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Spatial Distribution of Mental Health based on Geographic Information System in Ilam

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A B S T R A C T

Introduction: The use of geographical information systems in the field of mental health has increased significantly in recent years. Geographic Information System (GIS) has brought about positive changes by identifying geospatial hotspots and disease hotspots and by linking mental health to the physical and geographic environment. The purpose of this research was the investigation of mental health based on geographical information systems in Ilam.

Materials & Methods: The present study was a descriptive-analytical study. The sample size was 507 participants that were selected by the clustering sampling method. The instrument used was the General Health Questionnaire (GHQ 28). To analyze different statistical tests, including descriptive statistics (frequency, percent), inferential statistics (t-test), and analysis of variance, were employed. The SPSS V.21 version software was used at the significant level of less than 0.01.

Results: There was a significant difference between females and males, with females having more negative mental health compared to males ($p<0.002$). The results suggested that 37 and 10 of the subjects have had mental health scores higher than 22 and 40, respectively. They have a risk of disorder based on the cut-off point of the questionnaire. Also, subjects' mental health score distribution is displayed on the maps. The result showed that there is a significant difference between marital status and mental health score ($p<0.01$).

Conclusion: Given that females with negative mental health are geographically more likely to be found on the outskirts of the city and in centers and bases that suffer from social and welfare inequalities, measures should be taken to eliminate these inequalities.

Keywords: Mental health; spatial distribution; geographical information system

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Introduction

Mental health is a state of well-being in which one realizes his or her abilities and can cope with the normal pressure of life, can function productively, and is able to help oneself and society (1). Mental health is a comprehensive mental, social, and physical well-being and not just a pathology. Mental health and many mental disorders are largely shaped by the social, economic, and physical environment in which we live and can affect the life quality of individuals (2). Mental health assessments are still in the early stages of development. Many of these studies are now seeking to understand environmental-genetic interactions (3), known as nature-nurture, which can affect mental health. Examples such as the relationship between environmental and genetic factors have been found in schizophrenia studies in China (4). This study showed that geographical trends play a role in the character of schizophrenia in the youth of Sichuan province. This study was entitled "Spatial analysis of schizophrenic personality traits in Chinese male youth," which shows evidence of Geographic Information System (GIS) in Sichuan province and suggests that the GIS system can be effective in locating genetic and environmental factors associated with schizophrenic personality traits. Physical and mental health are highly interdependent; hence, much effort has been made to understand their cause-and-effect relationships. Many experts believe that identifying and providing services contributed to achieving this goal so that the geographical areas where drug use is the highest were identified. In this regard, research has been conducted in Kentucky on the drug epidemic (5). In this study, researchers used a map to depict areas in need of medical services. These measures have helped to establish links between medical centers, hospitals, mental health professionals, and social counselling services for people in need and have led to the successful resolution of crises, although the use of GIS in the field of mental health has increased recently. However, many efforts must be made to improve treatment and access for millions of people with mental disorders worldwide. The GIS has made positive changes by identifying critical and pathogenic geospatial regions.

Most of the available analyses are based on classical statistical methods in which the analysis is based on only observations in which the spatial correlation is not considered (6). Therefore, when the spatial distribution of mental health and its dimensions are plotted, a significant difference can be observed from one point to another that environmental interventions seem to be the main factors in etiology (7).

In order to adopt measures and strategies for the control and spread of mental illnesses, prevention programs, treatment, and the prevalence of each specific disease in the community must be determined. Officials also need reliable and up-to-date information on the epidemiology of mental disorders, for presenting effective plans in the field of mental health and adopting strategies to allocate resources require recognizing the prevalence of each specific disease in society.

The purpose of this study was to investigate the spatial distribution of mental health based on the geographic information system in Ilam.

Materials and methods

Study Design

The present study was a descriptive-analytical study. This research examines the existing situation and systematically describes its current state, studies its characteristics and attributes, and, if necessary, examines the relationship between variables.

Setting and Participants

The participants of this study were 17-65 years old in Ilam City who referred to urban health care centers to receive services. The sampling method was cluster sampling. The inclusion criteria for the study were age over 17 years, no mental disorder, no

medication use, and the individual's consent to participate in the study. The exclusion criteria were having an age under 17 years, using medication, and not consenting to participation in the study

Sample Size

The sample included 507 participants. The size of the statistical population was based on the Krejci-Morgan table; for a statistical population of more than ten thousand people, it is approximately 400 people. For the accuracy of the sample size, the sample size of the present study was selected to be larger than this number. In survey research, the larger the sample size, the lower the error rate in drawing conclusions (8).

