Iran J Public Health, Vol. 53, No.12, Dec 2024, pp.2625-2631

Review article

Unmet Need for Family Planning in Spatial Analysis: A Systematic Review

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(Received 21 Feb 2024; accepted 11 May 2024)

Abstract

Background: The unmet need for family planning is an indicator in monitoring and evaluating family planning programs in the decentralization era. Spatial analysis is an analytical tool that can understand the existence of family planning disparities among regions. This study aimed to conduct a systematic review of the application of spatial analysis in research related to the unmet need for family planning and to review its results.

Methods: The databases used in the literature search are PubMed, Scopus, and SpringerLink. The keywords used in the search were: "unmet need for family planning" OR "unmet need for contraception" AND (spatial OR geographic). Full-text articles from 2013 to 2022 were included.

Results: Of the 334 identified articles, 3 (three) articles were reviewed. The three studies used spatial analysis at the level of spatial data exploration by using global and local Moran Index tests, Getis-Ord Gi* local statistics, and natural break spatial techniques.

Conclusion: The use of advanced spatial analysis such as GWR and other regression analyzes is needed to investigate factors associated with regionally specific unmet need for family planning so that policy makers can allocate resources effectively

Keywords: Unmet need; Family planning; Spatial analysis; Systematic review; Regional

Introduction

Family Planning is part of the 2030 Sustainable Development Goals (SDGs), included explicitly in goal 3, health, and 5, gender equality and women's empowerment. The SDG indicator in family planning is the percentage of women of reproductive age who have family planning needs to be fulfilled by the modern method (1). Part of this indicator is the unmet need for family planning (2). The unmet need for family planning is defined as the percentage of women fecund and sexually active, who wish to stop or delay childbearing, but who are not using any form of contraception (3). The unmet need for family planning is an indicator for monitoring the progress of family planning programs (4). In addition, the unmet need for family planning is an

indicator that describes a region's health system and social conditions that support the ability of women to realize the preference for delaying or limiting births (5).

Disparities in family planning, especially unmet need for family planning, have occurred in developing and less developed countries such as Indonesia, Ethiopia, and Ghana (6-8). Its disparity is caused by regional differences, which are the result of geographical, socioeconomic, and demographic differences (2, 6-10). Region affects the unmet need for family planning (10-15). Health behaviors like the unmet need for family planning need to be understood in the context of the region in which they live and how they interact (16, 17).

Most previous studies focused on individuals and used global statistical analysis to understand the unmet need for family planning (11, 12, 14, 15, 18). The assumption used in the analysis is that each observation is independent of other observations. This assumption is inconsistent with Tobler's law that "everything is related to everything else, but things that are near are more related than things that are far" (19-22).

In fact, with decentralization, many decisions at the regional level have to be made. In addition, effective stewardship of health programs requires appropriate approaches to targeting resources and interventions to meet population needs (23). The method used to understand this is spatial analysis (16). Spatial analysis is needed to understand health disparities, especially the unmet need for family planning (24, 25). Spatial analysis is seen from the existence of spatial dependence and spatial heterogeneity. Spatial dependence is a situation where the values observed in one region depend on the observations of neighboring values in the nearest region. In other words, there is a regional grouping. Groups in health do not occur randomly but systematically in the population (26, 27). Spatial heterogeneity is that the relationship between variables differs according to place (28).

Spatial statistical methods are essential in designing and implementing community-based efforts to increase access to care while reducing healthcare costs (29). Spatial analysis can help policymakers to allocate resources effectively and provide insight into geographic factors related to the utilization or adequacy of health services (30, 31). In addition, spatial analysis can be used to track supply for family planning (32).

We aimed to conduct a systematic review of the application of spatial analysis in research related to the unmet need for family planning and review the results of its research.

Methods

Eligibility criteria

The included research must 1) have the aim of identifying factors related to the unmet need for family planning in couples of childbearing ages aged 15-49 yr, 2) use a cross-sectional study approach, 3) use spatial analysis, 4) use the English language, 5) be full paper accessible, and 6) be published in 2013-2022, dated 31 Aug 2022. The exclusion criteria in the study were articles published other than 2013-2022, no full access, non-spatial analysis, and non-English language.

