

DETERMINANTS OF HEALTH CARE-SEEKING BEHAVIOR FOR CHILDREN WITH ACUTE RESPIRATORY INFECTIONS SYMPTOMS: EVIDENCE FROM YEMEN 2022/2023 MULTIPLE INDICATOR CLUSTER SURVEYZakariya M. S. Mohammed^{1,2}, Sara H. M. Hamad³, Sanaa A.H. Mohammed⁴, Omaima A Hamid⁵, Maha M Abdullatif⁶, Asmara Syed⁷, Elhassan Hussein Eltom⁸, Ekramy M. Elmorsy^{*7,9}¹Center for Scientific Research and Entrepreneurship, Northern Border University, Arar, Saudi Arabia, ²Department of Mathematics, College of Science, Northern Border University, P.O. Box 1321, Arar 91431, Saudi Arabia, ³Central Bureau of Statistics, P. O. Box 700, Khartoum, Sudan, ⁴Department of Statistics, Faculty of Mathematical Sciences and Informatics, University of Khartoum, P. O. Box 321, Khartoum 11115, Sudan, ⁵Department of Obstetrics and gynaecology, College of Medicine, Northern Border University, P.O. Box 1321, Arar 91431, Saudi Arabia, ⁶Department of Surgery, College of Medicine, Northern Border University, P.O. Box 1321, Arar 91431, Saudi Arabia, ⁷Department of Pathology, College of Medicine, Northern Border University, P.O. Box 1321, Arar 91431, Saudi Arabia, ⁸Department of Pharmacology, College of Medicine, Northern Border University, P.O. Box 1321, Arar 91431, Saudi Arabia, ⁹Center for health research, Northern Border University, P.O. Box 1321, Arar 91431, Saudi Arabia**Abstract****Objectives:** Acute respiratory infection (ARI) is a leading cause of mortality among children in Yemen. Seeking medical advice is essential to control ARI and improve the outcomes. This study was conducted to determine the factors that influence mothers' or caregivers' healthcare-seeking behaviour for children under five in Yemen based on Using nationally representative demographic and health survey data.**Methods:** The study relied on the Yemen 2022/2023 Multiple Indicator Cluster Survey (MICS), which was conducted by the Central Statistics Office of Yemen in collaboration with UNICEF. It adopts a cross-sectional design and provides robust, nationally representative data on the health of women and children.**Results:** The study included 19,561 children of whom 52% were males. The overall prevalence of care-seeking for children with ARI symptoms was 35%. The survey logistic regression analysis, showed that the likelihood of care-seeking for children with ARI symptoms was significantly higher among children living in urban areas (UPOR: 1.77; 95% CI: 1.27, 2.46) compared to rural areas, in female-headed households (UPOR: 2.28; 95% CI: 1.32, 3.93), and across all wealth levels compared to the poorest, with the highest odds observed among the richest (UPOR: 3.29; 95% CI: 2.17, 4.97). A higher likelihood was also noted for children whose mothers had higher education (UPOR: 2.66; 95% CI: 1.52, 4.67).**Conclusion:** The healthcare seeking was unsatisfactory among the parents of children with ARI in Yemen. MoreManuscrito recibido: 25/04/2025
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awareness outreach and media campaigns are recommended to improve the care-seeking culture among parents.

Keywords: Acute respiratory infection, care-seeking behaviour, Multiple Indicator Cluster Survey, Yemen**Introduction**

Yemen's high child mortality rate highlights the urgent need for teamwork in order to effectively address prevalent health issues among children. 1 An infection of the respiratory tract that prevents a person from breathing normally is known as an acute respiratory infection (ARI). Both Lower and Upper Respiratory Infection are subtypes of ARI. 2 They are a leading global cause of death and illness among children under five, especially in underdeveloped nations. 3 For example, the Global Burden of Disease Study 2019 found that among children under five, lower respiratory infections rank as the second most common cause of death. 4 The World Health Organization (WHO) and United Nations (UN) recommended that ARIs be treated as "presumed pneumonia" due to the severity of the illness.5

The Global Action Plan for Prevention and Control of Pneumonia was created in 2009 in an attempt to lower the number of pneumonia-related deaths.6 Nonetheless, it was acknowledged that the preventative and control measures for both diarrhoea and pneumonia should be coordinated because they have similar drivers. In light of this, the Integrated Global Action Plan for Pneumonia and Diarrheal was put into effect in 2013 with the goal of eradicating avoidable Pediatric deaths from pneumonia and diarrhoea by 2025.7 Despite international efforts to reduce pneumonia-related deaths, only fifteen nations account for more than two-thirds of the global burden of pneumonia and diarrheal mortality.

