



## The Mental Health Information and Geographic Distribution in Urban Areas: SIMPUS Dataset Analysis of Patients with Schizophrenia

Hendra Rohman

Medical Record and Health Information Health Polytechnic  
of Bhakti Setya Indonesia, Yogyakarta, Indonesia  
Yogyakarta, Indonesia

email: [hendrarohman@mail.ugm.ac.id](mailto:hendrarohman@mail.ugm.ac.id)

Nor Naela Bella Arrizah

Medical Record and Health Information Health Polytechnic  
of Bhakti Setya Indonesia, Yogyakarta, Indonesia  
Yogyakarta, Indonesia

email: [naelabella88@gmail.com](mailto:naelabella88@gmail.com)

### ABSTRACT

*Background: The highest rates of schizophrenia in Indonesia was Yogyakarta and Aceh Province. Schizophrenia cases in 2015-2017 recorded an increase to 9,599 cases. In the city of Yogyakarta, the highest sufferers of schizophrenia patients were in Pakualaman and Mergangsan Health Center. This mental health data requires geographic information system as a preventive, promotive and rehabilitative effort in health services. This study aims to exploring SIMPUS dataset to identified geographic distribution of patients with schizophrenia, community's stigma, and socio-demographic factors. Method: Descriptive method and cross sectional design using geographic information systems. Schizophrenia patients was 130 patients. Quantum GIS used for buffering and descriptive analysis. Global positioning system was used to record the geographical position of house participant. Results: In 2018 Pakualaman region, there were 24 patient and in Mergangsan region there were 106 patient. Categorize schizophrenia coded F20 without specifications. Schizophrenics in Pakualaman region were more commonly found in Purwokinanti, while in Mergangsan region in Brontokusuman. The socio-demographic factors were influenced by multifactors, namely genetics, population density, and social status. The community's stigma that schizophrenia was a non-medical disease and considered a curse. Conclusion: The use of SIMPUS dataset be applied innovatively within a mapped area featured with schizophrenia cases. Community stigma that schizophrenia cannot be cured. The socio-demographic factors were influenced by genetic factors (heredity), population density (urbanites) and social status causing high stressors in the region.*

**Keywords:** Data Management, Geographic Information System, Non-Communicable Disease, Stigma

### I. INTRODUCTION

Mental health has not been prioritized. However, because of the increasing number of psychosocial problems in Indonesia, and the advocacy movement by many agencies, the government of Indonesia has realized that mental health has become an important health problem and currently is paying more attention to mental health programs (1).

In Indonesia, there is almost no provincial or district health departments with a specific mental health office. Usually mental health is a program under the office of family or the non-communicable diseases office.

Indonesia enacted a new Mental Health Law in 2014. It is sufficiently comprehensive to promote mental health services, with specific chapters on promotion, prevention, treatment and rehabilitation. Additional chapters deal with the mental health services system, resources, screening and mental health examination for forensic purposes. Under this new law the integration of mental health into the general health system continues to be strongly supported. To implement the new mental health law regulations are needed.

Although mental health is not in the priority list of the primary health center program some mental health service activities are conducted in some primary health centers. To support mental health services in primary health centers the Ministry of Health provides guidelines both for



basic mental health services and for community mental health programs. The total number of general hospitals with mental health services is 151 of 445 general hospitals (34%). Services in general hospitals may include outpatients clinics, inpatient units, and mental health promotion and family intervention (1).

Geographical Information System (GIS) was used to map public mental health facilities. Gaps in policy and planning around mental health are identified. There is a need to locate all facilities so that planning can be done in a more rational manner. In order to accomplish this it was decided to use the Atlas GIS to map the exact location of public mental health facilities and to determine potential access to these facilities. The method provides a useful and important guide to the planning of mental health services (2).

To provide a strong and useful mental health information system collaboration between central and local governments, supported by the Center for Health Research and Development, is needed. Efforts have been made to collect data manually on inpatients units, and for interventions (psychopharmacological and psychosocial) delivered in primary health care for people with mental disorders, but the data are not comprehensive or reliable. The situation in relation to information on SUD patients is different. Due to the drug law, the Ministry of Health is now piloting an SUD Information System (SINAPZA). The system is linked to the existing national health information system, with the intention of having comprehensive paperless data collection and entry and de-identified online reports to maintain confidentiality (1).

