International Journal of Community Medicine and Public Health
Shipanga V et al. Int J Community Med Public Health. 2024 Jan;11(1):363-370
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20234151

Systematic Review

The status of research on malnutrition among children under 5 years in Southern Africa: a systematic review

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Received: 09 November 2023
Accepted: 27 December 2023

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ABSTRACT

Malnutrition rates remain alarming with stunting declining too slowly while wasting still impacts the lives of many young children. Globally, 5.6 million children die before their fifth birthday annually, with 80% of these deaths occurring in Sub-Saharan Africa and Asia. A total of 29 most relevant articles were included, which followed the preferred reporting items for systematic reviews and meta-analyses for protocols (PRISMA-P). The literature search was conducted in multiple electronic databases, including Google Scholar, PubMed, and Research Gate. A large proportion of the literature focused on determining factors associated with malnutrition. Similarities were found amongst various articles with findings highlighting household food insecurity as a major threat that leads to inadequate feeding practices and consequently resulting in undernutrition. This review assessed the state of knowledge on malnutrition in Southern Africa. The authors identified knowledge gaps that should be considered for future research. We did not come across any evaluation studies assessing food security interventions in response to malnutrition. Moreover, sanitation in relation to malnutrition is not broadly researched. We recommend future studies to apply a cross-sectional analytic design with mixed methods, combining survey data, geographical data, household and key informant interviews. There is a need to map the prevalence of malnutrition in children under five years and providing more knowledge on vulnerability and contexts that influence malnutrition including socio-economic, environmental and infrastructural conditions. We further recommend the use of GIS databases to generate information on spatio-temporal patterns of malnutrition.

Keywords: Children, Malnutrition, Under-five years, Southern Africa

INTRODUCTION

Discussions of malnutrition tend to focus on undernutrition, but malnutrition also includes overnutrition. Undernourished children are wasted, stunted or underweight. Undernutrition occurs when a child takes in fewer nutrients than required for normal healthy functioning of the body. Overnutrition refers to children who are overweight or obese. Overnutrition is not considered in this essay.

Malnutrition refers to deficiencies or excesses in nutrient intake, imbalance of essential nutrients, or impaired nutrient utilization. The double burden of malnutrition consists of both undernutrition and overweight and obesity, as well as diet-related non-communicable diseases. Wasting is defined as low weight for height. It usually occurs when a person has not had food of adequate quality and quantity and/or they have had frequent or prolonged illnesses. Stunting is defined as low height for age. It is the result of chronic or recurrent undernutrition, usually associated with poverty, poor health and nutrition, frequent illness, and or inappropriate feeding and care in early life. Stunting prevents children from reaching their physical and cognitive potential. Underweight is defined as low weight for age. A child who is underweight may be stunted, wasted, or both.[1]

Adequate nutrition is critical to child development in the first two years of life, referred to as the critical window of opportunity, being important for optimal growth, health, and development. Unfortunately, this period is often marked by growth faltering, micronutrient deficiencies, and common childhood illnesses such as malaria, diarrhea, and acute respiratory infections.[2]

Malnutrition is a major public health issue, with alarming rates and stunting declining too slowly while wasting still impacts the lives of far too many young children.[3] While malnutrition can be caused by different factors, the path to prevention is fundamentally the same. This includes adequate maternal nutrition before and during pregnancy and lactation; optimal breastfeeding in the first two years of life; nutritious food; and a healthy environment, including access to basic health care, water, hygiene, and sanitation services.[3] These key ingredients can deliver a world where children are free from all forms of malnutrition.[3]

Globally, 5.6 million children die before their fifth birthday each year, with 80% of these deaths occurring in Sub-Saharan Africa and Asia.[4] Almost half of these deaths occur in children with malnutrition.[4] Strong epidemiological evidence suggests this is because of an elevated susceptibility to life-threatening infections among children with malnutrition.[4] The Southern Africa subregion is reported to have 12.1% average prevalence of overweight among children under five years while stunting is 23.3%, which is above the global average of 22%. Conversely, the prevalence of wasting is 3.2%, which is lower than the global average of 6.7%.[5]