Children's ARIs can have serious consequences, particularly if medical attention is not available or is not sought.7 Young children are particularly susceptible to negative consequences because of their underdeveloped immune systems. 3 The reduced healthcare-seeking behaviour of mothers and caregivers is one factor contributing to the rise in childhood morbidity and mortality, and getting the right medical care can prevent a significant portion of juvenile fatalities and problems. A worse outcome is linked to delaying getting proper medical attention for juvenile diseases.8,9

Identifying symptoms has often been considered a major difficulty in numerous studies concerning care-seeking for acute respiratory infections

in children. 10 Mothers and caregivers often serve as the initial observers of illness symptoms in their children. The unawareness of symptoms and danger signs among caregivers can result in delays or failures in seeking treatment. Evidence suggests that mothers lacked the necessary knowledge to adequately recognize the importance of child health issues and to seek professional healthcare advice. 11, 12 In nations with high rates of child mortality, access to treatment for childhood illnesses remains challenging.13. Social attitudes and financial considerations have been connected to delays in seeking care for Pediatric illnesses that could be fatal. Seeking treatment for children's illnesses might also be hampered by health attitudes and past experiences with related conditions.14 Acute respiratory infections can save lives if they are identified early and treated. 1. Effective prevention and treatment of childhood acute respiratory infections (ARIs) depend on integrating health-seeking behaviour at suitable healthcare facilities into all-encompassing management methods.8,9

Most of the earlier research used ordinary/standard binary logistic regression, which may have introduced bias into model results because it ignored the hierarchical nature of Demographic Health Survey (DHS) data. To boost statistical power and obtain the right estimation, we therefore used multivariable multilevel logistic analysis for this type of hierarchical data. Using nationally representative demographic and health survey data, this study sought to determine the factors at the individual and community levels that influence mothers' or caregivers' healthcare-seeking behaviour for children under five in Yemen.

Materials and methods**Data and study population**

The study relied on the Yemen 2022/2023 Multiple Indicator Cluster Survey (MICS), which was conducted by the Central Statistics Office of Yemen in collaboration with UNICEF. MICS is a global household survey program developed by the United Nations. It adopts a cross-sectional design and provides robust, nationally representative data on the health of women and children. A comprehensive explanation of the methodology, design, sampling, and data can be found in. 15 The study population considered in this study includes children under the age of five. Further details about Yemen 2023/2023 can be found in.16

Mothers were asked about their children's history of coughing accompanied by rapid, chest-related breathing and/or breathing difficulties in children aged 0–59 months during the two weeks preceding the survey, to gather

information specific to ARIs. The World Health Organization (WHO) defines the presence of these symptoms as "suspected pneumonia," and the survey used ARI symptoms as a proxy for pneumonia.¹⁷

Statistical analysis

Initially, descriptive statistical analysis was performed to summarize the attributes of the study sample and provide insights into the rate of care-seeking across different levels of the exploratory variables. This was followed by a Chi-square test to explore the bivariate associations between care-seeking behaviour and various child, parental, and household characteristics. Bivariate survey logistic regression was used to investigate the association between care-seeking and each exploratory variable individually, with the unadjusted odds ratio and corresponding 95% confidence interval reported. Finally, multivariable survey logistic regression was performed to assess the joint contribution of the explanatory variables, and the adjusted odds ratios along with their 95% confidence intervals were reported. Survey logistic regression was preferred over ordinary logistic regression due to its ability to account for the complex survey design, including clustering, stratification, and differential weighting of observations.¹⁸ This comprehensive approach to data analysis enabled an in-depth investigation of the factors contributing to care-seeking behaviour for ARI, highlighting the role of child sociodemographic and household characteristics in explaining this phenomenon. Data analysis was conducted using IBM SPSS Version 26.

Results

(Table 1) summarizes the characteristics of children at age 1-5 years included in the study, the study included 19,561 children of whom 52% were males, 21% aged 24_35 months, 36% were 2-3 birth order, 72% of the children lived in rural areas, 12% in Al Hudaydah. Regarding the parent's characteristics, 26% of them had mothers in age 25-29, 40% of them had preprimary/none educated mother, 26% of them had upper secondary educated father, 95% of the children lived in male headed household. 60% of the children lived in

Table 1.

