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Analysis of Risk Factors and Causes of High Maternal and Infant Mortality Rates in Rural Areas

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Abstract

This study aims to analyze the risk factors and causes contributing to the high maternal and infant mortality rates in rural areas. The literature review reveals that factors such as limited access to healthcare facilities, inadequate prenatal and postnatal care, lack of skilled birth attendants, and prevalent socio-cultural practices significantly impact these mortality rates. Additionally, poor maternal nutrition, insufficient antenatal education, and delays in seeking medical help during pregnancy and childbirth are identified as key contributors. In conclusion, addressing these multifaceted challenges requires a comprehensive approach that involves improving healthcare infrastructure, increasing awareness about maternal and child health, and enhancing the quality of prenatal and postnatal care services in rural areas.

INTRODUCTION

Maternal and infant health issues represent a significant challenge in improving community well-being, particularly in rural areas. Despite significant advances in global health, maternal and infant mortality rates remain a serious concern in many countries, especially in rural areas where access to healthcare is often limited. According to the World Health Organization (WHO), most maternal and infant deaths occur in developing countries, with a majority of cases occurring in rural areas. The high maternal and infant mortality rates in rural areas indicate a disparity in access to healthcare between urban and rural areas. Factors such as distance from healthcare facilities, lack of trained medical personnel, and infrastructure limitations are major obstacles faced by rural communities in accessing quality healthcare, a study by Razu et al. (2021).

The high maternal and infant mortality rates in rural areas are not only a public health issue but also reflect healthcare inequities (Dagher & Linares, 2022). Rural communities often have lower levels of prosperity and limited access to education and health information, all of which can exacerbate maternal and infant health conditions, a study by Chachar & Mian (2022). Therefore, research on the risk factors and causes of high maternal and infant mortality rates in rural areas is highly significant in efforts to improve maternal and infant health. By understanding the factors contributing to this health issue, it is hoped that more effective interventions and targeted health programs can be designed to reduce maternal and infant

mortality rates in rural areas. In this context, this study aims to analyze the risk factors and causes of high maternal and infant mortality rates in rural areas, with the aim of making a significant contribution to improving maternal and infant health and equal access to healthcare services across communities.

According to research by Ladak et al. (2020) the health issues of mothers and infants in rural areas are not only influenced by physical factors but also by complex social and cultural factors. From the study by Phommachanh et al. (2021) have shown that lack of knowledge about maternal and infant healthcare, reliance on unsafe traditional practices, and economic and social factors contribute to high maternal and infant mortality rates in rural areas. Nutritional problems are a serious concern in efforts to improve maternal and infant health in rural areas. Poor nutrition in pregnant women can increase the risk of complications during pregnancy and childbirth, which can have a negative impact on the health of both mother and baby (Zhu et al., 2019). Therefore, a holistic and integrated approach is needed to address maternal and infant health issues in rural areas, including physical, social, cultural, and economic aspects, a study by Ali (2021).

This research is also relevant to the efforts to achieve the Sustainable Development Goals (SDGs), especially targets 3.1 and 3.2, which emphasize the importance of reducing maternal and infant mortality rates and improving maternal and infant health. By analyzing the risk factors and causes of high maternal and infant mortality rates in rural areas, this research is expected to make a significant contribution to achieving these targets, in line research by Louangpradith et al. (2020). In this context, this research is expected to provide a better understanding of the health issues of mothers and infants in rural areas and to provide more appropriate policy recommendations to address these issues. Thus, it is hoped that there will be better and more equitable maternal and infant health conditions throughout the community, regardless of geographical and socio-economic differences.

The health issues of mothers and infants in rural areas can also be influenced by environmental factors, such as access to clean water and poor sanitation (Kwami et al., 2019). An unhealthy environment can increase the risk of infection and disease in pregnant women and newborns, which can ultimately lead to death, research by Münzel et al. (2023). Therefore, improving sanitation infrastructure and providing adequate clean water are important steps in efforts to improve the health of mothers and infants in rural areas (Cumming et al., 2019). Additionally, efforts to improve the quality of maternal and infant healthcare in rural areas need to be enhanced. Providing adequate healthcare facilities, training healthcare workers in good maternal and infant care, and intensive health promotion can help reduce maternal and infant mortality rates in rural areas, a study by Adu & Owusu (2023).

