Public Health 234 (2024) 91–97

Contents lists available at ScienceDirect

Public Health

journal homepage: www.elsevier.com/locate/puhe

Themed Paper– Original Research

Quality of nutritional status assessment and its relationship with the effect of rainfall on childhood stunting: a cross-sectional study in rural Burkina Faso

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A R T I C L E I N F O

Article history:
Received 27 September 2023
Received in revised form
8 May 2024
Accepted 11 May 2024

Keywords:
Climate change
Rainfall
Health system
Primary health care
Quality of nutrition status assessment
Stunting

A B S T R A C T

Objectives: In Burkina Faso, one in every four children under 5 years is stunted. Climate change will exacerbate childhood stunting. Strengthening the health system, particularly the quality of nutrition care at primary health facilities, can minimise the adverse climate effect on stunting. Thus, we examined the quality of nutritional status assessment (QoNA) during curative childcare services in primary health facilities in rural Burkina Faso and its relationship with rainfall-induced childhood stunting.
Study design: We conducted a cross-sectional analysis using anthropometric, rainfall, and clinical observation data.
Methods: Our dependent variable was the height-for-age z-score (HAZ) of children under 2 years. Our focal climatic measure was mean rainfall deviation (MRD), calculated as the mean of the difference between 30-year monthly household-level rainfall means and the corresponding months for each child from conception to data collection. QoNA was based on the weight, height, general paleness and oedema assessment. We used a mixed-effect multilevel model and analysed heterogeneity by sex and socio-economic status.
Results: Among 5027 young (3–23 months) children (mean age 12 ± 6 months), 21% were stunted (HAZ ≤ -2). The mean MRD was 11 ± 4 mm, and the mean QoNA was 2.86 ± 0.99. The proportion of children in low, medium, and high QoNA areas was 10%, 54%, and 36%, respectively. HAZ showed a negative correlation with MRD. Higher QoNA lowered the negative effect of MRD on HAZ ($\beta = 0.017$, $P = 0.003$, confidence interval = [0.006, 0.029]). Males and children from poor households benefited less from the moderating effect of QoNA.
Conclusion: Improving the quality of nutrition assessments can supplement existing efforts to reduce the adverse effects of climate change on children's nutritional well-being.

Introduction

Globally, more than 140 million children under five experience linear growth delays (stunting). Sub-Saharan Africa (SSA) has the

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https://doi.org/10.1016/j.puhe.2024.05.020
0033-3506/

highest prevalence of children with stunted growth. Stunting children are too short for their age, a condition that indicates chronic malnutrition. It is caused by a combination of factors such as maternal malnutrition during pregnancy, inadequate breastfeeding and food intake, or an inability to absorb nutrients due to sickness in early childhood.[2] Research has demonstrated that children who experience stunting during the first 1000 days may not make up for it in later growth phases [3] and are at risk of long-term repercussions, that is, obesity and cardiometabolic diseases.[1]

Climate change is a crucial driver for many factors associated with stunting.[2,3] The Sahel region in SSA is vulnerable to extreme climatic conditions, coinciding with a high prevalence of stunting.[3,4] Studies[5–7] have shown that changes in climatic factors significantly affect children's nutritional status by altering agricultural productivity, food security, and disease patterns.[7] The changing climatic conditions might amplify stunting prevalence,[8] compromising previous advances toward the UN's Sustainable Development Goal target 2.2 of halving stunting prevalence by 2030 (based on 2012 prevalence).[4]

Burkina Faso lies in the Sahel region of SSA, with a population of 20.5 million.[9] About 70% of the population resides in rural areas characterised by subsistence and rain-fed farming,[9] thereby vulnerable to climatic changes. One in every five children under 5 years is stunted,[5,6] and under-five mortality is 82 per 1000.[10] Climatic changes negatively impact childhood stunting and mortality through reduced food production, availability and diversity.[6,11–13] This trend will continue under future climatic scenarios.[8] The health system, dominated by primary health facilities (Centre de Santé et Promotion Sociale[14]) in the Burkinabe context, has contributed substantially to reducing childhood stunting since 1990.[15]

The capacity of the health system to avert climate-induced undernutrition will be crucial.[16] However, climate adaptation and resilience plans insufficiently consider health system strategies.[17] Efforts to build health system capacity in low-income countries have focused less on the quality of care (QoC),[18,19] defined by the Institute of Medicine 'as the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.[20]' The pressure of climate change on an overstretched health system in climate-vulnerable areas will manifest as poor-quality healthcare delivery.