Information sources and search strategy

This systematic review was conducted according to PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (6). Researchers took information sources from electronic database sources, namely PubMed, Scopus, and SpringerLink. The keywords used in the search were: "unmet need for family planning" OR "unmet need for contraception AND (spatial OR geographic).

Screening

The screening method is carried out by paying attention to the title, reading the abstract, and the purpose of the study. Furthermore, if appropriate, it is carried out by reading the full article. Duplicate articles are removed manually.

Data extraction

Research extracted based on title, year of publication, research objectives, analytical methods used

and important results of the study. Three studies were extracted and reviewed by 3 authors (MM, MR and HHDL). We resolved disagreements by consensus with the third author (TE).

Quality appraisal

Three articles included in the review are assessed using JBI critical appraisal for analytical cross-sectional studies (33). Each assessment element is given a score of 1 indicating that the criteria are met and a score of 0 if they are not met. Each study was assessed based on eight questions with the following: inclusion criteria, subject and setting, measurement method, measurement conditions, confounding factors, control of confounding factors, measurement results and appropriate statistical tests.

Results

A systematic literature review method was used in this study. The population in this literature review is couples/women of childbearing age 15-49 yr with exposure to factors related to the unmet need for family planning and its outcome being the unmet need for family planning. The databases used in the literature search are PubMed, Scopus, and SpringerLink. The keywords used in the search were: "unmet need for family planning" OR "unmet need for contraception AND (spatial OR geographic). The inclusion criteria in conducting a literature review are research published in 2013-2022, dated 31 Aug 2022, accessed in full and in English. The study selection process Fig. 1 is as follows:

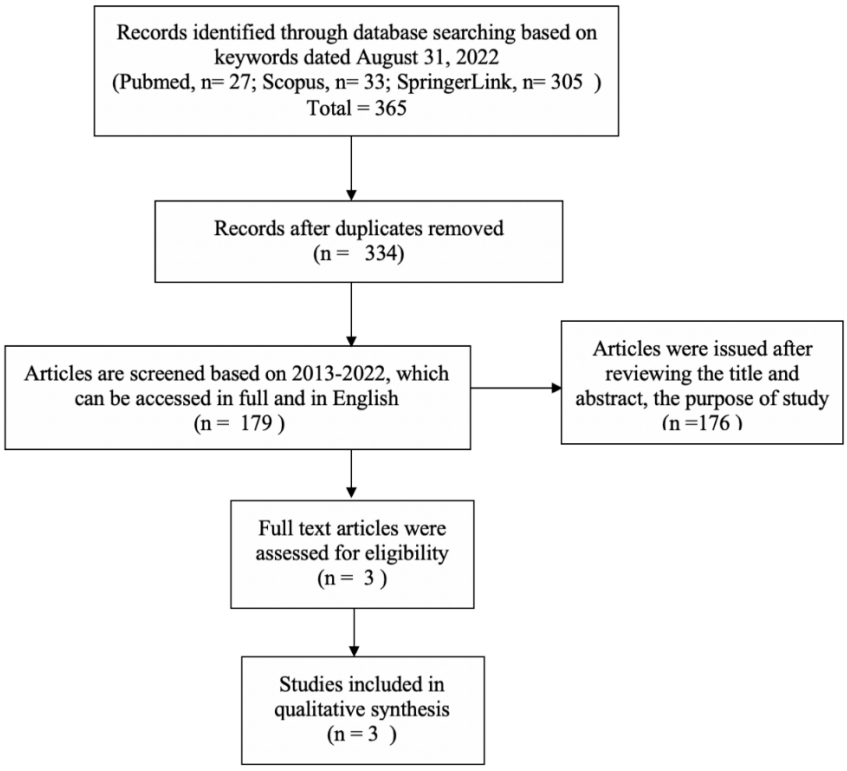

Fig. 1: Article selection process

Discussion

A systematic review of the literature found 3 previous studies related to the unmet need for family planning and the findings are as follows (Table 1).