Schizophrenia is a mental disorder characterized by disruptions in thought processes, perceptions, emotional responsiveness, and social interactions. Although the course of schizophrenia varies among individuals, schizophrenia is typically persistent and can be both severe and disabling. Symptoms of

schizophrenia include psychotic symptoms such as hallucinations, delusions, and thought disorder (unusual ways of thinking), as well as reduced expression of emotions, reduced motivation to accomplish goals, difficulty in social relationships, motor impairment, and cognitive impairment. Although symptoms typically start in late adolescence or early adulthood, schizophrenia is often viewed from a developmental perspective. Cognitive impairment and unusual behaviors sometimes appear in childhood, and persistent presence of multiple symptoms represent a later stage of the disorder. This pattern may reflect disruptions in brain development as well as environmental factors such as prenatal or early life stress. This perspective fuels the hope that early interventions will improve the course of schizophrenia which is often severely disabling when left untreated.

Schizophrenia is a disorder associated with high levels of social burden and cost, as well as an incalculable amount of individual pain and suffering. Although schizophrenia is not in itself a fatal disease, death rates of people with schizophrenia are at least twice as high as those in the general population. The excess mortality has been related in the past to poor conditions of prolonged institutional care, leading to high occurrence of tuberculosis and other communicable disease. This may still be an important problem wherever large numbers of patients spend a long time in crowded asylum-like institutions.

Social stigma refers to a set of deeply discrediting attributes, related to negative attitudes and beliefs towards a group of people, likely to affect a person's identity and thus leading to a damaged sense of self through social rejection, discrimination and social isolation. Stigma is strongly linked with the label of mentally ill and is, to a certain extent, unrelated to the actual characteristics or behaviours of those stigmatized. Various adverse consequences may arise from the stigmatization process:



use of pejorative language, barriers to housing or employment, restricted access to social services, fewer chances for marriage, increased mistreatment and institutionalization (3).

Various aspects of impact on caregivers should be considered, including the economic burden related to the need to support the patient and the loss of productivity of the family unit. Emotional reactions to the patient's illness, such as guilt, a feeling of loss and fear about the future. The stress of coping with disturbed behavior. Disruption of **household routine**. **Problems of coping** with social withdrawal or awkward interpersonal behavior. Curtailment of social activities.

Stigma also acts as a powerful barrier to treatment, not only because of the fear of being labelled as mentally ill, but also because too often mental health professionals and mental health services as a whole hold, often in a subtle way, negative or rejecting attitudes towards users and perpetuate practices fostering segregation, dependency and powerlessness (3).

Schizophrenia is a chronic and severe mental disorder that affects how a person thinks, feels, and behaves. People with schizophrenia may seem like they have lost touch with reality. Although schizophrenia is not as common as other mental disorders, the symptoms can be very disabling.

Most of the world's population now lives in cities. While living in cities have both health risks and benefits, mental health has been usually considered to be negatively affected by urbanicity. While mental health disorders have complex etiology and multiple causes, it has been shown in multiple observational studies that mood and anxiety disorders are more prevalent in urban centers and incidence has been increasing. In addition, the incidence of schizophrenia is strongly increased in people born and raised in cities. Studies on the effects of urbanicity on the brain, however, are more

challenging to conduct, since individual and environmental factors are hard to distinguish (4).

Mental health is still one of the significant health problems in the world. Schizophrenics also risk 2-3 times higher in youth, the number of further problems continues to increase which increases in increasing the burden on the country and increasing human welfare in the long run.

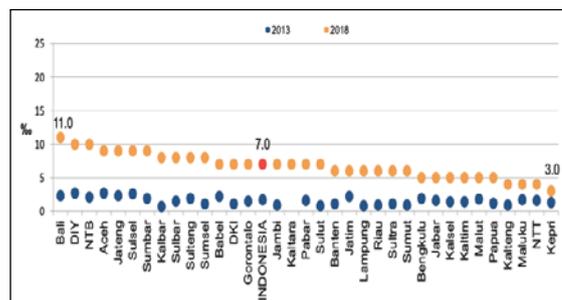


Figure 1. Prevalence schizophrenia 2013 and 2018

Basic Health Research in Indonesia (5), combined with routine data from Pusdatin, the prevalence of severe mental disorders, such as schizophrenia, is 1.7 per 1,000 population or around 400,000 people. Prevalence of severe mental disorders in the Special Region of Yogyakarta (DIY) is 2.7 per 1000 population. Yogyakarta has a fairly high number of people with schizophrenia. It is serious concern for the Yogyakarta Government to sufferers chronic mental illness. Results of research data in Yogyakarta are regions that occupy second position nationally for schizophrenia under Aceh Province. 14.3 percent of Indonesians with schizophrenia are restrained (pasung) on their own families because of people's ignorance about schizophrenia.