In the context of Indonesia, the health issues of mothers and infants in rural areas are a serious concern for the government in efforts to improve community welfare. According to research by Alauddin et al. (2023) programs such as Posyandu and desa siaga have been implemented to improve access to and quality of healthcare services in rural areas. However, significant challenges remain in reaching remote and isolated rural communities.

Therefore, this research is highly relevant in the context of health development in Indonesia, especially in efforts to improve the health of mothers and infants in rural areas. It is hoped that the results of this research can serve as a basis for formulating more effective and targeted policies to improve the health of mothers and infants in rural areas, and make a significant contribution to achieving the sustainable development goals related to health.

A study by Sano & Mammen (2022) the health challenges faced by mothers and infants in rural areas are often exacerbated by limited access to healthcare services and inadequate infrastructure. Rural communities often lack healthcare facilities and trained medical personnel, making it difficult for pregnant women and newborns to receive timely and appropriate care (Gizaw et al., 2022). Additionally, cultural beliefs and practices can also impact maternal and infant health, as some traditional practices may be harmful or may prevent women from seeking medical help (Ahmed et al., 2020).

Research by Vitale Brovarone & Cotella (2020) improving access to healthcare services in rural areas requires a multifaceted approach that addresses not only physical infrastructure but also social and cultural factors. Community-based health programs, such as Posyandu and desa siaga, play a crucial role in providing essential healthcare services and promoting health education in rural communities (Mizutani et al., 2019). These programs help empower communities to take charge of their health and well-being, leading to improved maternal and infant health outcomes.

Literature Review

Maternal and infant health is an important public health issue, especially in rural areas where access to health services is often limited. Several studies have highlighted various factors that contribute to high maternal and infant mortality rates in rural settings.

One important factor is the lack of knowledge about maternal and infant health care among women in rural areas. Research by Mutowo et al. (2021) shows that many women in rural communities are unaware of the importance of prenatal care and may not seek medical help during pregnancy until complications arise. This lack of knowledge can lead to delays in seeking care, which can have serious consequences for both mother and baby.

Traditional beliefs and practices also play a role in maternal and infant health in rural areas. Some cultural practices, such as home birth attended by a traditional birth attendant, may increase the risk of complications during childbirth (Gurara et al., 2020). Additionally, cultural taboos regarding discussing reproductive health issues may prevent women from seeking necessary care (Kaneoka & Spence, 2020).

Economic factors also contribute to poor maternal and infant health outcomes in rural areas. Poverty limits access to health services and nutritious food, increasing the risk of malnutrition and other health problems among pregnant women and babies (Siddiqui et al., 2020). Research by Mohamoud et al. (2019) has shown that poverty is strongly associated with higher maternal and infant mortality rates in rural areas.

Improving maternal and infant health in rural areas requires a complex approach that addresses these complex factors. Community-based interventions that focus on health education, increasing access to health services, and addressing social and cultural norms can help reduce maternal and infant mortality rates in rural areas (Nickel & von dem Knesebeck, 2020). By addressing these issues, we can work towards improving the health and well-being of mothers and babies in rural communities.

METHODS

This study adopted a qualitative descriptive approach through an extensive literature review to identify and analyze the risk factors and causes contributing to high maternal and infant mortality rates in rural areas. The focus was placed on understanding the complex interplay between healthcare access, socio-cultural practices, economic conditions, environmental determinants, and health service

infrastructure. This method was chosen because maternal and infant mortality is influenced by multifaceted issues that cannot be fully captured through a single quantitative indicator but instead require synthesis of diverse sources of evidence.