Already, most health facilities in low- and middle-income settings fail to provide high-quality child healthcare services.[21–23] Evidence from eight low- and middle-income countries showed that QoC is not a byproduct of other health system improvements, such as infrastructure.[24] Thus, improving healthcare quality has to be prioritised on its own. Disregarding the QoC has severe consequences on the population's health. Kruk et al.[19] found that the provision of poor healthcare quality resulted in more deaths compared with the non-utilisation of health services.

Few advances have been made in measuring the quality of nutritional care services.[25] So far, no study has explored the deficits in the quality of nutritional status assessment (QoNA) and how they affect the association between climate and stunting. This paper seeks to address this research gap. First, we investigate the QoNA in primary health facilities in rural Burkina Faso. Second, we examine how the quality of a child's nutritional status assessment (QoNA) provided by primary health facilities affects the association between rainfall deviation (proxying climatic change) and stunting in children aged 3–23 months (hereafter referred to as young children) in rural Burkina Faso. We focused on 3–23 months because these months have been identified as the crucial period in a child's stature growth,[26,27] and nutritional assessment is frequent within this age range due to the routine postnatal and vaccination visits.[28] Furthermore, we examine the role of sex and socio-economic status (SES) differences in moderating the effects of QoNA.

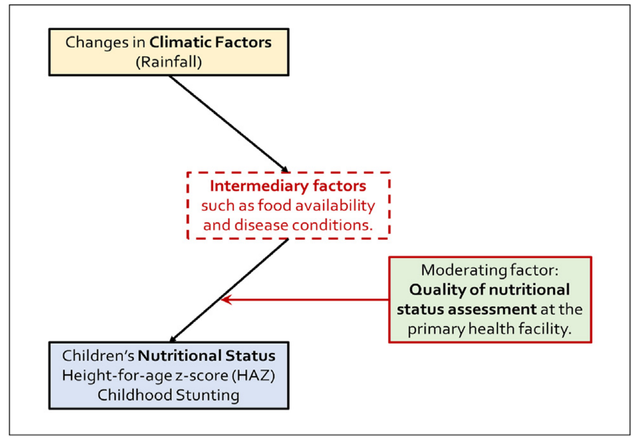

Fig. 1. A simplified conceptual framework showing the pathway from changes in climatic factors to children's nutritional status and how the quality of nutritional status assessment at the primary health level can moderate this relationship.

Methods

Conceptual framework

Climate change has a negative impact on the availability of food and related diseases[6,11] (see Fig. 1), which leads to a poor nutritional state, which affects children's growth and development.[12,13] Quality nutritional care services at the primary healthcare level can reduce the negative effect on children's nutritional status.[29]

Study design

We used a cross-sectional study design, pooling three data sources: a household survey, a health facility survey, and high spatial resolution rainfall data from the Climate Hazards Infrared Precipitation with Stations (CHIRPS). The household and health facility survey data originated from the endline survey of the impact evaluation of Burkina Faso's Performance-Based Financing intervention,[30] which we used independently of the intervention. The data were collected between April and June 2017 in 24 health districts distributed in six regions (see Fig. 3 in Appendix 1).