Variables	Count	Percent
Total	19561	100.0
Area		
Urban	5389	27.6
Rural	14172	72.4
Governorate		
Ibb	1959	10.0
Abyan	460	2.3
Sana'a City	2171	11.1
Al Bayda	434	2.2
Taizz	1963	10.0
Al Jawf	193	1.0
Hajjah	1807	9.2
Al Hudaydah	2430	12.4
Hadramaut	687	3.5
Dhamar	1494	7.6
Shabwah	398	2.0
Sa'ada	637	3.3
Sana'a	1108	5.7
Aden	579	3.0
Lahj	609	3.1
Marib	150	.8
Al Mahwit	609	3.1
Al Maharah	60	.3
Amran	854	4.4
Al Dhale'e	429	2.2
Raymah	501	2.6
Socotra	30	.2
Sex of child		
Male	10073	51.5
Female	9488	48.5
Child's Age (in months)		
0-11	3969	20.3
12-23	3927	20.1

Variables	Count	Percent
24-35	4119	21.1
36-47	4013	20.5
48-59	3532	18.1
Birth order		
1	4292	21.9
2-3	7099	36.3
4-6	5691	29.1
7+	2107	10.8
Missing	372	1.9
Mother's age		
15-19	704	3.6
20-24	4438	22.7
25-29	5128	26.2
30-34	4046	20.7
35-39	2961	15.1
40-44	1479	7.6
45-49	535	2.7
Missing	269	1.4
Mother's education		
Pre-primary or none	7902	40.4
Primary Education	5002	25.6
Lower Secondary Education	2394	12.2
Upper Secondary Education	3360	17.2
Higher	896	4.6
Missing/DK	8	.0
Father's education		
Pre-primary or none	2542	13.0
Primary Education	4147	21.2
Lower Secondary Education	3321	17.0
Upper Secondary Education	5029	25.7
Higher	3034	15.5
Biological father not in the household	1466	7.5
Missing/DK	23	.1
Functional difficulties (age 18-49 years)		
Has functional difficulty	2158	11.0
Has no functional difficulty	17020	87.0
Missing	383	2.0
Sex of household head		
Male	18665	95.4
Female	896	4.6
Household size		
1-3	736	3.8
4-6	7168	36.6
7+	11658	59.6
Wealth index quintile		
Poorest	4630	23.7
Second	4000	20.4
Middle	3750	19.2
Fourth	3817	19.5
Richest	3364	17.2

households sized 7+, wealth status ranged from 17% in the richest category to 24% in the poorest.

The overall prevalence of care-seeking for children with acute respiratory infection (ARI) symptoms was 35% with the maximum rate of care-seeking in Abyan Governate (60.6%) and the minimum rate of care-seeking in Al Jawf Governate (8.2%) (Figure 1). Table 2 shows that there were statistically significant variations in prevalence of care-seeking for children with acute respiratory infection (ARI) symptoms according to exploratory variables: area, mother's education, sex of household head, wealth index quintile. The rate of care-seeking for children with acute respiratory infection (ARI) symptoms were higher among children living in urban areas (45.3% vs. 31.9% in rural areas), richest households (50.3%), female headed households (54.1%), and with higher educated mothers (53.3%).