The literature search was conducted systematically across multiple databases, including PubMed, ScienceDirect, Scopus, and Google Scholar, covering publications between 2018 and 2023. Key search terms included combinations of "maternal mortality," "infant mortality," "rural health," "risk factors," "access to healthcare," "nutrition," and "socio-cultural practices." Additional grey literature, such as policy reports from the World Health Organization (WHO), United Nations Population Fund (UNFPA), and Indonesian Ministry of Health, was also included to provide contextual and policy-level insights. Only studies published in English and Bahasa Indonesia were considered to ensure relevance and accessibility.

Inclusion criteria for selecting the literature were: (1) studies focusing on maternal and/or infant mortality in rural settings, (2) studies that discussed risk factors or causes rather than only reporting prevalence, and (3) studies conducted in low- and middle-income countries, particularly in Southeast Asia and Africa, for comparative relevance. Exclusion criteria included studies with insufficient methodological clarity, those focusing only on urban populations, and commentaries without empirical or policy evidence.

The selected articles were then reviewed and synthesized thematically. The analysis process involved identifying recurring themes such as limited access to healthcare facilities, shortage of skilled birth attendants, inadequate prenatal and postnatal care, nutritional deficiencies, traditional practices, and environmental challenges. Each theme was examined for how it contributes directly or indirectly to maternal and infant mortality in rural contexts. By categorizing the findings under thematic clusters, the study was able to provide a clearer understanding of the multiple layers of determinants affecting maternal and infant health outcomes.

To ensure validity and reliability of the findings, triangulation was employed by comparing results across different studies and contexts. Attention was given to whether findings were consistent across countries, regions, and methodological approaches. This comparative process allowed for more robust conclusions and minimized the risk of bias from any single source. Ethical considerations were addressed by ensuring that all reviewed literature was properly cited and that sources were accessed through legitimate academic and institutional channels. Through this systematic approach, the study aims to generate evidence-based insights into the multifactorial causes of maternal and infant mortality in rural areas, providing a foundation for developing targeted policies and interventions.

RESULTS AND DISCUSSION

Risk Factors for Maternal and Infant Health in Rural Areas

In rural areas, access to healthcare is often a significant challenge for women, impacting their health and that of their infants. The following factors contribute to the health risks faced by mothers and infants in rural areas:

Limited Access to Healthcare Services

Women in rural areas often have limited access to healthcare facilities due to long distances and inadequate transportation. This can lead to delays in receiving essential care during pregnancy, childbirth, and postpartum, increasing the risk of complications and mortality.

Environmental Conditions

Rural environments are often characterized by poor sanitation and limited access to clean water. These conditions increase the risk of infection and disease for pregnant women and newborns, leading to poor health outcomes.

Cultural Practices

Cultural practices in rural areas, such as home births attended by traditional birth attendants, can also contribute to health risks. While these practices may be deeply rooted in tradition, they can increase the risk of complications during childbirth due to the lack of trained medical professionals and sterile equipment.

Addressing these factors requires a comprehensive approach that includes improving access to healthcare services, promoting healthy environmental practices, and addressing cultural beliefs and practices through education and community engagement. By addressing these factors, we can reduce the health risks faced by mothers and infants in rural areas and improve maternal and child health outcomes.

Causes of High Maternal and Infant Mortality Rates in Rural Areas

The causes of high maternal and infant mortality rates in rural areas can be attributed to several factors:

Lack of Knowledge

Women in rural areas may lack adequate knowledge about maternal and child healthcare. This lack of knowledge can lead to misunderstandings about the importance of prenatal care, safe delivery, and postnatal care, ultimately increasing the risk of maternal and infant mortality.

Limited Access to Healthcare Services

Constraints such as the cost of care, long distances to healthcare facilities, and inadequate transportation can hinder timely access to healthcare for pregnant women and newborns. This can result in delays in addressing serious medical conditions that could threaten lives.