Data sources

The primary sampling unit was the health facility, with villages selected for the household survey within the facility catchment area (one per facility). For the health facility survey, trained enumerators observed and scored primary healthcare workers (PHW) attending to sick young children. The trained enumerators evaluated the PHW with a standard checklist based on their adherence to integrated management of childhood illnesses clinical guidelines (IMCI). All observations happened on a single day for each facility. We used data for 1111 young children who visited 455 facilities with new illness cases (those with diarrhoea, fever, difficulty breathing, ear problems and vomiting as the principal complaints). Reviews or follow-up visits were excluded as IMCI guidelines do not apply (Fig. 3a).

For the household survey, 15 households in each village were randomly selected based solely on the criterion of having had a pregnancy in the household within the past 24 months.

Information was collected on all members of each household.[30] We used the anthropometric data of 5027 young children and the information on their caregivers and household characteristics (Fig. 3b). We assumed these children accessed healthcare services from the primary health facility, which serves their catchment area, with an average household distance to a health facility of 5 km.[5] Given the free healthcare policy for children since June 2016, we can assume that practically all children seek care at least once during a given year, enjoying the probability of being screened and handled for mulanutruítion.[31] Our recent data show that on a single illness episode, more than 80% of all illness episodes result in a consultation.[14,31]

For measuring rainfall, we used high spatial resolution (4.8 km) data from monthly data sets of CHIRPS.[32] We extracted monthly rainfall estimates for the households in the household survey. We used household instead of village coordinates to capture accurate information for households on the outskirts of villages. To extract the rainfall values, we first masked out the relevant CHIRPS cells for Burkina Faso. Subsequently, we linked each household coordinate to its closest CHIRPS grid centroid and extracted the amount of rainfall within the grid cell closest to the household.

Variables and their assessments

Outcome variable – childhood stunting

We operationalised childhood stunting as a height-for-age z-score (HAZ). HAZ uses children's age and height (recumbent length) to track their linear growth.[33] Since HAZ is sensitive to age measurement, the enumerators meticulously verified the child's age from available vaccination booklets, caregivers' responses and data consistency checks. We used the WHO Child Growth Standards embedded in the Stata igrowup package to compute HAZ.

Exposure variable – mean rainfall deviation

Rainfall deviation (anomaly) has been found to explain variation in the HAZ of young children.[34] We used the *mean rainfall deviation* (MRD) as the focal climatic factor. MRD is a variant of cumulative rainfall deviation used in hydrological studies to estimate excess or deficit rainfall over time.[35] MRD computation involved three steps: First, using the CHIRPS data, we computed the monthly average rainfall amount over the last 30 years (from June 1987 to June 2017). Then, we computed the age of every child from conception to the survey date (hereafter referred to as the child's age for simplicity) from the survey data. After merging the two data sets, we computed the rainfall deviation between each month of the child's age and the 30-year monthly rainfall average. We finally computed the MRD by summing the monthly rainfall deviation over the child's age and dividing it by the child's age in months. MRD captures the mean rainfall exposure for each child from conception to their current age.

Moderator variable – quality of nutritional status assessment

We focused on measuring the quality of nutritional care by examining the clinical assessment of undernutrition symptoms in ill children. Applying the IOM definition,[20] we describe the quality of nutritional care as the degree to which nutritional health services for children under five reduce the risk of malnutrition. In this study, we narrow down nutritional care services, focusing on the nutritional status assessment – assessing weight, height, signs of anaemia (low haemoglobin levels) and oedema (excess fluid) following the IMCI guideline.[36] To measure this, we created an indicator variable based on these four clinical actions (Table 2 in the Results section). Low weight indicated acute undernutrition, while low height indicated chronic undernutrition. Acute and chronic undernutrition were found to be strongly connected,[37] with acutely undernourished children often becoming chronically undernourished within 3 months.[37] In addition, anaemia and oedema served as clinical signs of undernutrition.[25] These four clinical actions collectively provided a comprehensive means of routinely checking for undernutrition signs during primary healthcare visits for children.[36]

We assigned points to each observed clinical action (Table 2). To determine facility scores, we calculated the mean score points across case observations per facility. These scores were then categorised as low (0–1), medium (2–3) and high (4/all) quality. To ensure the robustness of our categorisation, we used two alternative approaches (description in Appendix 6.2). We assigned each child the QoNA score of the catchment primary health facility.