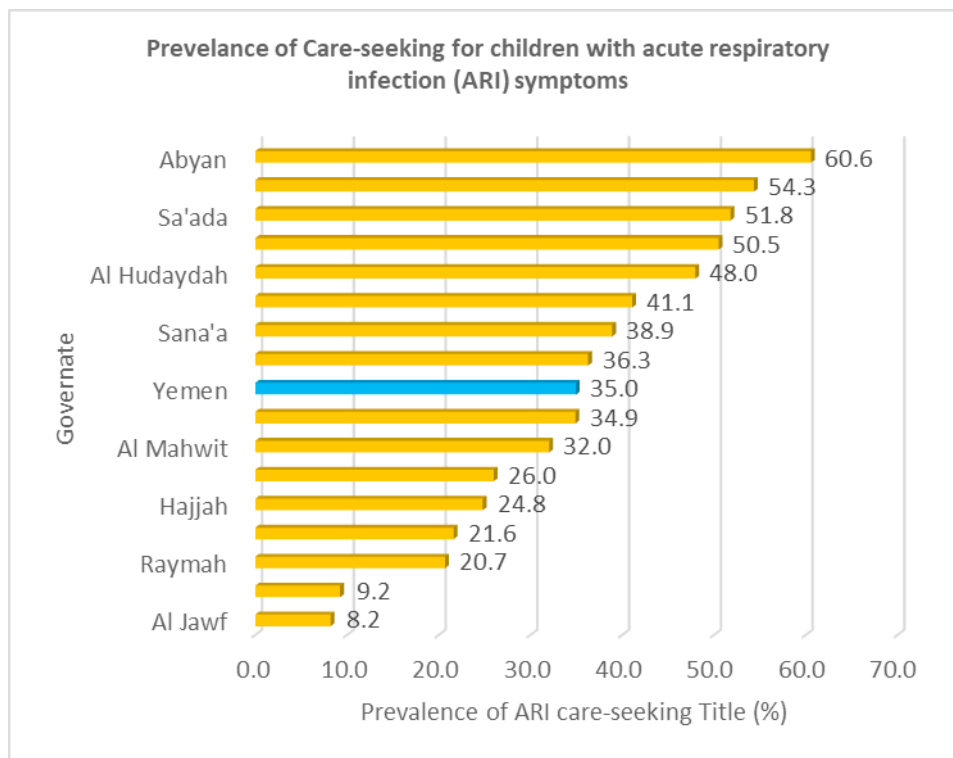


Figure S1. Prevalence of ARI care-seeking behaviour.

Table 2 shows that there were statistically significant variations in prevalence of care-seeking for children with ARI symptoms according to exploratory variables: area, mother's education, sex of household head, wealth index quintile. The rate of care-seeking for children with ARI symptoms were higher among children living in urban areas (45.3% vs. 31.9% in rural areas), richest households (50.3%), female headed households (54.1%), and with higher educated mothers (53.3%).

Table 3 presents the results of the survey logistic regression analysis, including both unadjusted prevalence odds ratios (UPORs) obtained from univariate logistic regression with one predictor and adjusted prevalence odds ratios (APORs) obtained from multivariable logistic regression. Based on the univariate logistic regression results, the child's sex, age, and birth order, mother's age, functional difficulties, father's education, and household size were not significantly associated with care-seeking for children with acute respiratory infection (ARI) symptoms, and these variables were excluded from the final model.

Conversely, the likelihood of care-seeking for children with ARI symptoms was significantly higher among children living in urban areas (UPOR: 1.77; 95% CI: 1.27, 2.46) compared to rural areas, in female-headed households (UPOR: 2.28; 95% CI: 1.32, 3.93), and across all wealth levels compared to the poorest, with the highest odds observed among the richest (UPOR: 3.29; 95% CI: 2.17, 4.97). A higher likelihood was also noted for children whose mothers had higher education (UPOR: 2.66; 95% CI: 1.52, 4.67). After adjusting for socio-demographic characteristics, the results show that the odds of care-seeking for children with ARI symptoms remained significantly higher across all wealth quintiles compared to the poorest, with the highest odds among the richest (APOR: 3.14; 95% CI: 1.77, 5.56), and in female-headed households (APOR: 1.89; 95% CI: 1.04, 3.41).

Discussion

The current study was conducted to explore determinants/factor associated with care-seeking of children with of children with acute respiratory infection in Yemen. Insights from Yemen 2022/2023 multiple indicator cluster survey. In order to lower infant mortality, it is crucial to seek medical attention for frequent childhood ailments. The current study showed the overall prevalence of care-seeking for children with acute respiratory infection (ARI) symptoms was 35% will be the maximum rate of care-seeking in Abyan Governorate (60.6%) and the minimum rate of care-seeking in Al Jawf Governorate (8.2%). The estimated prevalence of care seeking behaviour in children experienced ARI in the current study is within the range of other studies conducted in Ethiopia (32.6%) 19, Bangladesh (37.3%). Lower prevalence was reported in

Nigeria (13%) 20, while higher prevalence was reported in Indonesia (90%) 21, developing countries (60%), and sub-Saharan Africa (48%) 22,23. Level Relatively high levels of care seeking are inspiring in countries with low socio-economic development such as Bangladesh.

Care seeking behaviour among parents with children suffered ARI was shown to be significantly affected by multiple variables. Multi logistic regression model of the variables in the current study showed that the care seeking behaviour is significantly affected by place of residence, mother education, sex of household head, and Wealth quintile.

