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Spatial Analysis of Accessibility Inequality in Mental Health Facilities: Correlating the Distribution of Psychiatrists and IPWL Community Health Centers with the Provincial Prevalence of Emotional Mental Disorders

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ABSTRACT

The treatment gap in mental health within archipelagic nations is exacerbated by geographical barriers and inequitable resource distribution. This study investigates the spatial correlation between provincial Emotional Mental Disorder (EMD) prevalence and the accessibility of psychiatric services across Indonesia. Utilizing a quantitative design, the research synthesized 2023–2025 secondary data from National Health Research (Riset Kesehatan Dasar, Riskesdas) and the One Health Data (Satu Data Kesehatan) portal across 38 provinces. Geographic Information System (GIS) mapping was employed to calculate the Provider-to-Population Ratio (PPR) for psychiatrists and Mandatory Reporting Institutions (Institusi Penerima Wajib Lapor, IPWL) centers. Results reveal a non-significant correlation ($r_s = -0.142$), exposing an urban bias where resources cluster in Java-Bali despite higher clinical needs in peripheral regions. Notably, Eastern Indonesia exhibits the highest EMD prevalence (13.50%) but the lowest specialist density (0.12 per 100,000 residents). Significant spatial autocorrelation (Moran's $I = 0.421$) confirms that "service deserts" are geographically clustered. The study concludes that achieving equity requires a transition toward needs-based spatial planning and tele-psychiatry integration to bridge the distance gap in underserved territories.

Keywords: *Accessibility, Mental Health, GIS Analysis, IPWL Centers, Health Policy*

INTRODUCTION

The disparity in accessing mental healthcare services remains a critical global challenge, particularly within developing nations characterized by vast geographical imbalances. Emotional Mental Disorders (EMD), encompassing clinical depression and anxiety, have demonstrated a surging trend in the global burden of disease; however, the deployment of medical infrastructure remains disproportionately concentrated in major metropolitan hubs (Faria, 2023). This systemic inequality fosters a "treatment gap," wherein individuals requiring psychiatric intervention are deprived of adequate care due to physical distance, the erratic distribution of specialized practitioners, and the scarcity of primary-level facilities such as the Mandatory Reporting Institution (nstitusi Penerima Wajib Lapo IIPWL) Community Health Centers. Such practical dilemmas necessitate a profound investigation into the spatial interaction between mental health resource distribution and epidemiological burdens at the provincial level to ensure distributive justice within national health frameworks (Organization, World Health, 2021).

Contemporary scholarship over the past five years has extensively utilized Geographic Information Systems (GIS) to evaluate healthcare accessibility; yet, mental health remains significantly under-researched compared to infectious diseases or maternal and child health. A recent assessment indicates that the ratio of mental health professionals to the general population in the Southeast Asian region persists as one of the lowest globally, exacerbated by the centralized nature of services within tertiary hospitals (Wang, 2021). Furthermore, empirical evidence regarding the integration of mental health into primary care suggests that IPWL Community Health Centers are vital for the early detection of psychological distress, yet their operational efficacy is frequently undermined by a lack of psychiatric supervision, which is notably deficient in regions outside the primary economic corridors (Kementerian Kesehatan Republik Indonesia, 2023). Existing literature further highlights that while EMD prevalence is shaped by regional socio-economic determinants, the correlation between high prevalence rates and the density of mental health facilities often reveals significant spatial anomalies .

Despite numerous evaluations concerning the distribution of the health workforce in general, a distinct literature gap persists regarding the specific correlation between the distribution of psychiatrists and IPWL centers against the latest EMD prevalence data derived from National Health Research (Riskesdas) (Sutar, 2024). Most prior investigations have focused on the absolute quantity of facilities without synthesizing spatial accessibility metrics or the specific population burden each province must sustain. Consequently, there is a lack of research evaluating the strategic role of IPWL centers as the frontline of rehabilitation and psychiatric care within a unified spatial analysis framework alongside specialist availability. This misalignment between clinical demand (prevalence) and institutional supply (resource allocation) often results in policy interventions that miss their targets, leaving regions with high EMD burdens with the lowest accessibility scores (Azimi, 2025).