Household's children need access to nutritious diets, and essential services, in order to prevent malnutrition. However, currently, these important pathways to good nutrition are mostly hindered by food insecurity, driven by poverty, conflict, climate change, and the enduring secondary effects of the COVID-19 pandemic.[6] It is evident that more intensive efforts are required towards achieving the global target of reducing the number of children with stunting to 89 million by 2030.[6] According to a report by WHO, the evolution of food insecurity in Africa has been increasing rapidly since 2016. The highest rates of food insecurity were observed in Sub-Saharan Africa which affects about 60 percent of the population.[7]

Despite concerted efforts to address poverty, there are still challenges with food security. According to a 2016 United Nations children's fund (UNICEF) and world bank study, 385 million children lived in extreme poverty around the world in 2013. More than 80% of these children lived in rural areas. They live in situations where they are more likely to be underfed and malnourished, they eventually fall sick, and end up not completing school. As a result, they fall back into poverty in the aftermath of drought, disease, or economic instability. Poor children are also least likely to have access to safe water and adequate sanitation, receive preventative healthcare such as vaccinations, and when ill are less likely to get adequate medical care.[8]

The literature confirmed that malnutrition is a critical public health problem in children under five years and requires concerted efforts and multisectoral response.[9] The findings highlight that various factors such as demographic status, social and economic status and governments' priorities in addressing food insecurity are key attributes to the status of malnutrition in Southern Africa.

We mapped the literature to understand what has been researched in the past and discuss possible future research. This systematic review paper aims to determine the state of knowledge in malnutrition for children under five years in Southern Africa. The main objectives were to compare the research methodologies applied in various studies, compare the findings and limitations and ultimately identify the gaps. Therefore, this manuscript contributes to the literature by providing evidence of the state of research related to malnutrition in children under five years conducted in Southern Africa during the last 10 years (2013-2023).

LITERATURE SEARCH

The review followed a structured systematic process to determine the status of literature on malnutrition in children under 5 years in Southern Africa. The review was performed in accordance with the PRISMA. It helps authors to improve the reporting of systematic reviews and meta-analyses.[10]

The following research questions guided the review: What research has been conducted in the field of malnutrition? Which methods were used? And what gaps are available in the literature?

Inclusion criteria

Articles that focused on malnutrition in children under 5 years, original studies on malnutrition with clear aims, objectives, and clearly defined methodology and articles published in peer-reviewed journals, between 2013 and 2023 were included.

Exclusion criteria

Systematic/literature review articles and conference papers were excluded.

A qualitative systematic review approach was adopted. A qualitative systematic review brings together research on a topic, systematically searching for research evidence from primary qualitative studies and drawing the findings together.[9] The PICO (Population, intervention, comparison, outcome, settings) framework to develop the search strategy was used to search for literature related to

the topic with a research question "What is the state of knowledge on malnutrition for children under 5 years? Results were saved in a folder, entered in a literature review catalog (Excel sheet), and were later filtered to remove duplicates. An eligibility assessment was conducted to include the most relevant articles.

For this review, a comprehensive systematic literature search was carried out in multiple electronic databases, including Google Scholar, PubMed, and Research Gate. The searches were conducted from November 2022 to June 2023. The literature search was limited to articles in English that were published, during the period 2013-2023. This period was considered representative because it allows for a sufficient sample.

The keywords used for search strategy were: Malnutrition and children and 'Southern African Countries.

Articles were screened based on the above-mentioned inclusion and exclusion criteria. The screening started with a scanning of abstracts and further reading on the methodology, results, and conclusions. Secondly, we used the PRISMA 2020 checklist to include articles that met the inclusion criteria and were deemed necessary for this review. PRISMA was found to be appropriate because it covers concepts and topics relevant to any systematic review. Similar articles were found in the different databases and duplicates were removed. The final number of articles selected was 29. Figure 1 shows the literature search results in PRISMA flow diagram depicting identification, screening process and the articles included.