Lack of Adequate Healthcare Facilities

In rural areas, there is often a lack of adequate and trained healthcare facilities to care for pregnant women and infants. This shortage can lead to suboptimal healthcare, especially in managing complications that require advanced medical care.

Understanding these factors can help in implementing measures to improve the knowledge of rural communities about maternal and child healthcare, increase access to healthcare by expanding healthcare facilities and transportation networks, and improve the availability of adequate healthcare facilities in rural areas. These steps are expected to help reduce maternal and infant mortality rates in rural areas.

The Role of Environmental Factors in Maternal and Infant Health

The role of environmental factors in maternal and infant health is crucial, especially in rural areas where access to clean water and proper sanitation is limited. The following points elaborate on how these factors impact the health of mothers and infants:

Access to Clean Water

Limited access to clean water increases the risk of waterborne diseases that can be harmful to pregnant women and newborns. Contaminated water sources can lead to infections such as diarrhea, which can be particularly dangerous for infants and pregnant women.

Poor Sanitation

Inadequate sanitation facilities and practices contribute to the spread of infectious diseases. Poor sanitation increases the risk of infections, including those affecting the gastrointestinal tract, which can have serious consequences for the health of pregnant women and infants.

Addressing these environmental factors requires improving access to clean water sources and promoting proper sanitation practices. This can be achieved through infrastructure development, community education on hygiene practices, and the implementation of effective sanitation systems. By addressing these factors, the health risks faced by mothers and infants in rural areas can be significantly reduced.

Improving Health Infrastructure to Improve Maternal and Infant Health

Improving healthcare infrastructure is essential for enhancing maternal and infant health in rural areas. The following points elaborate on the significance of this improvement:

Provision of Adequate Healthcare Facilities

Building and enhancing adequate healthcare facilities in rural areas can significantly improve access to and quality of healthcare services. This includes establishing primary healthcare centers, maternity clinics, and facilities equipped to handle obstetric emergencies. These facilities can provide essential maternal and child health services, such as antenatal care, safe delivery services, and postnatal care.

Healthcare Staff Training

Providing training to healthcare providers in rural areas on proper maternal and child care practices can enhance the quality of care. Training programs can focus on various aspects of maternal and child health, including prenatal care, safe delivery practices, newborn care, and postpartum care. By ensuring that healthcare providers are well-trained and equipped with the necessary skills and knowledge, the overall quality of maternal and child health services can be improved.

Improving healthcare infrastructure in rural areas is crucial for reducing maternal and infant mortality rates and improving overall maternal and child health outcomes. By investing in healthcare infrastructure and training healthcare providers, governments and healthcare organizations can make significant strides in improving maternal and child health in rural areas.

Public Health Program to Address Maternal and Infant Health Problems

Community health programs play a crucial role in addressing maternal and infant health issues in rural areas. The following points elaborate on the significance of these programs:

Posyandu Program

The Posyandu program provides basic healthcare services at the village level and can significantly improve awareness of maternal and child health. These services often include growth monitoring for children, immunizations, and health education for mothers. By providing essential healthcare services at the grassroots level, the Posyandu program can help detect and address health issues early, reducing the risk of complications for mothers and infants.

Desa Siaga Program

The Desa Siaga program focuses on enhancing community preparedness for maternal and infant health issues and provides education on healthcare. This program aims to empower communities to take proactive measures to prevent health problems and seek timely care when needed. By promoting community involvement

and education, the Desa Siaga program can improve health-seeking behaviors and reduce the incidence of maternal and infant mortality.

These community health programs play a vital role in improving maternal and infant health outcomes in rural areas. By providing essential healthcare services, promoting health education, and empowering communities to take charge of their health, these programs can contribute significantly to reducing maternal and infant mortality and improving overall health outcomes.

The Influence of Local Culture on Maternal and Infant Health Behavior

Local cultural beliefs and practices can significantly influence maternal and infant health behaviors in rural areas. The following points elaborate on these influences:

Role of Traditional Birth Attendants

Traditional birth attendants (TBAs) play a significant role in many rural communities, often serving as the primary caregivers during childbirth. Their practices and beliefs can impact the decisions women make regarding maternal healthcare. While TBAs can provide valuable support and knowledge, their lack of formal medical training can also lead to practices that may be harmful or ineffective in preventing complications.