Table I. Prevalence of mental illness in 2013

Province	Severe mental disorder (schizophrenia) permil
Aceh	2,7
DI Yogyakarta	2,7

Province	Severe mental disorder (schizophrenia) permil
Sulawesi Selatan	2,6
Jawa Tengah	2,3
Bali	2,3
Bangka Belitung	2,2
Jawa Timur	2,2
Nusa Tenggara Barat	2,1
Sumatera Barat	1,9
Bengkulu	1,9

In 2015 there were 8,046 mental health cases, in 2016 there were 8,397 cases, in 2017 there were 9,599 cases recorded. The age group that contributed significantly to increasing the total number of mental health cases in Yogyakarta City in 2017 was the age group of 20-44 years (4,208 cases) and the age group of 45-59 years (2,827 cases). The most reported type of mental illness in health facility from total number of mental health cases is schizophrenia.

**Table II.** Schizophrenia in Yogyakarta

Primary health centers (Puskesmas)	2014	2015	2016	2017
Danurejan 1	12	3	8	19
Danurejan 2	26	5	4	9
Gondokusuman 1	34	39	45	43
Gondokusuman 2	4	2	0	4
Gondomanan	10	13	24	42
Gedongtengen	15	26	24	20
Jetis	46	58	65	32
Kotagede 1	47	32	66	23
Kotagede 2	11	24	82	73
Kraton	13	12	8	13
Mergangsan	34	71	30	103
Mantrijeron	16	9	14	11
Ngampilan	6	8	20	19
Pakualaman	2	3	16	30

Primary health centers (Puskesmas)	2014	2015	2016	2017
Tegalrejo	46	15	42	212
Umbulharjo 1	0	0	60	62
Umbulharjo 2	30	60	13	13
Wirobrajan	30	14	23	21

The highest patients with schizophrenia are Pakualaman Health Center and Mergangsan Health Center. The data has increased from 2014-2017 as shown in table III. Data on the distribution of schizophrenia patients in Pakualaman Health Center and Mergangsan Health Center in 2014-2017 according to the working area of each primary health center in Tables IV and V.

**Table III.** Schizophrenia in primary health center

Years	Pakualaman Health Center	Mergangsan Health Center
2014	2	34
2015	3	71
2016	16	30
2017	30	103

**Table IV.** Schizophrenia in Puskesmas Pakualaman

Years	Work area		Outside work area
	<i>Purwokinanti</i>	<i>Gunungketur</i>	
2014	4	2	0
2015	4	4	5
2016	7	3	4
2017	10	9	4



**Table V.** Schizophrenia in Puskesmas Mergangsan

Years	Work area			Outside work area
	Bronto	Keparakan	Wirogunan	
2014	21	3	1	1
2015	42	4	1	1
2016	15	5	4	0
2017	34	5	12	2

Schizophrenia patients increase in both health centers. In Pakualaman Health Center and Mergangsan Health Center increase from 2014-2017. In Mergangsan Health Center also included in the top ten diseases. The health office and the primary health centers do not use geographic information system (GIS) mapping. Data is still in the form of computerized with microsoft excel data. Using GIS is very helpful in this schizophrenia case to find out geographical conditions and environmental factors in each region by using GIS. It will be easier to find out the spread of schizophrenia in each of Pakualaman Health Center and Mergangsan Health Center, the treatment gap can be reduced, the availability of comprehensive and continuous mental health services, an increase in mental health efforts through community empowerment, and the availability of valid and accurate data for the preparation of mental health policies and strategies, especially in primary health centers.

Schizophrenia is a very severe mental disorder. This disorder is characterized by positive symptoms such as chaotic speech, delusions, hallucinations, cognitive and perception disorders. Negative symptoms such as avolition (decreased interest and encouragement), reduced desire to talk, and poor speech, and disruption of personal relationships. It appears that the symptoms of schizophrenia cause severe obstacles in the ability of individuals to think and solve life problems and disrupt social relations.

The questions of urban living, mental health and well being are complex issues correlated to

many interacting factors (6). The geographical distribution of mental health disorders is useful information for epidemiological research and health services planning. To determine the existence of geographical hotspots with a high prevalence of schizophrenia in a mental health area (7).

## II. METHOD

A facility based cross sectional study was conducted from February to April 2019. Secondary data was collected from two primary health center records and reports, and was descriptive analyzed to assess data quality. Survey reports were also reviewed. This study included 130 patients with schizophrenia in 2018 who were users of the community mental health care service in area of Pakualaman and Mergangsan sub-district. Interview with 6 medical records officers and 1 mental health programmer in Pakualaman Health Center. 5 medical records officers and 1 mental health programmer in Mergangsan Health Center.

Interview guidelines and GPS essential, used as a determination of coordinates patient's address. Quantum GIS application version 3.4.4 used to process and mapping of schizophrenia patients by region. Data collection methods, documentation studies carried out data collection of patients in Pakualaman Health Center and Mergangsan Health Center, as well as aggregate data of health services in Yogyakarta. Interviews were conducted to obtain mental health information. Collaborates with mental health staff of health department, medical records staff reporting and mental health programmer to identified promotive and preventive efforts.