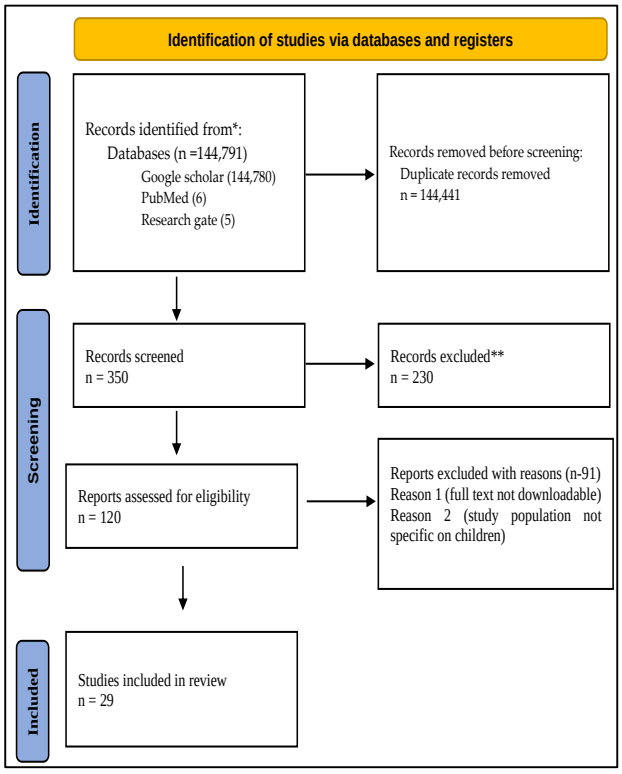

Figure 1: PRISMA flow diagram.

The quality of studies was considered through the assessment of methods used and the validity of the results obtained. We extracted data from the articles and transferred it to an Excel sheet (data catalogue) which included characteristics of the studies such as the author(s), year of publication, title, aim/objectives, key conclusion(s), recommendations, context, methodology, sample size, and limitations of the study.

We used the UNICEF framework (Figure 2) for malnutrition as a starting point to match results of the selected articles to this framework. Basic causes of malnutrition are reported to be related to economic and human resources which lead to inadequate care for children, inadequate access to food, and unhealthy environment such as no access to clean water.

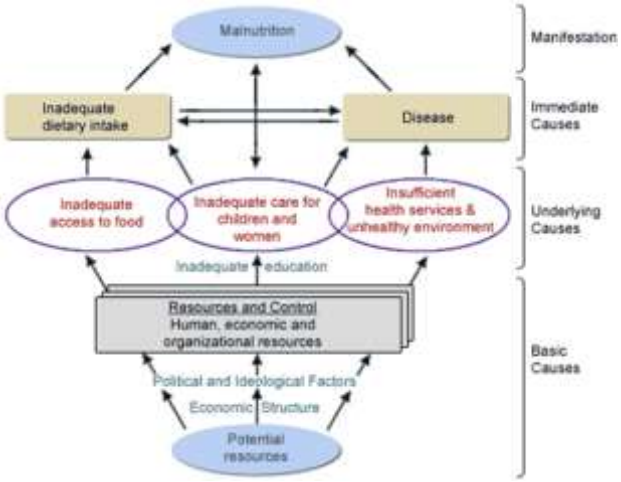

Figure 2: UNICEF nutrition conceptual framework.

DISCUSSION

This systematic review gives an overview of the available literature on malnutrition research targeting children under five years in Southern Africa. The review included 29 articles that met the inclusion criteria, conducted in any setting with a target population of children under five years. The findings highlight the current knowledge on malnutrition in children under five years, the research methodologies applied, and limitations of the studies.

Current knowledge on malnutrition in children under five years

Half of the 29 studies reviewed sought to determine the factors associated with malnutrition. Other studies focused on various aspects such as quantifying the socio-economic inequalities in the double burden of child malnutrition, further analysis of childhood malnutrition, determining the relationship between stunting and overweight among children. Other studies focused on the examination of the role of mothers' empowerment in the reduction of malnutrition, development and testing of a screening tool for community use in predicting growth

stunting, as well as assessing the nutritional status of children under five years of age with acute diarrhea. Zambia and Namibia came out with the highest number of articles. Majority of reviewed articles used secondary data from household surveys and hospital-based data. The literature shows that socio-economic and demographic status are the main factors associated with malnutrition.

Determinants for severe acute malnutrition (SAM) in children under the age of five years identified in a study conducted in Angola include socio-demographic factors, poor breastfeeding practices, marital status, and the household's geographical location.[11] These findings are in agreement with studies conducted in Angola, Malawi and Senegal[12] which confirmed that the type of residence, sex of the child, age of the child, mother's level of education, birth interval, and wealth index are statistically significant risk factors of malnutrition. Review shows that children residing in rural areas are at higher risk of being affected by malnutrition than those residing in urban areas. Moreover, it is highlighted that age of child and maternal overweight/obesity are predictors of stunting and underweight, while having younger mother and access to water protective against being underweight.[13] Similarly, a study conducted in Namibia[14] concluded that malnutrition prevalence was observed to be significantly ($p \leq 0.001$) associated with children aged between 12-23 months. Equally, highest prevalence of malnutrition was found amongst children under 5 years with mothers/ caregivers aged 18-30 years. Mother/caregiver low educational level came out as strong predictor of malnutrition.[14] Authors emphasized that it is imperative for governments to implement strategies that can reduce inequalities in effort to minimizing the basic causes of malnutrition.