This research aims to conduct a rigorous spatial analysis of accessibility inequalities in mental health facilities across Indonesia by correlating the distribution of psychiatrists and IPWL

Community Health Centers with the provincial prevalence of EMD. The primary inquiry focuses on the extent to which current mental health resource allocations respond to the psychological burden in each region and identifies the specific geographic "hotspots" of accessibility deficits. The novelty of this study lies in the integration of recent secondary data from the *Satu Data Kesehatan* portal and Riskesdas reports using spatial correlation techniques to provide data-driven recommendations for the strategic placement of future mental health infrastructure (Fathmawati, 2023). Through this approach, the study contributes to the equitable distribution of national mental health services and the strengthening of the referral system from primary to specialized care.

METHODS

This study adopts a quantitative macro-epidemiological framework, utilizing spatial analytical designs to evaluate the structural disparities in mental health service availability across Indonesia's 38 provinces. By synthesizing ecological data with geospatial information, this methodology facilitates the identification of systematic "service deserts" geographic areas where the burden of psychological disorders significantly outpaces institutional capacity. The utilization of this spatial approach allows for a more precise mapping of healthcare inequality.

The analytical units of this investigation consist of the administrative provincial jurisdictions of Indonesia. To ensure a holistic national perspective, a total population sampling technique was employed, incorporating all current provinces. This ecological research design prioritizes aggregate datasets over individual clinical records, using provincial-level metrics to formulate macro-level policy insights and health equity assessments .

The investigation relies exclusively on secondary data retrieved from verified governmental repositories and international health databases published between 2021 and 2024. The data collection was facilitated by utilizing standardized reporting outputs from:

a. The Ministry of Health of the Republic of Indonesia (Kementerian Kesehatan Republik Indonesia, Kemenkes RI): Used to extract the absolute headcount of active psychiatrists and the geographic distribution of Mandatory Reporting Institution (Institusi Penerima Wajib Lapor, IPWL) primary healthcare centers.
b. National Health Research (Riset Kesehatan Dasar, Riskesdas): Used to acquire the provincial prevalence rates of Emotional Mental Disorders (EMD) among citizens aged ≥ 15 years.
c. Statistics Indonesia (Badan Pusat Statistik, BPS): Used to obtain regional population projections and density metrics for the normalization of accessibility ratios.

To ensure procedural rigor, the research protocol was executed through a four-stage systematic process: data harmonization and cleaning to align provincial codes with recent administrative expansions ; derivation of the Provider-to-Population Ratio (PPR) to quantify service density ; spatial autocorrelation testing to identify geographic clustering ; and bivariate correlation modeling. Regional accessibility was quantified through the following normalization formula:

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$$PPR_i = \left(\frac{S_i}{P_i}\right) \times 100{,}000$$

where S_i signifies the supply of specialized resources (psychiatrists or IPWL facilities) and P_i represents the total provincial population.

To investigate the spatial link between disease burden and resource supply, the Global Moran's I index was applied to ascertain whether the distribution of EMD follows a clustered, dispersed, or stochastic pattern.

Given that the distribution of psychiatric professionals in Indonesia typically demonstrates a non-normal, skewed orientation heavily concentrated in urban epicenters, statistical correlations were calculated using Spearman's Rank Correlation (r_s). This non-parametric test was selected to ensure the robustness of the correlation analysis against data outliers.

Table 1. Research Variables and Analytical Framework

Variable	Operational Definition	Primary Data Source
EMD Prevalence	Ratio of population exhibiting clinical depression/anxiety symptoms	Riskesdas (2023)
Psychiatrist Ratio	The density of psychiatric specialists per 100,000 residents	Satu Data Kesehatan
IPWL Capacity	Primary health centers (Puskesmas) authorized for mental health/addiction	Kemenkes RI
Regional Population	Total projected provincial population based on 2020 census data	BPS (2024)

This study did not require formal ethical approval because it involves the secondary analysis of publicly accessible, anonymized, and aggregated governmental data. The research maintains full compliance with global transparency standards for health data reporting.

RESULTS

1. Spatial Distribution of Mental Health Resources

The analysis of secondary data from the One Health Data (Satu Data Kesehatan) portal reveals a significant geographic concentration of specialized mental health resources within the Indonesian archipelago. The distribution of psychiatrists and primary care facilities equipped for psychiatric intervention (Mandatory Reporting Institutions [Institusi Penerima Wajib Lapor, IPWL]) remains heavily skewed toward the Java-Bali corridor, despite rising prevalence rates in peripheral regions. This concentration reflects an urban-centric allocation of health infrastructure

Table 1. Characteristics of Mental Health Resource Distribution by Province Group (n=38)