## III. RESULT

1. Schizophrenia patient data collection in Pakualaman Health Center and Mergangsan Health Center area.

Data collection in primary health center is taken from dataset puskesmas information system (SIMPUS). Pakualaman Health Center and Mergangsan Health Center have used SIMPUS which makes it easy for data collection, processing, and reporting processes because system can be directly integrated with Health Office. Schizophrenia patient data in form of social identity entry results and examination results of patients with F20 code taken from medical record and health information in health center.

In Pakualaman Health Center and Mergangsan Health Center, data collection based on paper and computerized. Patients with schizophrenia diagnoses recorded in a special book held by a mental health programmer that contains data on name, date of birth, gender, age, address, diagnosis and method of payment. Computerized is more specific as number or total patient visits can be seen from dataset SIMPUS. It can be monitored directly whether patient is undergoing treatment properly or not.

Data collection is also included in archipelago program of the Ministry of Health of the Republic of Indonesia, which is a 'Healthy Family'. Every house is recorded and visited by primary health center staff to find out condition, health and lifestyle in community. Data processing in Pakualaman Health Center and Mergangsan Health Center has become ready data, which is taken from dataset SIMPUS only directly in format to microsoft excel, tables and diagrams.

Various types of community and demographic data were scattered. It was necessary to combine data in application available to all stakeholders. Utilization of a new concept of operation, that are addressed to include the contribution of various stakeholder groups, and to further improve planning for public health (8).

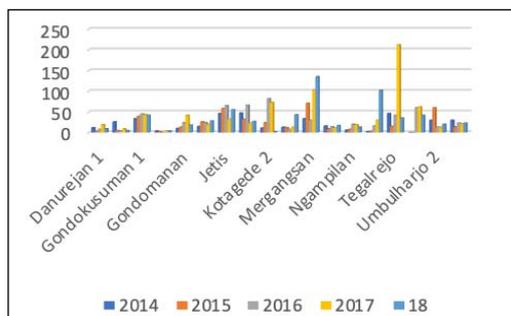
Internal reporting in primary health center is used to find out the top 10 diseases and promotive, preventive, curative and rehabilitative planning efforts. Reporting from the primary health center to the health department is reported monthly and annually to find out the number of visits of schizophrenics and new patients with schizophrenia.

Data collection from the health department was only collected from each mental health programmer in primary health center. SIMPUS has been integrated directly with the Health Department. It makes easy for officer to monitor existing data. Certain months are also scheduled for a mental health clinic programmer coordination meeting regarding further programs. Data processing is processed into the results of regional health research sent to the Ministry of Health and the Yogyakarta Provincial Charter and Action Plan.

A good quality Mental Health Information System (MHIS) is essential for the efficient planning and delivery of appropriate care services. Accurate, valid, reliable, complete, legible, timely and accessible data is a vital element to achieve this goal (9).

Dataset SIMPUS from the Yogyakarta City Health Office and schizophrenia patient data in Pakualaman Health Center and Mergangsan Health Center medical records in 2018 that based on observations and interviews the data collection process was carried out computerized and paper based. The first to collecting schizophrenia patient data is data obtained from puskesmas information system (SIMPUS) through the F20 code entry results. After the patient receives health care or is examined and diagnosed by a doctor, then the data is processed into tables in microsoft excel. Schizophrenia patient data is paper based

managed by a mental health programmer (Keswa) sourced from the patient's medical record file. Data contains name, address, gender, age, diagnosis, and method of payment. Data is recorded monthly for each patient visit or new patient visit.



**Figure 2.** Schizophrenia cases in primary health center

There are 18 health centers in the Yogyakarta city area. Graph shows number of schizophrenic cases experiencing a significant increase from 2014-2018 is Pakualaman Health Center and Mergangsan Health Center. Cases in Tegalrejo Health Center are highest, but in 2018 they have decreased. In 2017 there were 212 cases and in 2018 there were only 35 cases. The highest cases is Mergangsan Health Center, Tegalrejo Health Center and Pakualaman Health Center.



**Figure 3.** Tren schizophrenia cases in primary health center

Data on schizophrenia patients in two health centers has increased from 2014-2018. Schizophrenia patient visits at Pakualaman Health Center in 2014 there were 2 patients, in 2015 there were 3 patients, in 2016 there were 16 patients, in 2017 there were 30 patients, and in 2018 Pakualaman Health Center there was a very significant increase recorded by 102 patients. While in Mergangsan Health Center from 2014 there were 34 patients, in 2015 there were 71 patients, in 2016 there were a decrease of 30 patients, in 2017 there were 103 patients, and in 2018 in Mergangsan Health Center there were an increase of 135 patients. Seen in a period of 5 years. The total number of schizophrenic patient visits was 373 patients.