A study carried out in Namibia concluded that malnutrition among children under five years is associated with the age of mothers/caregivers, marital status, unemployment, educational level, limited duration of breastfeeding, and late introduction of complementary feeding.[15] The literature depicts no association between maternal occupation and any of the undernutrition indicators.[16] The results showed that the overall duration of breastfeeding as well as the duration of exclusive breastfeeding, and the time of initiation of complementary feeding were significantly related to stunting. The authors rather conclude that there is an association between maternal occupation and malnutrition. Depending on the type of occupation the mothers hold, it can have an influence on the type and number of meals that they feed their families. Childhood stunting was reported to progressively rise with the age of the child up to 24 months, and the findings show that males are more vulnerable to childhood stunting compared to their counterparts.[17] Socioeconomic status (wealth index) and residence status were highlighted as significant predictors of food insecurity and malnutrition. Availability and variety of food in the household heavily relies on economic status.[17] Authors identified mothers' educational level and unemployment as factors ranked high amongst others.

Severely stunted children were particularly found in male-headed households, rural areas, poor households, with mothers who had low education, and with health conditions such as diarrhea, and with HIV-positive. Inversely, child age and duration of breastfeeding had significant non-linear effects on severe childhood stunting.[18] However, literature confirms significant positive structured spatial effects on severe childhood stunting.[18] This calls for need to empower mothers on best feeding practices in order to reduce risk of malnutrition.

Most of the mothers and their children in South Africa are reported to have lived within a depressed socio-economic status, as a result of unemployment rate (82.3%) and a dependency on social grants (86.8%).[19]

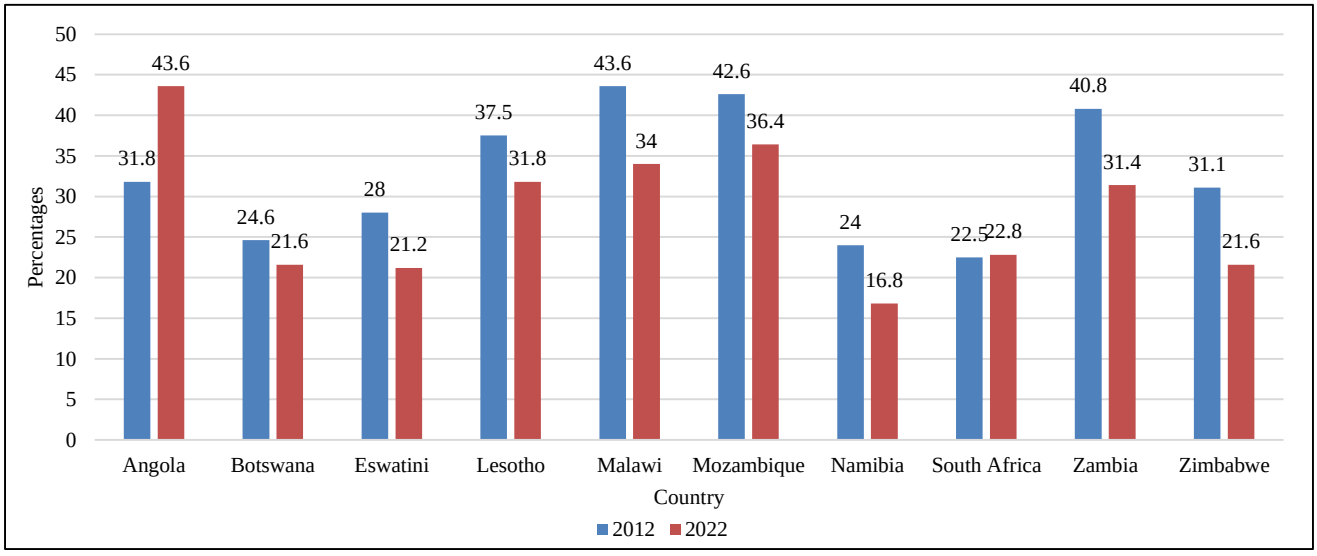

Figure 3: Prevalence of stunting in Southern Africa, 2012 and 2022.