Table 1: A systematic review of previous research literature

Reference No.	*Purpose of study*	*Analysis method*	*Results*
(34)	Identify variation in fertility, to describe patterns of key selected fertility determinants in areas of high fertility.	Non spatial: descriptive statistics Spatial: Moran's I and local statistics Getis-Ord Gi*	There is a grouping of percentages of the unmet need for family planning. Regions with a high percentage of the unmet need for family planning are grouped with other regions that also have a high percentage of the unmet need for family planning, and vice versa.
(35)	Identify the spatial heterogeneity and factors associated with the unmet need for family planning for spacing in India.	Non spatial: Descriptive statistics, Chi Square test, logistic regression, Spatial: spatial natural break technique	- Unmet need for family planning with higher spacing occurs in the early reproductive age group and low socioeconomic groups. - Socio-economic and demographic factors related to the unmet need for family planning for spacing, namely education, women's autonomy, wealth status, age, parity, place of residence, having at least 1 (one) son, religion, caste and exposure to mass media. - The Oromia, South Nation, and National People's and Gambela regions have a high number of hot spots than other regions
(36)	Explore the geographic differences in unmet need for family planning among women of reproductive age in Ethiopia using a 2016 national population-based survey.	Multilevel analysis and local statistics Getis-Ord Gi*	- individual level variables related to the unmet need for family planning: married status, lowest wealth status, having 5 (five) or more children, Muslim and Protestant religions compared to orthodox Christianity - Community level variables, are in rural areas including the Oromia region and the Somalia region

The three studies show that there are groupings of unmet need for family planning values in regions. Regions that have a high value of unmet need for family planning are surrounded by regions that have a high value too (hotspots), and vice versa (coldspots). The existence of hot spot areas is useful for accelerating progress, identifying areas that are lagging behind others can focus attention and resources on areas that need it most (37).

Previous research related to the unmet need for family planning in couples/women of childbearing age 15-49 yr using spatial analysis found 3 studies in 2013-2022. The three studies used spa-

tial analysis but were still at the level of spatial data exploration by using the global and local Moran Index test, Getis-Ord Gi* local statistics, and the spatial natural break technique (34-36).

Spatial data exploration is a technique that visually depicts spatial distribution, identifies outliers, spatial distribution patterns, clusters, and hotspots, and suggests other spatial methods such as spatial heterogeneity. Spatial data exploration is a step before confirmation analysis. Spatial data exploration is concerned with a spatial effect (38). Location effects (spatial effects) consist of two types, namely spatial dependency and spatial heterogeneity (39). Spatial dependence that describes the similarity of nearby observations (28,40). Spatial heterogeneity occurs due to random location effects, namely differences between one location and another. Spatial heterogeneity is defined as the absence of a mean location. The term spatial heterogeneity refers to variations in relationships between spaces, meaning different relationships for each region. Relationships can be similar to nearby neighboring regions (22,27,41, 42).

Spatial effects are often not formally incorporated into population modeling in most demographic and sociological research. It is important to consider spatial effects in demographic modeling because from a methodological point of view, if spatial effects are present but not accounted for in the model, estimates and inference statistics may be unreliable (e.g., the effects of explanatory variables may be overestimated or underestimated) (43). Modeling that takes into account spatial effects is spatial regression. Spatial regression is a regression method used for spatial data types or data that has a location effect (spatial effect). The spatial regression method is a development of the classical linear regression method (multiple linear regression) (41). Most previous research, especially in unmet need for family planning, used classical statistics without taking into account the existence of spatial effects (11, 12, 14, 15, 18, 44).

Three previous studies have not investigated what factors are associated with unmet need for family planning in specific areas, in other words spatial data modeling (spatial econometrics). In fact, with decentralization, regional governments must make family planning policies at the regional level. Regional governments need regionally specific evidence-based evidence to make effective and efficient policy planning and resource allocation according to regional conditions. Spatial analysis, especially spatial modeling, is needed in research related to unmet need for family planning because spatial analysis can investigate specific regional conditions and find out specific determinants of health, especially unmet need for family planning (21, 31, 40). The quality of the articles was assessed using the JBI critical appraisal for analytical cross-sectional studies. The author agrees that the three articles are of good quality so they can be continued for review.

Conclusion

There is still little research related to unmet need for family planning using spatial analysis. There are 3 studies that use spatial analysis but are still limited to exploratory spatial analysis. The use of advanced spatial analysis such as GWR and other regression analyzes is needed to investigate factors associated with regionally specific unmet need for family planning so that policy makers can allocate resources effectively.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgements

We would like to thank the Indonesian Education Endowment Fund (LPDP) supports this research

Conflicts of interest

The authors declare that there is no conflict of interest.

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