Routine data collected at the National Institute of Mental Health (NIMH) is of poor quality in terms of accuracy and validity, reliability, and completeness. Access to data and the data's timeliness were also found to be sub optimal. Various data collection formats were used for monthly and yearly reports at various time points, which has limited the scope of data analysis for further use. The quality of NIMH data is inadequate, thus limiting its usefulness and requiring effective measures for improvement (9).

Schizophrenia is a devastating neuropsychiatric disorder with increasing concern. Daily data of schizophrenia outpatient admissions and air pollution from 1 October 2010 to 31 December 2013 were collected, a heavily-polluted city. The associations between short-term air pollution and schizophrenia outpatient visits with different lag days. A total of 34,865 outpatient-visits for schizophrenia were identified. Short-term exposure to ambient air pollution (PM10, SO2, and NO2) can be associated with increased risk

of daily outpatient visits for schizophrenia, which may contribute to the further understanding of the potential adverse effects of air pollution in schizophrenia and other neuropsychiatric disorders (10).

In recent years, geo-referencing of epidemiological data has become one of the vital features. Often, epidemiological data collected for regions under study will show areas that are affected with certain diseases in the form of incidence or prevalence information. As well, such information may be spatially mapped and used for further analysis on pattern comparisons (11).

The use of information systems and computer science applications in the health sector is now entrenched and widespread. In mental health services there are the typical applications of information systems concerning administrative, clinical and research issues, as well as innovative applications concerning diagnostic procedures, self-help, communication and delivery of psychotherapy.

A Mental Health Information System (MHIS) is a system for collecting, processing, analysing, disseminating and using information about a mental health service and mental health needs of the population it serves.

The MHIS aims to improve the effectiveness and efficiency of mental health services and ensures more equitable delivery by enabling managers and service providers to make more informed decisions for improving the quality of care. In short, a MHIS is a system for actions, it exists not simply for gathering data, but also for enabling decision making in all aspects of mental health system.

Monitoring is one of the primary activities of the MHIS, and this activity has always been considered important in

the majority of the medical disciplines. In psychiatry, the complexity of the parameters to measure, the difficulty of defining all services contributing to mental health, and the fact that services are multidisciplinary have often discouraged and complicate monitoring.

The use of information technology facilitates wide spread sharing and linkage of electronic health care data. MHISs can be linked with health and non-health electronic databases. Linkage studies allow investigation of risk factors for mental illnesses or of the pathways of care among several sources of care. It's may be integrated into the general health information system. If mental health services are fully integrated, mental health information is gathered as part of general health information. This is possible when mental health services are provided at different care levels.

It's can make clinical information readily available when patients are seen in many settings, particularly in the case of patients with chronic illness that present for care in several settings and to multiple health facilities. Communication of information and data can be shared not only between clinicians, but can be also delivered from patients themselves or from the family to the services.

Some internet applications are described that have been used for the delivery of cognitive behaviour therapy interventions for posttraumatic stress disorder, panic disorder, and depression. Computer science applications are also important for public health research, education and bioinformatics (12).

## 2. Community stigma in schizophrenia patients.

Community stigma in schizophrenia patients in area of Pakualaman Health



Center and Mergansan Health Center, data obtained through interviews with mental health programmers. There are still many families and communities who consider schizophrenia as an embarrassing disease and bring shame to the family, diseases that can't be cured medically and argues that schizophrenic mental disorders due to violations of the prohibition (taboo), affected by witchcraft/teluh/witchcraft, demon possession, possessed evil spirits or curses and like. Therefore many sufferers are hidden, isolated, locked up, isolated in Pakualaman Health Center and Megangsan Health Center.

To eliminate the community's stigma of schizophrenia, various efforts to educate and disseminate mental health, among others by empowering the community through the formation of community cadres per each village area, then organizing a program of healthy mental alert to create a supportive environment for people with mental disorders (ODGJ), especially schizophrenia. These cadres help anticipate and provide protection for ODGJ who recur when they commit acts of violence.

The family support for schizophrenia, mostly by family caregivers independently. Mental health professionals need to gain skills to work collaboratively with assertive family caregivers to develop services to support those diagnosed with mental illness (13).

There is a long pathway for people with mental illness to get appropriate mental health treatment and care. Many members of the community consider mental symptoms to be spiritual or religious issues, and often seek help from traditional healers or religious leaders before coming to health services. Cases of mistreatment and abuse of people with mental health problems are common. Many people with mental illness

are restrained (pasung). Many others are found homeless or lost (1).