Measurements & Validity and Reliability

Demographic Tool

Mi Demographic variables included gender, categorized as male or female, and marital status, categorized as single or married.

General health Questionnaire (GHQ 28)

The 28-item General Health Questionnaire (GHQ-28), created by Goldberg, was used in this research to measure the participants' overall mental health. The GHQ-28 has four subscales: somatic symptoms, anxiety and sleeplessness, social dysfunction, and depressive symptoms. Each subscale has seven items. Responses are given a score between 0 and 3, which gives subscale values between 0 and 21. The total GHQ-28 score is the sum of the values from all four subscales and may be anywhere from 0 to 84. This instrument is acknowledged as one of the most reliable and extensively used instruments for mental health screening, including ease of administration and good psychometric characteristics. A total score over 41 or a subscale score above 22 indicates a serious mental health condition. More than 70 nations throughout the globe have done psychometric validation studies on the GHQ-28. The questionnaire may be scored using either a four-point Likert scale or a binary method, depending on the research objectives. In an Iranian study, the criterion validity for the questionnaire was 0.78, the reliability coefficient of split-half was 90%, and Cronbach's alpha was 0.97 (8). In another study, the test-retest reliability and Cronbach's alpha coefficient of the GHQ equaled 85% and 91% (9). In this study, the reliability of this questionnaire was calculated employing Cronbach's alpha and split-half, equaling 92% and 90%

Ethical consideration

Ethical concerns included acquiring the ethics code (IR.IlAM.REC.1404.002), ensuring integrity in library collection and data reporting, and getting writing information permission from all participants in concordance with the Declaration of Helsinki and human intervention.

Statistical and Data Analysis

Descriptive data were reported as frequency, mean, number, and standard deviation. The Kolmogorov-Smirnov test was performed, and it was observed that the variables of marital status, gender, and expression of mental health were normally distributed, so parametric tests were used to analyze and compare the difference. A significant level less than 0.01 was considered statistically significant. SPSS V.21 was used for statistical analysis.

Results

A total of 507 individuals participated in the study, of whom 261 (51%) were male and 240 (49%) were female; six participants did not disclose their gender. Regarding marital status, 407 respondents reported being married, while 70 reported being single. In terms of age distribution, 27 participants (3.5%) were under 20 years old; 77 (15.2%) were between 21 and 25 years; 113 (22.3%) between 26 and 30 years; 112 (22.1%) between 31 and 35 years; 108 (21.3%) between 36 and 40 years; 32 (6.3%) between 41 and 46 years; and 33 (6.5%) were older than 46 years. Regarding mental health scores based on the General Health Questionnaire (GHQ-28), 321

participants (63.3%) scored below the critical threshold of 22, indicating relatively good mental health, whereas 186 participants (36.7%) scored above this threshold, suggesting potential mental health concerns. Additionally, 458 participants (90.3%) had a total GHQ score below 40, and 49 participants (9.7%) scored above 40 (Table 1).

Table 1 presents descriptive statistics for the GHQ total score and its subscales (somatic symptoms, anxiety and insomnia, social dysfunction, and depressive symptoms), disaggregated by gender. As shown, the mean overall mental health score was 19.96 (SD = 11.75) for males and 21.85 (SD = 14.30) for females, indicating slightly higher levels of psychological distress among women.

Table 1. Descriptive data of mental health scale scores in Ilam city.

Index / Variable	Gender	Number	Mean	Standard Deviation	Standard Error of Mean
Mental health total score	Male	261	19.96	11.75	0.72
	Female	240	21.85	14.30	0.92
Anxiety and sleep disorder score	Male	261	6.44	4.70	0.29
	Female	238	7.03	5.15	0.33
Social function score	Male	259	6.25	2.73	0.17
	Female	236	6.83	3.16	0.20
Depression symptoms score	Male	255	2.89	3.80	0.23
	Female	235	3.31	4.60	0.30
Somatic symptoms score	Male	261	4.48	3.13	0.19
	Female	240	4.90	3.42	0.22

Table 2 presents the results of independent t-tests comparing overall mental health scores and subscale scores between male and female participants in Ilam. Prior to conducting the t-tests, Levene's test was applied to assess the homogeneity of variances. The results indicated that the assumption of equal variances was met for all variables, allowing the use of t-tests. As shown in Table 2, statistically significant differences were found between men and women in terms of overall mental health scores ($p = 0.002$), depressive symptoms ($p = 0.006$), and anxiety and sleep disorder scores ($p = 0.04$). In each of these dimensions, women reported higher scores, indicating greater psychological distress. However, no significant differences were observed for social functioning ($p = 0.19$) or somatic symptoms ($p = 0.10$) between the two groups. These findings suggest that female participants exhibited higher levels of mental health problems, particularly in the areas of anxiety, sleep disturbances, and depression, while social and physical symptom dimensions showed no statistically significant gender differences.