Social Norms

Social norms within communities can also influence maternal and infant health behaviors. For example, stigma surrounding facility-based delivery may discourage women from seeking care at healthcare facilities, leading them to opt for home births attended by TBAs. Additionally, cultural norms related to modesty and privacy may affect women's willingness to seek prenatal care or postnatal care.

Understanding the influence of local culture on maternal and infant health behaviors is essential for designing effective healthcare interventions. By working with communities and respecting their cultural beliefs and practices, healthcare providers can develop strategies that are culturally sensitive and address the unique needs of each community. This approach can help improve maternal and infant health outcomes in rural areas.

Strategy for Increasing Health Awareness among Rural Communities

Improving health awareness among rural communities is essential for promoting maternal and infant health. The following points elaborate on strategies to enhance health awareness:

Health Education

Utilizing educational approaches to raise health awareness among rural communities about the importance of maternal and child healthcare. This can involve conducting workshops, seminars, and interactive sessions to educate community members about prenatal care, safe delivery practices, and postnatal care. Health education can also focus on dispelling myths and misconceptions related to healthcare practices.

Health Promotion

Conducting intensive health promotion campaigns through various media channels to raise awareness about maternal and child healthcare. This can include using radio broadcasts, posters, pamphlets, and community events to disseminate information about the importance of seeking healthcare services during pregnancy, childbirth, and postpartum. Health promotion activities can also involve engaging community leaders and influencers to endorse and support maternal and child healthcare practices. By implementing these strategies, healthcare providers and policymakers

can effectively increase health awareness among rural communities, thereby promoting healthier behaviors and reducing maternal and infant mortality rates.

Discussion

The current study supports the premise that maternal and infant death rates within rural areas cannot be attributed to one factor, rather are the product of the interplay of health, socioeconomic, cultural, and environmental factors. This multidimensionality resembles that of the WHO, which previews the so-called three delays model: delay in decision to seek care, delay to a facility, and delay to appropriate care as the main contributors to maternal mortality. There is always empirical evidence that such delays are worsened in rural settings, where remoteness, lack of transport and weak health facilities are daunting factors.

The ongoing inadequate supply of qualified health staff in the rural areas stands out as a vital piece of information, which is highlighted in the regional and global research. The lack of midwives or certified birth attendants leads to the development of the dependency on traditional practices that might not have empirical support and sometimes increase the risk of the mother. This finding is in agreement with other sub-Saharan Africa and Southeast Asian researchers who have found similar trends of maternal vulnerability in the context of limited human resources. To deal with this shortage, there is a need to not only increase the number of trained specialists but also to provide incentives to help find and keep them in underserved areas.

Socioeconomic limiting factors can be very central in determining maternal and infant outcomes. The low family income reduces access to healthy food, health services, and safer living environment- factors that are important to reduce death. Further, maternal education has been strongly correlated with improved health seeking practices and compliance with prenatal and postnatal health care. These results highlight the need to incorporate health initiatives with larger social policies which encourage poverty reduction, empowerment of women and education development to integrate maternal and infant mortality as a social justice problem and a health one.

Health behaviors and outcomes are also further moderated by cultural factors. In most rural societies, patriarchal structures or societal standards control decision-making on maternal health in that traditional means are more appropriate than modern medical care. Although cultural traditions are a part of the identity of the community, they might be among the causes of practices that are harmful, including delays in consultations as complications arise. Some past studies propose that the culturally sensitive approach to health promotion, which respects the values of the local people and still promotes safer practices, can be more sustainable in the long run when compared to the purely biomedical ones.