Stigma is deeply rooted in the cultural background of society. Some observers have pointed out that it is less pervasive in most rural societies, but this assumption has been challenged by cross-cultural studies. There is no convincing evidence that there are cultures in which stigma is not attached to major mental disorders, whatever theories people hold about their causes, although the process of negative labelling may concern different groups across cultures and the level of stigma may vary (3).

It is clear that low community awareness and stigma attached to mental illness are serious problems in Indonesia. To address this issue various resources should work together. The roles of consumers and families are crucial in this movement. Currently, several family and consumer organizations have initiated strong advocacy and awareness programs.

Unfortunately, some health professionals also stigmatize mental illness, hampering the integration of mental health services into general health services. The stigma can be observed by the attitude of some doctors in primary health centers who refuse patients with mental illness and directly refer the patient without assessment or intervention (1).

Stigma operates however, not only in the larger community but within the mental health services as well. It may even be found at the level of the affected individuals as internalized negative self-perception. Undoubtedly, stigma represents a major challenge with regard to the integration of persons with schizophrenia and other mental disorders into the community. Many first person accounts from people with experience of mental disorder vividly portray the painful effects of stigmatization on their everyday lives (3).

Traditional healers are playing an important role in dealing with mental health problems. However, some religious and traditional organizations who residential services for people with mental illness give unsafe and sometimes dangerous interventions. A new regulation is needed to protect people with mental illness from harmful interventions and to promote mental health services in the community, including integrating mental health services into national health services (1).

Geographic analyses suggest that structural factors within communities and across regions may bear a greater influence on mental illness stigma than individual level factors alone (14).

3. Environmental factors and the amount of schizophrenia patient data in the working area of Pakualaman Health Center and Mergangsan Health Center.

- 1) Environmental factors in Pakualaman Health Center

Based on interviews with mental health programmers in Pakualaman Health Center, data was obtained that environmental factors that caused schizophrenia in Pakualaman Health Center were still unknown because it was limited to collecting data, in form of identifying patients with schizophrenia, which subsequently primary health center only promoted, prevented and curative. While the causes of schizophrenia have not been carried out further analysis. Schizophrenic patients who cannot be treated with categories such as patients can't be controlled or there is no medication needed by patient, primary health center will refer the patient to the hospital. The referral hospital in the area is Ghrasia Hospital.

- 2) Environmental factors at Mergangsan Health Center

Based on interviews with mental health programmers in Mergangsan Health Center, data were obtained that environmental factors in schizophrenia patients were influenced by genetic factors, population density and social status of the population of Mergangsan sub-district, because Mergangsan sub-district was included in urbanization area. Where dwellings are too close together, and there is a river code along residential areas. Due to the overcrowded Mergangsan area, the stressors in that area are increasing and the social status of the population also affects the condition of the soul or calmness in life.

Urban environments act as a risk factor for mental disorders. the effects of economic factors (unemployment, socioeconomic status), social condition (social network support), environmental exposures (toxins, air pollution, noise, light), that must be weighed to identify how it contributes to mental disorders (4).

Urbanization may cause mental health problems, such as psychotic experiences, depression and stress-related disorders, particularly in vulnerable individuals. Challenges of urban living are even greater in developing countries, because of other urgent problems these countries are facing (6).

The data of impact of urban living on mental health are still controversial and mechanism of association is unclear. Urban living may be related to biological or social/environmental factors or both. Most probably, urbanicity has a synergistic effect with



genetic vulnerability. Interdisciplinary and intersectoral actions are needed to meet urban living challenges, such as providing access to green space and mental health services, decrease of poverty, homelessness and emerging problems of immigration to cities (6).

There is little evidence on the association between area-level social factors and schizophrenia. Schizophrenia was ascertained according to the International Statistical Classification of Diseases, Tenth Revision. Multilevel logistic regressions showed that areas with higher urbanization rate was associated with increased risk of schizophrenia. Stratified analyses found that, in female adults, urbanization rates, divorce rates and socioeconomic conditions were positively associated with increased risks for schizophrenia. However, in male adults, low socioeconomic conditions was related to decreased risk of schizophrenia, and there was no significant association between rates of divorce and risks for schizophrenia. County-level social factors, in the form of urbanization rate, divorce rate, and socioeconomic conditions, were associated with the risk of schizophrenia (15).

A relationship between urbanism and social disorganization has long been recognized and demonstrated. Crude rural-urban comparison of rates of dependency, crime, divorce and desertion, suicide, and vice have shown these problems to be more severe in the cities, especially the large rapidly expanding industrial cities. But as the study of urban sociology advanced, even more striking comparisons between the different sections of a city were discovered. Some

parts were found to be as stable and peaceful as any well-organized rural neighborhood, while other parts were found to be in the extreme stages of social disorganization. Extreme disorganization is confined to certain areas and is not characteristic of all section of the city (16).