Table 2. independent t- test results of mental health score and its sub scales scores for male and female.

Statistics of Variables	f	df	Leven's test	T	P value	Mean difference	Standard Error of Mean
Mental health total score	9.69	499	0.10	1.62	0.002	-1.89	1.16
Anxiety and sleep disorder score	3.82	479	0.18	1.34	0.04	-0.69	0.44
Social function score	1.72	493	0.30	2.18	0.19	-0.58	0.26
Depression symptoms score	7.67	488	0.26	1.10	0.006	-0.42	0.38
Somatic symptoms score	2.68	499	0.14	1.45	0.10	-0.42	0.29

O: Overall mental health; 1: Anxiety symptoms and sleep disorder scale; 2: Depression symptoms scale; 3: Social functioning scale; 4: Somatic symptoms scale

Table 3 shows the descriptive data for the overall mental health scores and the subscale scores for both single and married people in Ilam. The information includes the mean, standard deviation, and standard error of the mean for each group. In general, the mean overall mental health score was a little higher for single people (M = 21.41, SD = 13.90) than for married people (M = 20.89, SD = 13.09). This suggests that single people are somewhat more psychologically distressed. But this difference doesn't seem to be very big. In terms of the subscales, the results were very much the same for both single and married people. There were very small variations in the average scores for anxiety and sleep problems, social functioning, somatic symptoms, and depressive symptoms. Single persons had marginally elevated depressed symptoms (M = 3.56) in contrast to married participants (M = 3.05). This may indicate variations in emotional well-being contingent upon marital status, however more statistical analysis is necessary to ascertain significance. These results indicate that marital status may have a minimal influence on the mental health ratings of the individuals in our sample.

Table 3. Descriptive data of the mental health scale and its subscales of single and married people in Ilam.

Index / Variable	Gender	Number	Mean	Standard Deviation	Standard Error of Mean
total mental health score	Single	70	21.41	13.90	1.66
	Married	407	20.89	13.09	0.64
Anxiety and sleep disorder score	Single	70	6.62	4.97	0.59
	Married	405	6.79	4.94	0.24
Social function score	Single	69	6.63	3.02	0.36
	Married	402	6.52	2.96	0.14
Depression symptoms score	Single	69	3.56	4.42	0.53
	Married	399	3.05	4.22	0.21
Somatic symptoms score	Single	70	4.72	3.28	0.39
	Married	407	4.70	3.30	0.16

Table 4 presents the results of independent t-tests comparing the total mental health score and its subscales between single and married individuals. Levene's test confirmed the equality of variances across all variables, permitting the use of t-tests. As shown in the table, no statistically significant differences were found between the two groups in any of the dimensions assessed. Specifically, the p-values for total mental health (p = 0.63), anxiety and sleep disorders (p = 0.93), social functioning (p = 0.93), depressive symptoms (p = 0.40), and somatic symptoms (p = 0.95) all exceeded the threshold for statistical significance. These findings indicate that marital status did not have a significant impact on overall mental health or any of its subscales among the participants in this study.

Table 4. Independent t- test results of mental health score and its sub scales scores for single and married.

Statistics of Variables	f	df	Leven's test	T	P value	Mean difference	Standard Error of Mean
Mental health total score	0.23	475	0.76	0.30	0.63	0.51	1.66
Anxiety and sleep disorder score	0.008	473	0.79	0.26	0.93	-0.16	0.64

Social function score	0.006	469	0.76	0.29	0.93	0.11	0.14
Depression symptoms score	0.69	466	0.77	0.92	0.40	0.11	0.53
Somatic symptoms score	0	475	0.95	0.05	0.05	0.02	0.16