Residents of urban areas showed high levels of care seeking behaviour. This can be explained by more availability of private and public healthcare facilities with more easy access to the service. In addition to higher levels of resident's education and higher monthly income among the urban residents. In addition, they are targeted by healthcare campaigns. 24

Furthermore, the existing data indicate that maternal education significantly enhances care-seeking behavior for children with acute respiratory infections in Yemen. The primary responsibility for child care typically falls on mothers. The mother's understanding of child care significantly impacts the nature and quality of care provided to the child. 25 Research indicates that a mother's educational attainment positively influences her knowledge and management of child health care matters. 26- 28

Women household heads were shown to be more keen to seek medical care with ARI of their kids. Thompson et al. 29 reported that women seek medical care for physical and mental illness more than did men. This conclusion is also aligned with other previously published studies. 30-31

Parents from the wealthiest quintile sought care from qualified providers (private or public institutions), indicating a substantial correlation between the type of care sought and wealth quintile. Previous research has also supported these findings. 32, 33, 34 Given that persons from the wealthiest quintiles can typically afford healthcare prices, it is clear that the cost of care plays a big part in decision-making. In developing nations, out-of-pocket expenses account for the majority of all care received. 32,35,36 However, it was found that almost all economic quintiles sought out pharmacies more than any other sort of care. The prevalence of pharmacies in most parts of Yemen, where people can buy medications without a prescription, may be the cause of self-medication behaviors. 37 Furthermore, the poorest and middle-class groups sought medical care from traditional providers, in contrast to the wealthiest group. These findings are consistent with those of other recent studies. 32,38 Poor populations may be able to obtain these programs due to their affordability and accessibility.

Table 2. Chi-square test of association between care-seeking and exploratory variables.

Variables	Prevalence of Care-seeking for children with acute respiratory infection (ARI) symptoms		
	Count	Percent	P-value
Total	648	35.0	
Area			
Urban	195	45.3	0.002*
Rural	454	31.9	
Governorate			
Ibb	75	26.0	<0.005*
Abyan	11	60.6	
Sana'a City	51	50.5	
Al Bayda	10	36.3	
Taizz	88	41.1	
Al Jawf	6	8.2	
Hajjah	61	24.8	
Al Hudaydah	142	48.0	
Hadramaut			
Dhamar	33	21.6	
Shabwah			
Sa'ada	34	51.8	
Sana'a	15	38.9	
Aden	12	34.9	
Lahj			
Marib	1	9.2	
Al Mahwit	26	32.0	
Al Maharah			
Amran	35	54.3	
Al Dhale'e			
Raymah	21	20.7	
Socotra			
Child's Sex			
Male	324	33.7	0.341
Female	324	36.4	
Child's Age (in months)			
0-11	128	35.6	0.607
12-23	167	38.0	
24-35	140	36.0	
36-47	105	31.7	
48-59	109	32.5	
Child order			
1	154	35.5	0.195
2-3	240	38.0	
4-6	169	30.6	
7+	81	39.4	
Mother's Age			
15-19	21	30.6	0.782
20-24	151	33.6	
25-29	177	37.2	
30-34	133	34.9	
35-39	101	37.0	
40-44	51	37.2	
45-49	10	22.3	
Mother's education			
Pre-primary or none	245	30.0	0.010*
Primary Education	184	37.5	
Lower Secondary Education	72	34.0	
Upper Secondary Education	103	41.2	
Higher	45	53.3	
Father's education			

Variables	Prevalence of Care-seeking for children with acute respiratory infection (ARI) symptoms		
	Count	Percent	P-value
Pre-primary or none	84	33.3	0.593
Primary Education	136	30.8	
Lower Secondary Education	123	35.0	
Upper Secondary Education	171	37.2	
Higher	84	38.0	
Functional difficulties (age 18-49 years)			
Has functional difficulty	114	30.5	0.133
Has no functional difficulty	529	36.5	
Sex of household head			
Male	603	34.1	0.003*
Female	45	54.1	
Household size			
1_3	49	40.2	0.726
4_6	251	35.1	
7+	349	34.3	
Wealth index quintile			
Poorest	134	23.5	>0.005*
Second	169	36.3	
Middle	119	34.2	
Fourth	135	46.8	
Richest	91	50.3	

Strengths and limitations

Our study's primary strength is that it was based on a questionnaire that asked mothers about childhood diseases and care-seeking, which might be skewed by recall bias. Additionally, we may have overestimated appropriate care-seeking because of social desirability bias, which may have caused some caregivers to report inaccurately if they did not seek treatment, sought care late, or sought care from informal providers. Any overestimate, however, would not significantly alter the interpretation of our results because the overall percentage of appropriate care-seeking in this study is still low.