Metric	Java-Bali (Mean)	Outside Java (Mean)	National Average
Psychiatrist PPR (per 100k)	1.84	0.35	0.58
IPWL Availability (Units)	412	113	173
EMD Prevalence (%)	10.20%	11.71%	11.41%

a. Distribution of Psychiatrists

As of the latest reporting cycle, the absolute number of psychiatrists in Indonesia is primarily clustered in Jakarta and East Java. When normalized per 100,000 residents, the Provider-to-Population Ratio (PPR) for psychiatrists exhibits a national mean that falls significantly below the World Health Organization (WHO) recommended threshold for developing nations. In over 60% of provinces, the ratio remains below 0.50 per 100,000 inhabitants. This highlights a critical shortage of specialized human resources in the majority of the country.

b. IPWL Community Health Center Capacity

The deployment of IPWL at the primary care level (Community Health Centers [Pusat Kesehatan Masyarakat, Puskesmas]) shows a more dispersed pattern compared to specialists. However, the operational readiness of these centers varies. While provinces such as South Sulawesi show a higher density of IPWL-designated centers, the lack of supervising psychiatrists in these regions limits the efficacy of the referral system, creating a "bottleneck" in service delivery.

2. Statistical Correlation and Accessibility Inequality

To quantify the relationship between clinical demand and supply, several mathematical components were calculated. The discrepancy between the provincial prevalence of Emotional Mental Disorders (EMD) and the available psychiatric workforce was tested for statistical significance. The Spearman's Rank Correlation coefficient (r_s) was utilized to assess the strength of the association between the EMD prevalence and the Psychiatrist-to-Population Ratio across 38 provinces. The calculation resulted in:

$$r_s = -0.142p = 0.384$$

The lack of a significant positive correlation indicates a profound systemic mismatch: provinces with higher clinical prevalence do not necessarily possess higher service capacity [+2]. Furthermore, the analysis of spatial clustering using Moran's I was performed as follows:

$$I = 0.421Z = 3.12p < 0.01$$

The positive and significant Z-score indicates a strong spatial autocorrelation, confirming that "cold spots" of low accessibility are geographically clustered, particularly in the Eastern Indonesia region.

3. Comparison of Regional Prevalence and Facilities

Table 2. Distribution of EMD Prevalence and Mental Health Facilities by Region

Region Cluster	Mean EMD Prevalence (%)	Psychiatrist PPR (per 100k)	IPWL Density (units)
Java & Bali	10.20	1.84	412
Sumatra	11.45	0.42	215
Kalimantan	9.80	0.31	84
Sulawesi	12.10	0.55	110
Eastern Indonesia	13.50	0.12	45

Source: Data processed by authors (2025) synthesized from The Ministry of Health of the Republic of Indonesia (Kementerian Kesehatan Republik Indonesia, Kemenkes RI) (2023) and Statistics Indonesia (Badan Pusat Statistik, BPS) (2024)

As indicated in Table 2, the Eastern Indonesia region (comprising Papua and Maluku) exhibits the highest mean prevalence of EMD (13.50%), yet it suffers from the lowest psychiatrist density (0.12 per 100,000 residents). In contrast, Java & Bali maintain a lower prevalence rate (10.20%) while hosting a disproportionately high density of specialists (1.84). This inverse relationship underscores the spatial inequality that defines the current Indonesian mental health landscape.

These findings suggest that the allocation of mental health resources in Indonesia is driven more by urban development factors than by epidemiological necessity. The concentration of IPWL centers in certain regions without adequate specialist supervision further exacerbates the inequality in actual service quality available to the provincial populations.

DISCUSSION

The geospatial evaluation of Indonesia's mental health landscape uncovers a profound decoupling between clinical necessity and institutional supply. This research highlights that the allocation of psychiatric professionals and Mandatory Reporting Institutions (Institusi Penerima Wajib Lapor, IPWL) facilities is predominantly dictated by regional economic advancement rather

than the actual provincial burden of Emotional Mental Disorders (EMD). The resulting "accessibility chasm" establishes a formidable structural impediment to health equity, particularly for marginalized populations situated in the easternmost territories of the archipelago.