Materal and infant health outcomes interact with environmental conditions, such as poor sanitation, lack of water, and exposure to infectious diseases. The literature reviewed shows that these variables increase the vulnerabilities especially in the environment where accessibility to healthcare is already impaired. These lessons underscore the need to have intersectoral cooperation that cuts across health system to include infrastructural, hygienic and nutritional enhances.

CONCLUSION

Addressing maternal and infant health in rural areas requires a comprehensive approach that considers the complex interplay of factors such as limited access to healthcare services, environmental conditions, cultural practices, and social norms. Strategies to improve health outcomes include improving access to healthcare services, enhancing healthcare infrastructure, providing health education, and promoting healthy behaviors. Community health programs like Posyandu and Desa

Siaga are crucial in this effort. Understanding and respecting local cultural beliefs and practices is also essential for designing effective interventions. By implementing these strategies, governments, healthcare providers, and communities can work together to reduce maternal and infant mortality rates and promote healthier communities in rural areas.

REFERENCES

Adu, J., & Owusu, M. F. (2023). How do we improve maternal and child health outcomes in Ghana?. *The International Journal of Health Planning and Management*, *38*(4), 898-903. https://doi.org/10.1002/hpm.3639

Ahmed, J., Raynes-Greenow, C., & Alam, A. (2020). Traditional practices during pregnancy and birth, and perceptions of perinatal losses in women of rural Pakistan. *Midwifery*, *91*, 102854. https://doi.org/10.1016/j.midw.2020.102854

Alauddin, M. R. S., Ediyono, S., & Irwanto, A. (2023). The Role of Actors in The Desa Siaga Program in Watupute Village, Mowewe Subdistrict, East Kolaka. *International Journal Of Health Science*, *3*(3), 72-80. https://doi.org/10.55606/ijhs.v3i3.2874

Ali, A. (2021). Current status of malnutrition and stunting in Pakistani children: what needs to be done?. *Journal of the American College of Nutrition*, *40*(2), 180-192. https://doi.org/10.1080/07315724.2020.1750504

Chachar, A. S., & Mian, A. I. (2022). A Review of Intersection of Social Determinants and Child and Adolescent Mental Health Services: a case for Social Psychiatry in Pakistan. *World Social Psychiatry*, *4*(2), 69-77. https://doi.org/10.4103/wsp.wsp_23_22

Cumming, O., Arnold, B. F., Ban, R., Clasen, T., Esteves Mills, J., Freeman, M. C., ... & Colford, J. M. (2019). The implications of three major new trials for the effect of water, sanitation and hygiene on childhood diarrhea and stunting: a consensus statement. *BMC medicine*, *17*, 1-9. https://doi.org/10.1186/s12916-019-1410-x

Dagher, R. K., & Linares, D. E. (2022). A critical review on the complex interplay between social determinants of health and maternal and infant mortality. *Children*, *9*(3), 394. https://doi.org/10.3390/children9030394

Gizaw, Z., Astale, T., & Kassie, G. M. (2022). What improves access to primary healthcare services in rural communities? A systematic review. *BMC Primary Care*, *23*(1), 313. https://doi.org/10.1186/s12875-022-01919-0

Gurara, M., Muyldermans, K., Jacquemyn, Y., & Draulans, V. (2020). Traditional birth attendants' roles and homebirth choices in Ethiopia: A qualitative study. *Women and Birth*, *33*(5), e464-e472. https://doi.org/10.1016/j.wombi.2019.09.004

Kaneoka, M., & Spence, W. (2020). The cultural context of sexual and reproductive health support: an exploration of sexual and reproductive health literacy among female Asylum Seekers and Refugees in Glasgow. *International Journal of Migration, Health and Social Care*, *16*(1), 46-64. https://doi.org/10.1108/IJMHSC-01-2019-0002

Kwami, C. S., Godfrey, S., Gavilan, H., Lakhanpaul, M., & Parikh, P. (2019). Water, sanitation, and hygiene: linkages with stunting in rural Ethiopia. *International journal of environmental research and public health*, *16*(20), 3793. https://doi.org/10.3390/ijerph16203793