4. Severity level of schizophrenic patients

Pakualaman Health Center and Mergangsan Public Health Center data show that there is no level of illness in schizophrenic patients because with this disorder. Schizophrenic patients are directly included in people with severe mental disorders, with F20 code without a diagnose specification according to ICD 10. While schizophrenia based on ICD 10 in F20 code there is a more specific code that is divided from points 0-9.

**Table VI.** Classification of Mental and Behavioural Disorders

Specific code	Diagnose
F20.0	Paranoid schizophrenia
F20.1	Hebephrenic schizophrenia
F20.2	Catatonic schizophrenia
F20.3	Undifferentiated schizophrenia
F20.4	Post-schizophrenia depression
F20.5	Residual schizophrenia
F20.6	Simple schizophrenia
F20.8	Other schizophrenia
F20.9	Schizophrenia, unspecified

There are several factors that contribute to the risk of developing schizophrenia. Genes and environment, scientists have long known that schizophrenia sometimes runs in families. However, there are many people who have schizophrenia who don't

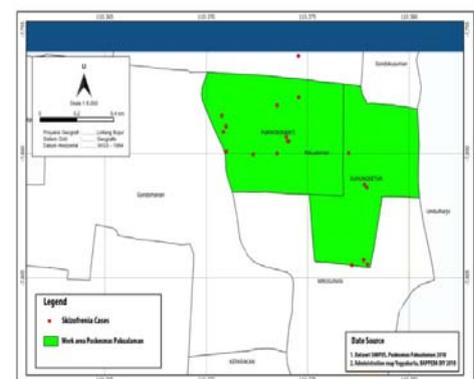
have a family member with the disorder and conversely, many people with one or more family members with the disorder who do not develop it themselves. Scientists believe that many different genes may increase the risk of schizophrenia, but that no single gene causes the disorder by itself. It is not yet possible to use genetic information to predict who will develop schizophrenia. Scientists also think that interactions between genes and aspects of the individual's environment are necessary for schizophrenia to develop. Environmental factors may involve, exposure to viruses malnutrition before birth problems during birth psychosocial factors.

The symptoms of schizophrenia fall into three categories, positive, negative, and cognitive. Positive symptoms are psychotic behaviors not generally seen in healthy people. People with positive symptoms may lose touch with some aspects of reality. Symptoms include, hallucinations delusions thought disorders (unusual or dysfunctional ways of thinking) movement disorders (agitated body movements) negative symptoms are associated with disruptions to normal emotions and behaviors. Symptoms include, flat affect (reduced expression of emotions via facial expression or voice tone) reduced feelings of pleasure in everyday life difficulty beginning and sustaining activities reduced speaking cognitive symptoms, for some patients, the cognitive symptoms of schizophrenia are subtle, but for others, they are more severe and patients may notice changes in their memory or other aspects of thinking. Symptoms include, poor executive functioning (the ability to understand information and use it to make decisions) trouble focusing or paying attention problems with working memory (the ability to use information immediately after learning it).

Different brain chemistry and structure, scientists think that an imbalance in the complex, interrelated chemical reactions of the brain involving the neurotransmitters (substances that brain cells use to communicate with each other) dopamine and glutamate, and possibly others, plays a role in schizophrenia. Some experts also think problems during brain development before birth may lead to faulty connections. The brain also undergoes major changes during puberty, and these changes could trigger psychotic symptoms in people who are vulnerable due to genetics or brain differences.

5. Schizophrenia map in Pakualaman and Mergangsan Health Center
  - 1) Schizophrenia map in Pakualaman Health Center

Schizophrenia map in Pakualaman Health Center 2018 identified the most schizophrenia patients in region. Mapping did not reach coordinates patient's place of residence. Health information obtained is less accurate and transformative. It can be concluded that the most schizophrenic cases in Pakualaman Health Center area are in Purwokinanti village.



**Figure 4.** Distribution of schizophrenia cases in Pakualaman

2) Schizophrenia map in Mergangsan Health Center

In Mergangsan Health Center, it was found that schizophrenia map had not been done at all. This was due to absence of competent human resources to be able to make mapping. Schizophrenia map can be concluded that the most schizophrenic cases in Brontokusuman Village.