Statistical analysis

We described the study population with means, standard deviations (SDs; for continuous variables), and percentages (for categorical variables). We fitted a multilevel mixed-effect model due to the hierarchical structure of the survey data. We specified a four-level model with child-level factors as the first level, household at the second, health facility at the third, and health district at the fourth to control for both measured and unmeasured differences at each level of clustering.[38] We included interaction terms between QoNA, MRD and HAZ to examine whether improvement in QoNA minimises MRD's effect on HAZ. For the interactions, we reported the average marginal effect, which is the marginal effects at every observed value of MRD averaged across the effect estimates. The models (1–6) are mathematically expressed in Appendix 6.4.

As a sensitivity analysis, we tested the different categorisations of QoNA. Also, we tested with a QoNA indicator of only height and weight, regarded as the most relevant indicators for chronic undernutrition. Finally, we conducted a heterogeneity analysis to disaggregate the moderating effects of QoNA by sex and SES. All analyses were conducted using Stata/IC 15.1. StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC.

Results

Characteristics of the study population

Table 1 presents the characteristics of 5027 children aged 3–23 months with complete data. The mean age was 12 months (SD 6); 50% were boys, and 21% showed stunting. The mean MRD was 11 mm (SD 4; see Appendix Table A1 & A2 for the detailed MRD). Most children were located in areas of facilities with medium QoNA; the mean distance to the nearest facility was 5.2 km (SD 6.2), and the workload for health professionals was heavy (Table 1). In the 455 facilities, 89% of children got weight measurements, 71% had pallor (paleness) examinations, and two-thirds got assessments of length and oedema, respectively (Table 2). The mean age of caregivers was 28 ± 7 years, 79% were illiterate, and children lived in households with a mean of seven people (SD 4; Table 1).

In high QoNA facilities, children were exposed to the lowest MRD, the proportions of stunting were highest, and the mean wealth score was lowest (Table 1). These facilities also had the lowest caseload per staff. The age and literacy level of caregivers, the number of people in the household, and the distance to the nearest health facility were similar between the QoNA categories.

Main results

QoNA moderates the associations between rainfall deviation and HAZ

Table 3 combines the regression estimates from four models: (1) unadjusted model (1) of the associations of MRD with HAZ, (2)

Table 1
Description of the study sample organised by the level of quality of nutrition status assessment (QoNA).

	Total	Low QoNA	Medium QoNA	High QoNA
Number of CSPS	450	44	239	167
Number of children (3–23 months)	5027	510	2727	1790
Child and caregiver characteristics				
Mean (SD)				
Age in months	12.35 (5.97)	11.98 (5.91)	12.36 (5.97)	12.45 (5.97)
Length in cm	71.99 (6.64)	71.94 (6.71)	72.05 (6.57)	71.92 (6.74)
Height-for-age z-score	−0.82 (1.59)	−0.69 (1.65)	−0.78 (1.56)	−0.91 (1.60)
Mean QoNA score	2.86 (0.99)	0.94 (0.29)	2.54 (0.51)	3.89 (0.19)
Mean rainfall deviation in millimetre	10.60 (4.49)	11.61 (3.77)	10.57 (4.53)	10.36 (4.57)
Caregiver's age in years	28.18 (6.87)	28.37 (6.74)	28.33 (6.92)	27.89 (6.82)
Percentage of:				
Stunting	20.73	19.22	20.39	21.68
Male	50.01	53.14	48.81	50.95
Born during:				
Off-season harvest	29.49	29.37	29.38	29.69
Sowing and growing	34.50	31.35	35.12	34.45
Main harvest	36.01	39.29	35.49	35.86
Caregiver education (% illiterate)	78.99	80.00	78.33	79.72
Household and health facility characteristics				
Mean (SD):				
Wealth index	0.05 (0.96)	0.01 (0.97)	0.10 (0.98)	−0.02 (0.91)
Household size in number of people	7.46 (3.86)	7.38 (3.86)	7.56 (3.95)	7.32 (3.71)
Distance to a health facility in kilometre	5.20 (6.20)	5.81 (10.34)	4.97 (7.42)	5.37 (8.61)
Caseload per clinical staff	63.26 (57.07)	63.81 (42.59)	63.78 (59.84)	62.00 (56.35)

CSPS, Centre de Santé et Promotion Sociale; SD, standard deviation.