Ladak, L. A., Gallagher, R., Hasan, B. S., Awais, K., Abdullah, A., & Gullick, J. (2020). Exploring the influence of socio-cultural factors and environmental resources on the health related quality of life of children and adolescents after congenital heart disease surgery: parental perspectives from a low middle income country. *Journal of Patient-Reported Outcomes*, *4*, 1-12. https://doi.org/10.1186/s41687-020-00239-0

Louangpradith, V., Yamamoto, E., Inthaphatha, S., Phoummalaysith, B., Kariya, T., Saw, Y. M., & Hamajima, N. (2020). Trends and risk factors for infant mortality in the Lao People's Democratic Republic. *Scientific Reports*, *10*(1), 21723. https://doi.org/10.1038/s41598-020-78819-9

Mizutani, M., Moriyama, M., Sugiarto, H., & Bando, H. (2019). Challenges and Assets for Promoting Early Childhood Development in Indonesia: A Health Statistics Review from a Community Health Perspective. *Asian Community Health Nursing Research*, 20-20. https://doi.org/10.29253/achnr.2019.12011

Mohamoud, Y. A., Kirby, R. S., & Ehrenthal, D. B. (2019). Poverty, urban-rural classification and term infant mortality: a population-based multilevel analysis. *BMC pregnancy and childbirth*, *19*, 1-11. https://doi.org/10.1186/s12884-019-2190-1

Münzel, T., Sørensen, M., Hahad, O., Nieuwenhuijsen, M., & Daiber, A. (2023). The contribution of the exposome to the burden of cardiovascular disease. *Nature Reviews Cardiology*, *20*(10), 651-669. https://doi.org/10.1038/s41569-023-00873-3

Mutowo, J., Yazbek, M., van der Wath, A., & Maree, C. (2021). Barriers to using antenatal care services in a rural district in Zimbabwe. *International Journal of Africa Nursing Sciences*, *15*, 100319. https://doi.org/10.1016/j.ijans.2021.100319

Nickel, S., & von dem Knesebeck, O. (2020). Effectiveness of community-based health promotion interventions in urban areas: a systematic review. *Journal of community health*, *45*(2), 419-434. https://doi.org/10.1007/s10900-019-00733-7

Phommachanh, S., Essink, D. R., Wright, P. E., Broerse, J. E., & Mayxay, M. (2021). Maternal health literacy on mother and child health care: A community cluster survey in two southern provinces in Laos. *Plos one*, *16*(3), e0244181. https://doi.org/10.1371/journal.pone.0244181

Razu, S. R., Yasmin, T., Arif, T. B., Islam, M. S., Islam, S. M. S., Gesesew, H. A., & Ward, P. (2021). Challenges faced by healthcare professionals during the COVID-19 pandemic: a qualitative inquiry from Bangladesh. *Frontiers in public health*, *9*, 647315. https://doi.org/10.3389/fpubh.2021.647315

Sano, Y., & Mammen, S. (2022). Mitigating the impact of the coronavirus pandemic on rural low-income families. *Journal of family and economic issues*, *43*(2), 227-238. https://doi.org/10.1007/s10834-021-09800-5

Siddiqui, F., Salam, R. A., Lassi, Z. S., & Das, J. K. (2020). The intertwined relationship between malnutrition and poverty. *Frontiers in Public Health*, *8*, 453. https://doi.org/10.3389/fpubh.2020.00453

Vitale Brovarone, E., & Cotella, G. (2020). Improving rural accessibility: A multilayer approach. *Sustainability*, *12*(7), 2876. https://doi.org/10.3390/su12072876

Zhu, Y., Hedderson, M. M., Sridhar, S., Xu, F., Feng, J., & Ferrara, A. (2019). Poor diet quality in pregnancy is associated with increased risk of excess fetal

growth: a prospective multi-racial/ethnic cohort study. *International journal of epidemiology*, *48*(2), 423-432. https://doi.org/10.1093/ije/dyy285