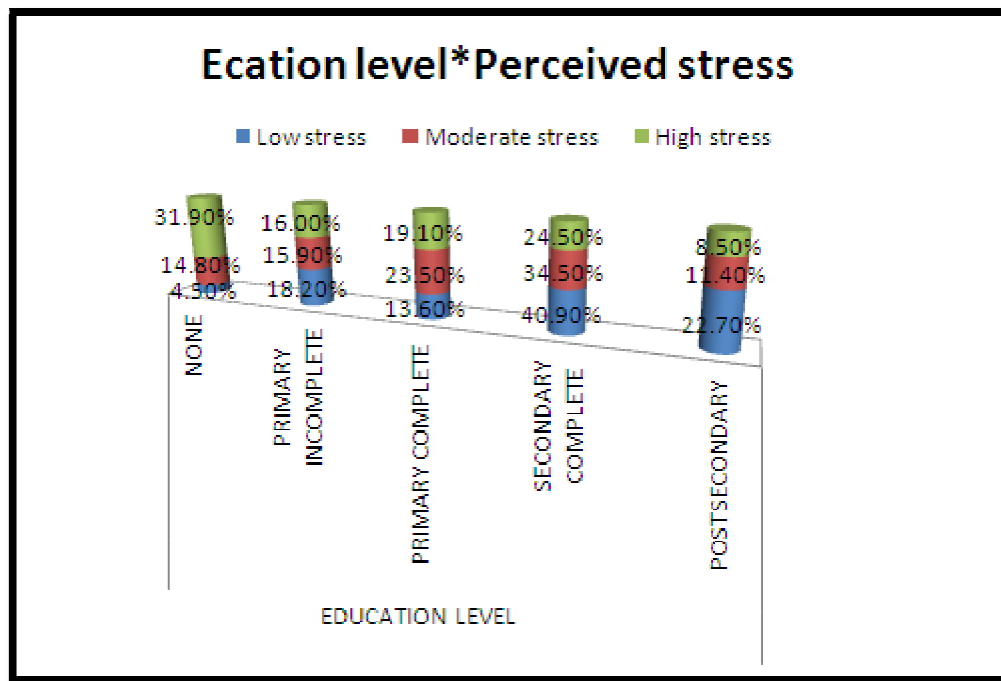
*Figure 4: Education level and Perceived stress category*

People who did not go to school were the most found with high stress (31.9%) compare to people with primary incomplete level (16%), people with primary complete level (19.1%), those with secondary complete level (24.5%) and people with post-secondary level (8.5%). When comes to low stress, we found only 4.5% of people with no education level versus 18.2% of those with primary incomplete level, 13.6% among  people with primary complete level, 40.9% secondary complete level and 22.7% of those with post-secondary level.

*3.2. Correlation Analysis*

| Correlations | | | Education Level | Perceived Stress Scale Category |
|---|---|---|---|---|
| Kendall's tau_b | Education Level | Correlation Coefficient | 1.000 | -.170** |
| | | Sig. (2-tailed) | . | .000 |
| | | N | 380 | 380 |
| | Perceived Stress Scale Category | Correlation Coefficient | -.170** | 1.000 |
| | | Sig. (2-tailed) | .000 | . |
| | | N | 380 | 380 |

*Table 4: Education Level and Perceived Stress Correlation*
*\*\*. Correlation Is Significant at the 0.01 Level (2-Tailed)*

We also found a weak negative correlation between education and perceived stress using kendall's tau-b variation coefficients. This means that the higher someone is educated, the less he's stressed.

*3.3. Reliability of Measurements*

| Reliability Statistics | | |
|---|---|---|
| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
| .688 | .688 | 10 |

*Table 5: Reliability statistics of perceived stress scale*

In our study the reliability was 0.68 (slightly below the most common values found in papers).
Some professionals, as a rule of thumb, require a reliability of 0.70 or higher (obtained on a substantial sample) before they will use an instrument. Although Nunnally  is often cited when it comes to this rule, he has actually never stated that 0.7 is a reasonable threshold in advanced research projects.  (Nunnally, 1978)

## 4. Discussion

Gender is qualified in the literature as an important social factor of vulnerability in disaster.
In most studies where human cognition is concerned, they tend to over sample the number of women compare to men. That's the reason why in this research we deliberately chose to include more women (52%) than men (48%).

Our findings on stress in pre-disaster phase confirmed a positive relationship between gender and stress level. Majority (62%) of the respondents who had high stress level were women. When comes to low stress level, 41% of the respondents were women versus 59% for male. Two studies about analyzing vulnerability in a disaster context also found that women were more vulnerable than men. The investigation of gender impact after Hurricane Mitch showed that three quarters of the emotionally affected people were women or girls. (Sanaz Soharibizadeh, 2014)

Bradshaw (2004) analyzed the socio-economic effects of Hurricane Mitch with gender consideration to reflect women's disadvantageous position relative to men. The next sections investigated the direct and indirect impacts of disasters on women.

Educational level was found in this study as a factor influencing stress. The more we are educated, the less we are stressed. In the disaster psychology literature, we didn't find any article linking stress to educational level.
In the literature they do recognize that farmers have a poor mental health compare to non-farmers. In a study about English farmers, Booth and Lloyd observed 35% of surveyed farmers scored highly on the General Health Questionnaire, a representation of poor mental health. This study also observed that an increase in the number of work-related stressors reported was associated with an increase in both depression and anxiety levels amongst respondents.(Juliet Hassard and Kevin Teoch, 2013)

In this study the relationship between source of income and level of stress was not statistically significant. Although people doing agribusiness (farmers) were the most affected by stress compare to business man, employed people and others. 41.5% were found with high stress compare to business man (34%), employed people (5.3%) and other (17%).