UNICEF, WHO, international bank for reconstruction and development/the world bank.; 2023.

The review found substantial inequalities in child stunting within Southern Africa with incidence of stunting concentrated among children living in households with low socio-economic status. Similar to other studies the review highlights significant contributions of child, maternal, and household characteristics to inequalities in child stunting.[15,16] From these articles, it is clear that unequal wealth distribution plays a major role in food insecurity and undernutrition.

Figure 3 above, shows that although declines have been observed in stunting, some Southern African countries still experience high prevalence rates. Angola is reported to have the highest prevalence rate (43.6%) of stunting as reported in 2022 and the only country with an increase between 2012 and 2022. Mozambique, Malawi, Lesotho and Zambia have relatively high prevalence rates while Namibia is reported to have the lowest prevalence rate (16.8%).

It is observed that there is an association between acute malnutrition and a child's health outcomes that are generally linked to poor living conditions and the independent effects of shocks.[20] Agrifood systems remain highly vulnerable to shocks and disruptions arising from conflict, climate variability and extremes, and economic contraction. These factors, combined with growing inequities, keep challenging the capacity of agrifood systems to deliver nutritious, safe and affordable diets for all. Any kind of shock threatens the livelihoods of households, and eventually leads to malnutrition.[21] In a Namibian study entitled "Factors contributing to the development of undernutrition in children under the age of 5 years in Oshikoto Region" concluded that poor feeding practices, household food insecurity, and financial difficulties have greatly impacted the nutritional status of children under the age of 5 years.[22] A study conducted in Zambia highlighted the important aspects concerning risk factors that are associated with severe malnutrition in children with disabilities in low middle income countries (LMIC). It is reported that the risk factors for severe malnutrition among children with Cerebral Palsy are more related to the severity of the condition and caring practices.[23] Furthermore, the literature highlights significant determinants of severe childhood stunting as attributed to socio-demographic, child and maternal factors.[24] This particularly refers to those who belong to male-headed households, living in rural residences, whose mothers had low education, with frequent exposure to diarrhea, with human immunodeficiency virus (HIV) positive status, and belonging to poor households. It is concluded that child age and duration of breastfeeding had significant nonlinear effects on severe childhood stunting.[24] These studies present evidence that proper care of children is key to their well-being.

While different analytical methods exist, some may result in variations in stunting and wasting prevalence. However, it is indicated that PROBIT is the best method because it takes into account poor quality anthropometry and is best to use it when poor data quality is suspected. The importance of high-quality anthropometric data in public health was highlighted and is relevant to other low- and middle-income countries with similar data quality issues in child anthropometry.[25]

In Zambia, it is observed that malnutrition in children is dependent on birth weight of the child, number of meals given to a child in a day and the mother's knowledge about malnutrition.[26]

Stunting, and wasting prevalence is concentrated in the lowest wealth quintile and maternal education level in the Eastern and Southern African Region.[27] Consistent and in agreement with observations from other authors, a study conducted in Botswana confirms that the variation in nutritional status of under-five children is a function of characteristics of the households and communities within which they live.[28] Children in households with low resources are more vulnerable to unhealthy conditions compared to those in well-resourced households. Similarly, at the individual child level, the age of the child influences all the variables while the influence of birth-weight and gender on the child's growth depend on the nutritional indicator being considered.[28]

Like in all other Southern African countries, stunting prevalence is of particular concern in Mozambique since it reflects long-term structural factors of undernutrition.[29] This reveals the need for continuous efforts to reduce the high prevalence rate.