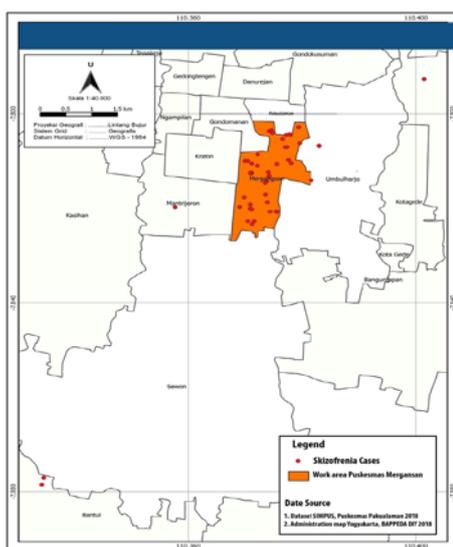


Figure 5. Distribution of schizophrenia cases in Mergangsan

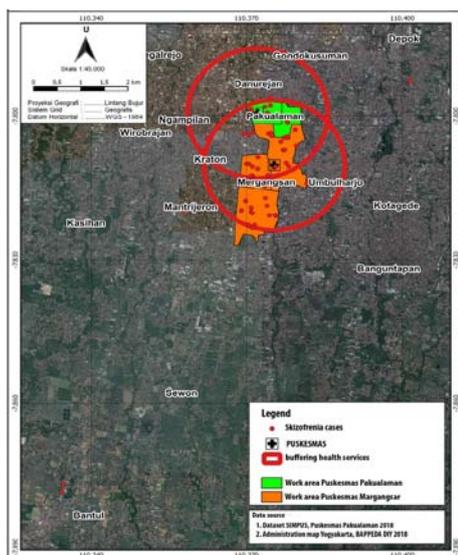


Figure 6. Health services coverage

Pakualaman and Mergangsan Health Center sub-district has an outreach service area. In Pakualaman Health Center there are two villages, namely Purwokinanti and Gunungketur. In Mergangsan Health Center there are three villages, namely Wirogunan, Keparakan and Brontokusuman. Both primary health center include primary health center in urban areas which have a range of services as far as 3 km from health services center, so affordability area is measured 3 km from primary health center. Buffer is one of the facilities in Quantum GIS for affordability or area boundaries that can be reached by primary health services.

Buffer area shows the work area of Pakualaman Health Center including buffer area. Whereas in Meragangsan Health Center in Brontokusuman Urban Village, only part of it is included in the buffer area. This shows that the level of distribution of schizophrenia patients in Mergangsan Health Center area is mostly found in Brontokusuman Village, which is not a buffer area. The Yogyakarta social service office of the government agency that handles social problems is in Brontokusuman region which causes many schizophrenia patients in area. Two health centers are some patients who outside the work area with reason patient is a transfer patient who lives around area of health center.

The prevalence zone of schizophrenia had poor accessibility to and availability of mental health services. Spatial analysis techniques are useful tools to analyze the heterogeneous distribution of a variable and to explain genetic or environmental factors in hotspots related with a lack of easy availability of and accessibility to adequate health care services (7).

Accessing mental health care still is problematic for many needing services.

More than 123 million reside in federally-designated Mental Health Professional Shortage Areas (MHPSA). Geographic Information Systems (GIS) with spatial analysis approaches provide tools to understand the ever-changing distribution of health care, outcomes, and delivery to improve care. GIS approaches to improve access to mental health care can be categorized as type of care (integrated, community), contributions to access (distance, time, cost, perception of traveling, inequalities), and the utilization of services. Closer examination of measures used to assess geographic variations in accessibility is needed for ultimately improving quality of care for people in MHPSA (17).

Knowledge gained from ecological studies about geographic disparities in mental health are likely to have important implications for policy, program planning, and resource allocations. Given the importance of geography for needs assessment and service planning, it is surprising that geographic study designs, which use ecological data, have not received greater attention as an important and viable method of assessing population mental health (18).

The combination of GIS and mental health information presents us with many opportunities in the areas of mental health research, planning and delivery. With technology becoming more user-friendly and accessible, it is imperative to find many more innovative applications in the mental health arena (19).

#### IV. CONCLUSION

The use of SIMPUS dataset be applied innovatively within a mapped area featured with schizophrenia cases. Community stigma that schizophrenia cannot be cured. The socio-demographic factors were influenced by genetic

factors (heredity), population density (urbanites) and social status causing high stressors in region. Schizophrenia patient data collection in Pakualaman and Mergangsan Health Center are computerized with SIMPUS application and paper base by recording each new patient taken from medical record file. In Mergangsan Health Center, they are influenced by multifactors such as genetics, population density, and social status. Severity level schizophrenia in Pakualaman and Mergangsan Health Center are not categorized because by being declared as a schizophrenic patient, it is directly included in category of people with severe mental disorders. It is included in F20 code without a diagnosis specification in ICD 10. Schizophrenia map in Pakualaman Health Center area is more schizophrenic cases in Purwokinanti and Mergangsan Brontokusuman area.

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