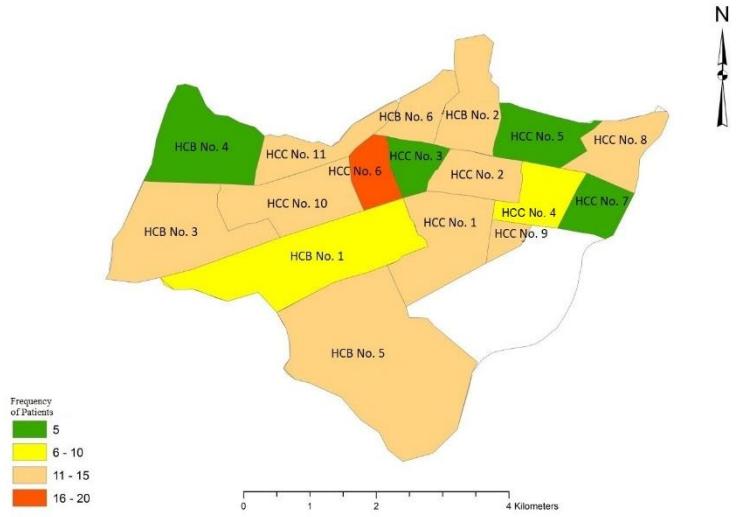

Figure 1. GIS of Mental Health in Ilam City.

Figure 1. These codes are for mental health centers and bases in Ilam city, which are spread across the city of Ilam and are distributed in different geographical locations. People in these areas have a mental health score above 22. This number is the cutoff point in the mental health questionnaire. They are identified based on the number of colors. The green color indicates the lowest number, and the red color indicates the highest number of people suspected of having negative mental health.

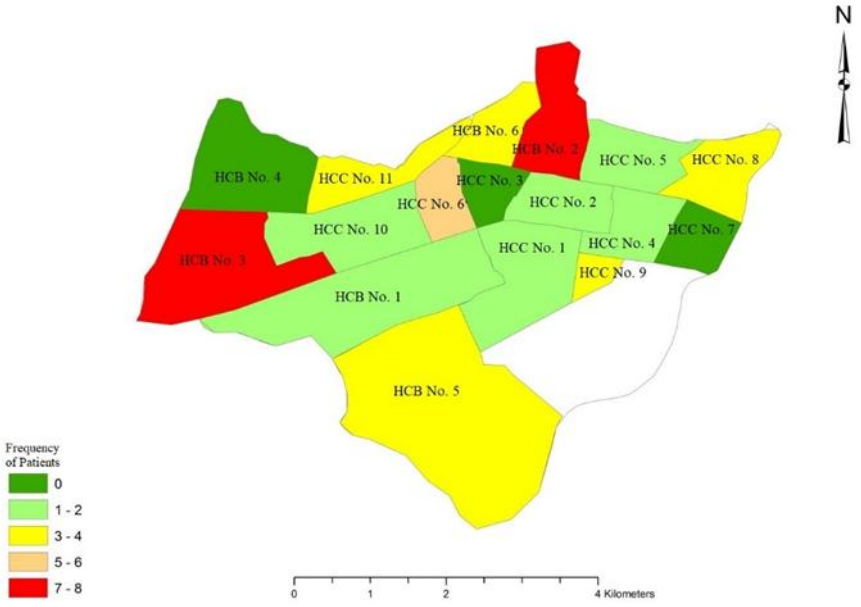

Figure 2. Mental health centers and bases in Ilam city.

Figure 2. These codes are for mental health centers and bases in Ilam city, which are spread across the city of Ilam and are distributed in different geographical locations. People in these areas have a

mental health score above 40. People with a mental health score above 40 have a critical mental health condition. They are identified based on the number of colors. Green color indicates the lowest number, and red color indicates the highest number of people suspected of having negative mental health

Discussion

The purpose of this study was to investigate the spatial distribution of mental health based on the geographic information system in Ilam. Overall mental health results showed that 37% of the subjects had a mental health score above 22, which, according to the criteria of the cut-off point of the mental health questionnaire, is suspected of having the disease, while 63% of the subjects had a mental health score below 22. Also, other results of the study showed that 49 people, ten percent of the subjects, obtained a mental health score above 40, which indicates the deterioration of their mental status. Health care basements and centers are located in geographical zones of the city where there are not adequate health care facilities and practitioners such as dentists, midwives, counselors, and general physicians.