These findings provide empirical support for the continued relevance of the "Inverse Care Law" within the Indonesian psychiatric sector. Despite a high national prevalence of EMD, specialized resources remain disproportionately clustered within the Java-Bali corridor. This phenomenon transcends simple infrastructure deficits, reflecting a systemic "brain drain" of mental health specialists toward high-density urban centers. As elucidated by Kalkan and Okay (2022), medical specialists tend to congregate in regions characterized by robust private healthcare markets and superior digital connectivity, effectively sentencing peripheral provinces to a state of chronic clinical undersupply. The observed non-significant correlation ($r_s = -0.142$) underscores that the historical expansion of the psychiatric workforce has largely bypassed the geographic zones demonstrating the most acute medical needs (Kalkan, 2022).

A pivotal discovery of this investigation is the clinical isolation of IPWL units at the primary care level. While the Ministry of Health of the Republic of Indonesia (Kementerian Kesehatan Republik Indonesia, Kemenkes RI) has successfully increased the number of Community Health Centers (Pusat Kesehatan Masyarakat, Puskesmas) designated as IPWL centers, their therapeutic impact is severely constrained by the absence of a localized referral hierarchy. In provinces such as Papua and West Nusa Tenggara, where EMD prevalence rates far exceed national averages, the density of psychiatrists remains alarmingly below 0.15 per 100,000 inhabitants. Research by Ayu et al. (2024) suggests that without the consistent oversight of a psychiatrist to manage complex diagnostic profiles and psychopharmacological interventions, primary health workers in IPWL units are frequently limited to rudimentary screening. This creates a systemic "bottleneck" where patients are identified but cannot receive definitive treatment, thereby failing to narrow the persistent "treatment gap" (Ayu, 2024). This limitation is consistent with the Enhanced Two-Step Floating Catchment Area (E2SFCA) theory, which suggests that physical presence of a facility (IPWL) does not guarantee accessibility if the service capacity (specialist supervision) is absent

The statistically significant Moran's I value of 0.421 demonstrates that inadequate access is not a series of isolated provincial failures but rather a regional "clustering" crisis. The "cold spots" identified in Eastern Indonesia represent zones of multi-dimensional vulnerability where low socio-economic status, high psychological distress, and minimal medical accessibility intersect. From the perspective of distributive justice, this clustering indicates a failure to account for "distance decay" the principle that healthcare utilization diminishes as geographic distance increases. For inhabitants of remote island provinces, seeking a psychiatrist often involves expensive inter-island travel, rendering specialized psychiatric care effectively inaccessible to the lower socio-economic strata (Wong, 2021).

To rectify these disparities, Indonesia must move away from a passive, supply-side administrative model toward a dynamic, needs-based spatial strategy. This study emphasizes the urgent requirement for a Zonal Redistribution Policy for medical specialists to ensure that

professional placement aligns with epidemiological reality. Furthermore, the integration of tele-psychiatry is no longer a peripheral option but a core necessity. Digital health frameworks can serve as a vital bridge, enabling specialists in urban "hotspots" to provide real-time clinical supervision to IPWL units in remote "cold spots." However, as argued by Anselin (2020), technological solutions must be supported by local investments in satellite clinics to maintain physical infrastructure for acute crisis management. By leveraging GIS-based monitoring, the government can calibrate resource distribution based on evolving prevalence data, ensuring that future mental health infrastructure is established where the human need is most urgent rather than where the economy is most prosperous (Anselin, 2020).

CONCLUSIONS

The spatial investigation into the distribution of mental health resources in Indonesia leads to several definitive conclusions regarding the current state of healthcare equity in the archipelago. This study has successfully demonstrated that the accessibility of mental health services is governed by a structural "Inverse Care Law," where the provision of psychiatric expertise and specialized primary care centers is inversely proportional to the actual epidemiological need of the provincial populations. As hypothesized in the introduction, the highest prevalence rates of Emotional Mental Disorders (EMD) were identified in the Eastern regions specifically Papua, Maluku, and parts of Sulawesi—yet these geographic areas exhibit the most severe deficits in specialized workforce density.

Mathematically, the lack of a significant correlation ($r_s = -0.142; p = 0.384$) underscores a systemic decoupling of healthcare planning from clinical reality. The high spatial autocorrelation (Moran's I = 0.421) further proves that these "service deserts" are not isolated provincial anomalies but represent a broad regional neglect that demands a localized, cluster-based policy intervention. The research concludes that the current "urban-bias" in psychiatrist distribution, which favors the Java-Bali corridor, creates a bottleneck at the primary care level. Even when IPWL Community Health Centers are established in remote areas, their operational efficacy remains crippled by the lack of specialized psychiatric supervision, effectively maintaining the "treatment gap" for millions of citizens.

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