Table 2
Description of the quality of nutritional status assessment for four clinical actions using the PHW-patient observation data for under two sick outpatient visits ($N = 1111$).

Nutritional clinical actions	Total sick child cases	Low (0–1) assessment quality	Medium (2–3) assessment quality	High (All 4) assessment quality
Number of CSPS	455	44	243	168
Number of sick child cases	1111	109	590	412
Weight measured (%)	88.79	45.45	88.89	100.00
Length/height measured (%)	65.71	2.27	55.56	97.02
Pallor assessed (related to anaemia) (%)	70.77	20.45	61.73	97.02
Pressed both feet (related to oedema) (%)	64.40	20.45	51.85	94.05
Mean (SD) score for the quality of nutritional status assessment (0–4)	2.89 (0.98)	0.92 (0.29)	2.56 (0.51)	3.89 (0.19)

CSPS, Centre de Santé et de Promotion Sociale; SD, standard deviation.

Table 3
Multilevel regression results on the moderating effect of the quality of nutritional status assessment (QoNA) on the relationship between mean rainfall deviation (MRD) and height-for-age z-score (HAZ), $N = 5027$.

Outcome: Height-for-age z-score	Model 1: Unadjusted model		Model 2: Adjusted, No interaction		Model 3: Interaction using continuous QoNA		Model 4: Interaction using categorical QoNA	
	Coef. (SE)	95% CI	Coef. (SE)	95% CI	Coef. (SE)	95% CI	Coef. (SE)	95% CI
Mean rainfall deviation (MRD)	−0.148*** (0.017)	−0.181, −0.115	−0.010 (0.017)	−0.043, 0.022	−0.065*** (0.025)	−0.113, −0.016	−0.069** (0.028)	−0.122, −0.015
Interactions								
Continuous QoNA								
MRD# QoNA score#MRD					0.017*** (0.006)	0.006, 0.029		
Categorical QoNA								
MRD# low QoNA							−0.045** (0.019)	−0.082, −0.008
MRD# medium QoNA							0.004 (0.008)	−0.013, 0.022
MRD# high QoNA							0.017* (0.011)	−0.004, 0.038
Categorical pairwise comparison								
MRD# (medium-low QoNA)							0.049** (0.021)	0.009, 0.090
MRD# (high-low QoNA)							0.062*** (0.021)	0.020, 0.104

CI, confidence interval; Coef., coefficient; SE, standard error.
Note: This table focuses on only the estimates of interest. Models 2–4 were adjusted for the child's age (months), sex (male/female), the season of birth (off-season harvest, sowing and growing, main harvest season), caregiver's age (in years) and literacy (illiterate/literate); household size (number of people living in the household), socio-economic status (SES), distance to the nearest health facility; and for each facility, the number of under-five cases per staff seen in the last month before the survey. We also omitted quadratic MRD, single variable estimates of continuous and categorical QoNA.
***$P < 0.01$, **$P < 0.05$, *$P < 0.1$. The full results for each model are in Appendix Table A3.

adjusted model without interaction (Model 2), (3) adjusted model with interaction using continuous QoNA (Model 3), and (4) adjusted model with interaction using categorical QoNA (Model 4). In the unadjusted model 1, a 1 mm increase in MRD tended to decrease HAZ (beta: −0.148; 95% confidence interval [CI]: −0.181, −0.115; $P = 0.000$). The effect size decreased when we adjusted for the child's age (months), sex, season of birth, caregiver's age (in years) and literacy, household size, SES, distance to the nearest health facility and for each facility the number of under-five cases per staff seen in the last month before the survey in model 2 (covariate description in Appendix 6.3), and added interaction terms in Models 3 and 4.