## 5. Conclusion and Recommendation

Result on mental health assessment in Kiziba village during a pre-disaster phase showed alarmed data. First of all, 28% of the respondents were found with a high level of stress. These ones are mentally ill and should be taken to the hospital for counseling. But they are also the most vulnerable to the future volcanic eruption and need particular attention. And I believe that without such an intervention this rate cannot go down.

Majority of the respondents (69%) had moderate stress. However this rate can vary (either go up or down) depending on the level of threat. The assumption is that in case of other stressors such as war, political instability – that are considered as confounding factors to this study-, it will lead some people with moderate stress to have a high level of stress. The magnitude of the problem will increase and in a long run will constitute a public health concern.

Therefore i recommend the government to come up with an intervention of psychosocial support for disasters. The psychosocial support will be of a great help for the community during the warning period and in the evacuation process. It will be based on spreading regularly information in radio and public places on the volcano and the potential risks and also to bring psychologists expert in the household level to give counseling and educate people how to control fear and to make critical decision despite the panic during and volcanic eruption or gas explosion.

The psychological preparedness should consider gender differences because women are vulnerable in pre-disaster phase during the disaster and in post-disaster phase. For example this study showed that in pre-disaster phase most women had high stress compare to men.

The intervention should also focus on increasing self-efficacy to  provide a plan whereby the communities within are able to plan to respond and remain self-reliant for at least 72 hours without any outside assistance or until the Local Civil Defense Emergency Management agencies can assist.

## 6. Scope and Study Limitation

Psychological state is wide topic. Therefore, narrowing it down by picking stress assessment might have left other elements that could enable us reaching systematic and holistic conclusion.
However, this study is a starting point for future research that may take other aspects of psychological status and find out the relationships with these data.

A part from French and English papers, other literatures are found as limitation of this study.
Lastly we did not find a tool for stress assessment in a context of natural disaster specifically in pre-disaster phase. Therefore the Perceived Stress Scale (PSS) used in this study is general. The reliability was 0.68 (slightly below the most common values found in papers). The scale shows level of stress of people caused by various stressful events rather than just volcanic eruption. Therefore we cannot -for instance- attribute high stress only to anxiety or worry of a volcanic eruption. But these

data will enable to refer special cases (high stress) for father psychological assessment and start the psychological preparedness of an eruption at the household level. It will also open doors to other research on mental assessment after the intervention stated above and see if there will be change in stress level.

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**Appendix**

A.1 Letter of Consent

My name is-----------------------------. I am a researcher from Great Lakes University of Kisumu (GLUK) in Republic of Kenya. We are talking to people in your community to find out the vulnerability of people towards volcanic eruption and release of the gas from Lake Kivu in order to strengthen the support to the community in a pre-disaster phase.
The purpose of this study is to examine the current psychological state of farmers towards volcanic and gas explosion in Kiziba village. It is hoped that this will prevent mental disorders and contribute to achievement of millennium development goals.
Participation in this study will provide you an opportunity to contribute to addressing the issues that affect quality of rural life. Our discussion will last for about twenty minutes. Responses from this interview will be kept confidential and will be used only for the purpose of the study. Only study staff whose job requires use of the data will have access to it. No one will link your name to your responses. The decision to participate in this study is your choice and you are free to stop the interview any time. There will be no monetary compensation for participation in the study.
Do you have any question?

Your signature means you agree to participate
------------------------------------------------------------------------------------------
Signature of the respondents
Thank you for participating in this study.

A.2 Questionnaire
Personal details
Notability: ……………….

Sex:    1.  M                    2.    F

Age
   1.   18-24
   2.   25-39
   3.   40-49
   4.   50-59
   5.   60-77
Marital Status
   1.   Married (monogamy)
   2.   Married (Polygamy)
   3.   Widow
   4.   Widower
   5.   Single
   6.   Other
Relation with the head of household
   1.   Head of household
   2.   Spouse
   3.   Child by birth
   4.   Grand child
   5.   Child by relation
   6.   House help
   7.   other
Education Level
   1.   None
   2.   Primary incomplete
   3.   Primary complete
   4.   Secondary complete
   5.   Post-secondary school (University or college)
Session de counseling passé
   1.   None
   2.   Individual Counseling
   3.   Group Counseling
Source of income
   1.   Agriculture
   2.   Business
   3.   Employment
   4.   other, specify

Perceived Stress Scale

0 –never        1 -almost never        2 –sometimes        3 -fairly often        4 -very often

| N° | Questions | 0 | 1 | 2 | 3 | 4 |
|----|-----------|---|---|---|---|---|
| 1 | In the last month, how often have you been upset because of something that happened unexpectedly? | | | | | |
| 2 | In the last month, how often have you felt that you were unable to control the important things in your life? | | | | | |
| 3 | In the last month, how often have you felt nervous and stressed? | | | | | |
| 4 | In the last month, how often have you felt confident about your ability to handle your personal problems? | | | | | |
| 5 | In the last month, how often have you felt that things were going your way? | | | | | |
| 6 | In the last month, how often have you found that you could not cope with all the things that you had to do? | | | | | |
| 7 | In the last month, how often have you been able to control irritations in your life? | | | | | |
| 8 | In the last month, how often have you felt that you were on top of things? | | | | | |
| 9 | In the last month, how often have you been angered because of things that happened that were outside of your control? | | | | | |
| 10 | In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? | | | | | |

*Table 6*