Child age and preceding birth interval had significant nonlinear effects on childhood overweight (including obesity). Furthermore, significant spatial and temporal effects on childhood overweight (including obesity) were observed in Namibia between 2000 and 2013.[18] This is confirmed by an increasing trend in overweight/obesity in children and women observed across Malawi, Namibia and Zimbabwe. The likelihood of undernutrition in children affected mostly boys and children from low wealth status, and mothers with low level of education.[31]

Regrettably, severe malnutrition among admitted children in a Mozambican setting was found common but frequently went undetected.[31] To prevent malnutrition among children, identifying risk of growth stunting is a crucial first step. Specifically, the findings highlight that health care workers can be trained to conduct proper assessment and surveillance of malnutrition in order to prevent the severity of the condition. The development of a screening tool can therefore provide an opportunity for an early detection of malnutrition cases.[32]

The literature highlights the basic sanitation conditions and family structure as important predictors of the nutritional deficit among children under 5 years old in Angola.[33] Similarly, in Namibia the most significant contributors to under-five malnutrition are inappropriate

feeding practices, poor hygiene, and sanitation as well as poor nutrition.[34] Sanitation and hygiene practices can make significant differences in halting the cycle of infectious diseases and undernutrition.[22] It is however observed that sanitation in relation to malnutrition is under researched.

In the light of evidence about the effects of an urbanised lifestyle within the nutrition transition, further analysis performed in South Africa shows a significant negative association between body mass index (BMI) and height-for-age (HAZ), with more overweight children than normal weight and underweight children being stunted.[34]

Research methods applied

While various data collection methods exist, 48 percent of the articles used secondary data. Secondary data sources include demographic and health surveys (DHS), multiple indicator cluster surveys (MICS), nutrition surveys, family health surveys, national food consumption surveys, and hospital-based data. Cross-sectional studies proved to be common while case studies and interviews were the least applied research methods.

Several studies used data from cross-sectional surveys and therefore causal inferences were not feasible and the available data from different years may have limited the comparisons. Evidence of causal relationships between food insecurity and malnutrition and socioeconomic variables. Survey data may be outdated; therefore, the conclusions may not reflect the true reflection due to the fact that contributing factors may have changed. We therefore recommend longitudinal studies in order to measure change in populations.

Although different research methods applied were regarded as the most appropriate ones, limitations were also highlighted. These include the representativeness of the sample, whereby the results may not be generalized to the whole population; biases attributed to retrospective studies. For hospital-based records, limitations were experienced on the amount and quality of information based on available data.

Gaps in the malnutrition literature

The review concluded that although malnutrition is regarded as a threatening condition, not much research in this field is conducted in Southern African countries. It is therefore of utmost importance that in-depth research is conducted in order to understand the dynamics of this phenomenon.

We recognized the need for further research using other methodologies such as analytical cross-sectional design with mixed methods of quantitative and qualitative approaches. This would provide more knowledge of vulnerability and the contexts that influence malnutrition in children under five years. We recommend a GIS-based solution by mapping the prevalence and illustrating the geographic/spatial distribution to depict the intensity of malnutrition among children under five years. Spatial analysis helps in identifying hotspots that may need more interventions. Therefore, regression methods/models and spatial statistics can be applied to explore the impact of socio-economic, environmental and other geographic factors on malnutrition. The authors did not come across any evaluation studies aiming to assess the interventions of food security. Moreover, sanitation in relation to malnutrition is not broadly researched. The studies conducted in Southern Africa focused mainly on identifying factors associated with malnutrition. While it is important to understand the interactions between food systems and nutrition, out of the reviewed articles, only one was based on the nutrition survey.

The published literature claims that there is a need for Clinicians to be proactive in assessing the risk of malnutrition.[11] Furthermore, it is recommended that future studies should focus on incorporating mothers' dietary explanatory variable(s) before and after giving birth.[12]

CONCLUSION

This systematic review provides an overview of the available literature on malnutrition in children under-five years in Southern Africa. The review identified a number of key themes in relation to the contributing factors of child malnutrition, with household food insecurity identified as a major threat. Addressing these issues requires concerted efforts, we therefore, emphasise the importance of empowering mothers/ caregivers with knowledge on good feeding practices as well as general care of children, in an effort to having a positive impact on the nutrition and health status of the children. This article brings attention to the negative impact that Poverty contributes to the well-being of the children in Southern Africa. However, gaps were identified concerning the state of knowledge on this topic and thus we recognized the need for further research to provide more knowledge on vulnerability and the contexts that influence malnutrition in children. This will contribute to the limited body of literature and could further guide national policy formulations that can reduce food insecurity.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Shipanga V, Kappas M, Wyss D. The status of research on malnutrition among children under 5 years in Southern Africa: a systematic review. Int J Community Med Public Health 2024;11:363-70.