In Model 3, an increase in the 1-score point of QoNA reduced the negative effect of MRD on HAZ by 0.017 (95% CI: 0.006, 0.029; $P = 0.003$). Model 4 shows that the association between MRD and HAZ differs by the QoNA category. A 1 mm increase in MRD tended to decrease HAZ for children residing near low QoNA facilities (beta: −0.05; 95% CI: −0.08, −0.01; $P = 0.018$) while tending to increase HAZ for those around medium (beta: 0.004; 95% CI: −0.01, 0.02; $P = 0.609$) and high (beta: 0.02; 95% CI: −0.004, 0.038; $P = 0.103$) QoNA facilities, albeit not statistically significant. In the pairwise comparison of the association between MRD and HAZ given QoNA categorisation, we found a positive and statistically significant difference in the effect of MRD on HAZ in children residing near medium (beta: 0.049; 95% CI: 0.009, 0.090; $P = 0.017$) and high (beta: 0.062; 95% CI: 0.020, 0.104; $P = 0.004$) QoNA facilities relative to those near low QoNA facility areas (Table 3).

The results were similar when we tested different categorisations of QoNA (Appendix Table A4). When we tested with a reduced QoNA score (including only weight and height assessments), the moderation effects were also similar, although the interaction term was not statistically significant (Appendix Table A5).

Sex and wealth heterogeneity in the moderating effect of QoNA on the association between MRD and HAZ

In Fig. 2a, the association between MRD and HAZ was higher in females than males for each QoNA facility category. We found statistically significant differences comparing high-low and medium-low QoNA categories within and between sexes (Appendix Tables A6–A8). The association between MRD and HAZ was highest in the least-poor group in low and medium QoNA areas but not in the high QoNA area (Fig. 2b). The pairwise comparisons between household SES groups showed statistically significant differences within the high QoNA category and not within the low and medium QoNA categories. Looking at the pairwise difference between QoNA categories within SES groups, we found statistically significant positive differences comparing medium-low and high-low within the poor SES group and high-low and high-medium with less-poor SES group. We observed no statistically significant difference within the least-poor SES group (Appendix Tables A9–A11).

Discussion

We investigated the influence of the QoNA at the primary health facility on the relationship between rainfall deviation and stunting among young children in rural Burkina Faso by linking geographically coded household survey, facility-level clinical observation and high-resolution rainfall data. Three key findings emerged from our analysis. First, higher nutritional assessment quality minimised the adverse effects of rainfall deviation on