Social determinants' views on mental health believe that mental disorders are distributed according to the degree of economic deficiencies in society in these zones scattered in the margins of the city geographically (10). A review of the population survey in European countries showed that higher prevalence of common mental disorders, especially depression and anxiety, is associated with low educational status, financial problems, and unemployment, and in older people with social isolation, and that these difficulties are common in marginal areas of the city geographically (11). Another result of this study showed that there is a significant difference in the total score of mental health of males and females as well as subscales of anxiety and depression in males and females; moreover, females have more negative mental health than males; this finding is supported by the results of much research. Researchers believe that psychological problems and issues are more common in females (12, 13). Some researchers believe that lower mental health was higher in women who belonged to weaker groups and those who received the least social support (13, 15, 16). Another group of researchers believes that there are significant and uprising levels of mental disorders among the population, especially women, and depression is a major cause of years of disability among women (17).

Numerous predictions and studies show worse outcomes for women than men in a wide range of mental disorders. The Britain evidence points to an increased risk of depression in elder men over 75 and elder women over 65 (18). In one study, women's mental health was lower than men's (19). In this study, 45.7% of the sample received a mental health score above 23, while 34.5% of men had a score above 23. In another study, women's mental health was lower than men's (20). The results of a study in China using the GHQ showed that women suffer more from stress than men (21). Giddens (22) believes that various studies indicate that women are more likely to get sick than men, and they also receive more medical interventions than men (23). Do women have lower health-related quality of life compared to men despite their longer life expectancy? The biomedical model claims that it is women's physiology that increases their predisposition to diseases. The social model claims that there is a lot of pressure and stress on women; besides, women do not enjoy the facilities, and also their limited access to social resources and services leads to a decline in their health. Numerous studies in different countries of the world, including Iran, have shown lower levels of health, both in terms of mental health and in terms of physical health, for women compared to men (24, 25); but, in addictive disorders such as alcohol abuse, men are more likely to be harmed than women (26). At the same time, health is not a simple and one-dimensional concept but a normative, socially productive, mental, and

psychological phenomenon and, at the same time, a physical reality (27).

The differences in mental health between single and married individuals using an independent t-test demonstrated that there was no significant difference between the mental health scores of the two groups; although this difference was not significant, descriptive data on the mental health of singles were higher than those of married ones. The results obtained are consistent with some studies and inconsistent with others. These reasons may be due to age differences in the statistical population and other methodological considerations (28).

In social psychology, there is a concept called self-perception that addresses people's perception of themselves as a reflective image of the perception of others. The perception of women in society considers them weak creatures who have fewer abilities compared to men. In society, women have a lower status, and they are hired in low-income jobs that are less rewarding (29). Even there are words in Western texts that refer to the helplessness of women. Many of the terms used for women contain words that mean stress and strain, such as "seamstress," which means "female tailor." We see "stress," which means mental pressure, in a word that is used for women, or "songstress," which means female singer. In different Persian dialects, we come across words that mean women's helplessness, such as "Zaeefeh," which means weak, etc. Therefore, such a view can affect women's perception of themselves and negatively affect their mental health. Of course, such a view of women is more prevalent in traditional and rural communities and families with low levels of education, but in general, with the increase of awareness and education, these attitudes are adjusting. Likewise, when negative consequences result from women's work, behavior, and activity, and they receive fewer rewards, it leads to depression and anxiety in women. This is one of the explanations of the phenomenon of depression in females, which is in the framework of behavioral theory (30).

Due to the fact that the statistical population of this study was very wide, answering the questions of this study took 40 days, and researchers had to continue to do so through regional health care centers and basements of the city of Ilam during this period of time. One limitation of this study was that it was not possible to interview the subjects. An advantage of this study was the large sample size.

Conclusion

Given that females with negative mental health are geographically more likely to be found on the outskirts of the city and in centers and bases that suffer from social and welfare inequalities, measures should be taken to eliminate these inequalities. It is suggested that future researchers use diagnostic interviews in addition to the mental health questionnaire.

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Ethical Considerations

Ethical concerns included acquiring the ethics code (IR.IlAM.REC.1404.002), ensuring integrity in library collection and data reporting, and getting writing information permission from all participants in concordance with the Declaration of Helsinki and human intervention.

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Conflict of interest

The authors declare that they have no conflict of interest.

Authors' contributions

ConcConceptualization, Methodology, Validation, Formal Analysis, Investigation, Resources, Data Curation, Writing– Original Draft Preparation, Writing– Review & Editing, Visualization, Software, Supervision, Project Administration: JM, RV, HM, MH, EN.

Writing Disclosure

The authors affirm that the composition and preparation of this document were executed independently, without the assistance of any professional writing services. The material only represents the unique work and efforts of the writers.

Data Availability Statement

The data supporting the conclusions of this investigation are accessible from the corresponding author upon reasonable request.

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