Large-scale surveys, however, provide a number of benefits when it comes to gathering data. First of all, they give researchers the opportunity to collect information from a sizable and varied sample, giving them a more comprehensive picture of the target population. This improves the findings' external validity and generalizability. Furthermore, a significant amount of data is frequently produced via large-scale surveys, enabling more accurate estimations of the correlations between variables and strong statistical analysis. Large-scale surveys yield a wealth of data that may be used to support longitudinal research and offer important insights into how things have changed and evolved over time. Large-scale surveys are also appropriate for tackling intricate research topics or examining several facets of a phenomenon due to their scalability. Large-scale surveys ultimately aid in the creation of successful policies and initiatives, guide evidence-based decision-making, and add to the body of knowledge.

Recommendation for programs and research

To stop serious child illnesses and fatalities in Yemen, care-seeking timeliness and source improvements are desperately needed. All socioeconomic groups must be made more aware of the significance of promptly seeking care from formal facilities for Pediatric illnesses through extensive education efforts. Health professionals can remind parents when and where to seek care through routine contacts, such as vaccinations and prenatal and postnatal visits.

Yemen has far lower rates of prenatal care and facility deliveries than other nations, which emphasizes the need for a more comprehensive effort to enhance attitudes toward and willingness to use the healthcare system at all stages of life. To guarantee that children admitted to facilities receive high-quality treatment and to facilitate a decrease in child mortality, quality improvement initiatives and health system improvements must be coordinated with educational initiatives. 39, 40

To better understand the causes of care-seeking behaviors, the differences among children disorders, and the creation of communication campaigns, qualitative research is required. To determine which programs are effective, the effect of novel interventions on care-seeking behaviors should be evaluated.

Conclusion

Table 3. Survey logistic regression results investigating association between care-seeking behavior and sample characteristics.

Area	UPOR	95% CI		P-value	APOR	95% CI		P-value
		Lower	Upper			Lower	Upper	
Area								
Rural	1				1			
Urban	1.77	1.27	2.46	0.001	0.92	0.58	1.48	0.741
Mother education								
Pre-primary or none	1				1			
Primary Education	1.40	1.01	1.96	0.046	1.19	0.85	1.68	0.312
Lower Secondary Education	1.20	0.83	1.73	0.325	0.92	0.63	1.36	0.688
Upper Secondary Education	1.63	1.15	2.33	0.007	1.12	0.79	1.58	0.541
Higher	2.66	1.52	4.67	0.001	1.55	0.87	2.74	0.134
Sex of household head								
Male	1				1			
Female	2.28	1.32	3.93	0.003	1.89	1.04	3.41	0.036*
Wealth quintile								
Poorest	1				1			
Second	1.85	1.23	2.80	0.004	1.80	1.18	2.74	0.006*
Middle	1.69	1.13	2.52	0.011	1.64	1.09	2.47	0.019*
Fourth	2.86	1.79	4.55	<0.005*	2.79	1.61	4.84	<0.005*
Richest	3.29	2.17	4.97	<0.005*	3.14	1.77	5.56	<0.005*

UPOR: unadjusted prevalence odds ratio. APOR: Adjusted prevalence odds ratio.

This study shows that Yemeni caregivers of children with ARI symptoms do not seek adequate care. To lessen Yemen's intolerably high child mortality rate, a nationwide, multifaceted communication campaign is desperately needed to enhance care-seeking for childhood illnesses. Increased usage of formal health care services by wealthier and more educated households showed that interventions that specifically target low-socioeconomic and low-education households should be a part of effective mitigation efforts. Based on the findings, this study should strengthen the health system by influencing policies for creating efficient awareness/health education programs, poverty alleviation programs, and culturally acceptable interventions to improve care-seeking from qualified providers, particularly for rural residents. In order to provide fair service, it is advised that health care services be made more accessible and affordable by collaborating with community-based organizations, private health care activists, and public institutions.

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Authors statement

Ethical approval: Yemen 2022/2023 multiple indicator cluster survey is a publicly available dataset from website (<https://mics.unicef.org/surveys>). Hence no ethical issues were considered for the current study

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