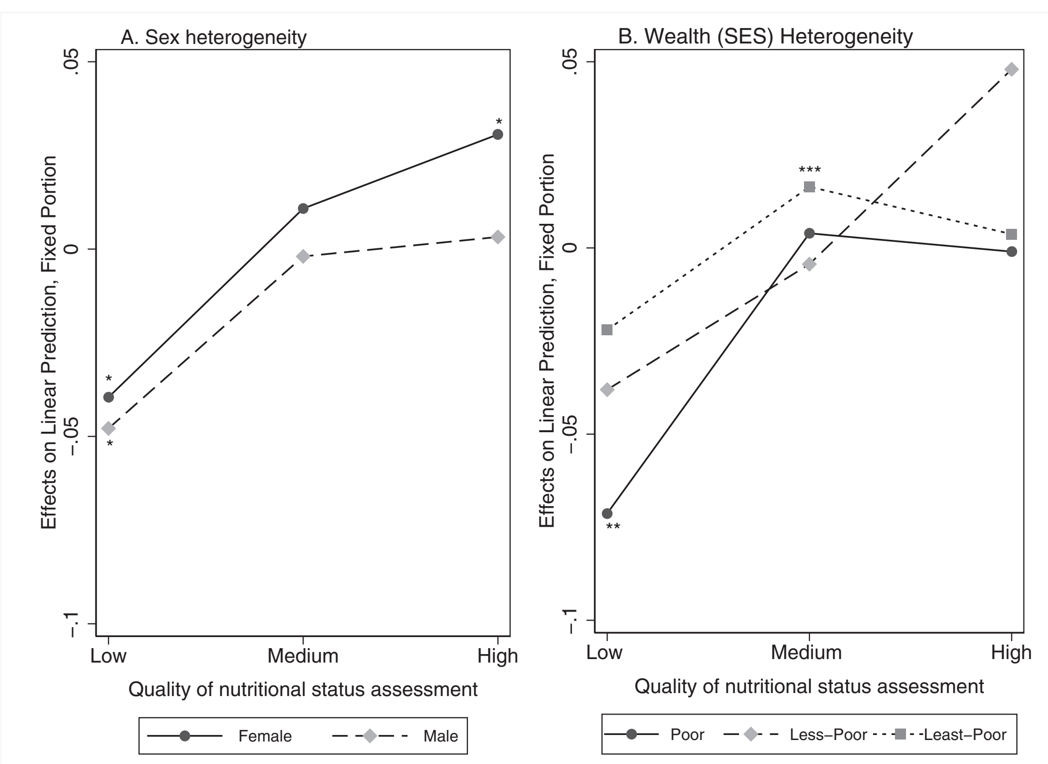

Fig. 2. Average marginal effects of quality of nutritional status assessment on the relationship between mean rainfall deviation (MRD) and height-for-age z-score (HAZ) stratified by sex and household wealth index (SES). Note: Adjusted for child's age (months), sex (male/female), the season of birth (off-season harvest, sowing and growing, main harvest season), caregiver's age (in years) and literacy (illiterate/literate); household size (number of people living in the household), socio-economic status (SES), distance to the nearest health facility; and for each facility, the number of under-five cases per staff seen in the last month before the survey. ***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

childhood stunting. Second, the moderating effect of nutritional assessment quality was stronger in females than males. Third, the moderating effect of nutritional assessment quality was stronger in children living in wealthier households than in poorer households.

In Burkina Faso, stunting prevalence has reduced considerably from 43% in the 1990s to 25% in 2021.[15] This feat has been achieved through many nutrition-specific and sensitive interventions for which the health system plays a crucial role in delivery.[29] Notwithstanding, we found that health facilities provide moderate quality in routinely assessing young children's nutritional status according to the IMCI protocol. This evidence is contrary to studies that found low adherence to the guidelines in treating ill children.[24] The relatively higher routine assessment of nutritional status in rural Burkina Faso could result from the high undernutrition prevalence – we observed that facilities that scored higher in nutritional status assessment also had the highest prevalence of stunting. This observation aligns with the evidence that the North, Sahel, Center–North, and East regions with the highest stunting prevalence also had the most nutritional interventions.[29]

Nevertheless, we found that children who lived in areas where the facilities conducted more nutritional assessments had lower adverse effects of rainfall on their HAZ. This observation can be explained by the fact that routine assessments help facilities detect and respond quickly to climate-induced nutritional effects through community interventions and outreach. Evidence from Burkina, Nepal, Ethiopia, Peru, Kyrgyzstan, and Senegal show that health system–led delivery of nutrition-specific interventions accounted for almost half of the stunting reduction.[15,16] Our results generally aligned with other findings on providing high-quality care and child health.[19] This finding supports the potential for improving healthcare quality to enhance communities' adaptation and resilience to climate-induced undernutrition.

Furthermore, the positive moderating effect of facilities' nutritional assessment quality differed within and across sex groups. However, female children benefited more from this moderating effect on the MRD-HAZ relationship than male children. We observed that girls received slightly more consulting time (attention) than boys (Appendix Table A12). Drawing from other evidence in Burkina Faso,[39] preferential caregiver treatment and gender-based discrimination common to other countries and contexts (such as India) are unlikely.[40] Further studies exploring sex differences in the moderating effect of nutrition-related care will be needed to explain our observation.

Finally, we found that household wealth relates to how facility quality scores affect the MRD-HAZ relationship. Wealth disparities in the MRD-HAZ relationship existed in each QoNA category. However, in each wealth group, a higher nutritional assessment quality was associated with a net-positive MRD-HAZ effect. This critical finding implies that although improving the quality of nutritional status assessment might benefit children from all socio-economic backgrounds, reducing disparities in climate change's effect on child health will also require efforts to curtail wealth inequality.

This study has some limitations. First, the observed QoNA provided may not always represent reality as PHWs may modify their behaviour under observation (Hawthorne effect).[41] Second, relying on facility-based outpatient data, we did not account for the facilities' community outreach activities to assess the nutritional status of children. Thus, our facility score might not fully represent nutrition-related care efforts across services. Third, we focused on children aged 3–23 months because stunting is more crucial and amenable in the first 1000 days.[26] However, there is the possibility of underestimating the effect of QoNA on stunting, as some studies indicate that the association between stunting and socio-economic variables such as wealth and improved toilet use culminates after 24 months (higher in older children).[27] Thus, we recommend future research to focus on children above 24 months. Fourth, we cannot completely rule out the possibility that households bypass the health facility in their village for higher-level facilities. However, we suspect this to be less of a problem for young children who receive postnatal and routine services from the facilities in their village. Finally, the study's cross-sectional nature means we could not consider changes in healthcare quality over time or establish causality. Therefore, we recommend that further studies adopt a longitudinal approach to capture the dynamism of assessment quality and possible causal links.

In summary, the primary healthcare system acts as the first point of call to identify and treat climate-induced undernutrition in children in lower-income settings. This paper is the first to investigate how improving nutrition care at the primary healthcare level can minimise climate-induced undernutrition. We found that primary healthcare facilities in rural Burkina Faso provide suboptimal nutrition status assessments during child healthcare services. Nevertheless, we found that higher-quality nutrition status assessments minimised climate-induced childhood stunting. The study provides timely evidence of leveraging health system strengthening to build community climate resilience, especially as health is gaining prominence in the climate adaptation dialogue.[42] We show that reinforcing health systems with particular attention to the QoC could be considered among other strategies to lessen the adverse impacts of climate change on child nutrition.

Author statements

Acknowledgements

We acknowledge the support of Felix Amberg and Rupal Shah-Rohlfs for the rainfall data acquisition and processing, for providing comments, and for reviewing the paper for language. The authors are also grateful to the World Bank for granting the use of the Performance-Based Financing survey data, collected with financial and technical support by the Health Results Innovation Trust Fund and field support by the Centre Muraz.

Ethical approval

Ethical clearance was not required for this study because we used fully anonymised secondary data that had already received clearance from the Ethics Committees of the Medical Faculty of the University of Heidelberg and the Burkina Faso National Ethics (Protocol numbers S-272/2013 and 2013-7-06, respectively).

Funding

We are grateful to the Katholischer Akademischer Ausländer-Dienst (KAAD), who financially supported the lead author through a PhD scholarship.

Competing interests

None declared.

Authors' contribution

E.Y. was responsible for conceptualisation, data curation, formal analysis, data interpretation and manuscript drafting. J.L. contributed to data collection, formal analysis, data interpretation and manuscript drafting. J.L.K. contributed to data collection, interpretation and manuscript drafting. N.K. contributed to the formal analysis and manuscript drafting. N.N.A.K. contributed to composite index conceptualisation, data interpretation and manuscript drafting. S.H. contributed to data collection, data interpretation and manuscript review. V.R. contributed data interpretation and manuscript review. I.D. contributed to study conceptualisation, data interpretation and manuscript drafting. M.D. contributed to study conceptualisation, data interpretation and manuscript drafting. S.B. contributed to study conceptualisation, data interpretation and manuscript drafting. All authors critically reviewed the paper and gave final approval for its publication.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2024.05.020.

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