

Multilevel Analysis of Lifestyle and Household Environment for Toddlers With Symptoms of Acute Respiratory Infection (ARI) in Indonesia in 2007, 2012, and 2017

by Leka Lutpiatina

Submission date: 18-Aug-2022 04:16PM (UTC+0800)

Submission ID: 1883872108

File name: artikel-Multilevel_Analysis.pdf (125.98K)

Word count: 8156

Character count: 36343

Multilevel Analysis of Lifestyle and Household Environment for Toddlers With Symptoms of Acute Respiratory Infection (ARI) in Indonesia in 2007, 2012, and 2017

Global Pediatric Health
Volume 9: 1–13
© The Author(s) 2022
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/2333794X221078700
journals.sagepub.com/home/gph
SAGE

Leka Lutpiatina, M.Si^{1,2}, Lilis Sulistyorini, M.Kes¹,
Hari Basuki Notobroto, M.Kes¹, Reynie Purnama Raya, M.Epid^{3,4},
Ricko Darmadji Utama, S.Tr Kes², and Anny Thuraidah, M.S²

Abstract

Introduction. The morbidity and mortality rate of Acute Respiratory Tract Infection (ARI) in children under 5 is relatively high in Indonesia. Socio-demographic characteristic is considered one of the factors causing ARI in Indonesia. However, no study analyzed the prevalence of ARI among toddlers and the differences among the determinant factors in multiple periods. Thus, this study aimed to analyze the prevalence trends and determinant factors associated with ARI symptoms in children under 5 in Indonesia in 2007, 2012, and 2017. **Methods.** This study analyzed cross-sectional survey data from the Demographic and Health Survey (DHS) in Indonesia during 2007, 2012, and 2017. Bivariate and multivariate analysis with logistic regression was performed using Stata version 15. The final results were expressed in Adjusted Odds Ratio (AORs) and 95% Confidence Interval (CI). **Results.** The findings showed a progress in prevalence trends with a decrease in the percentage of children with ARI symptoms from 11.25% (2007), then 5.12% (2012) to 4.22% (2017). Risk factors for toddlers experiencing ARI symptoms were as follows: younger maternal age (OR: 1.13, 95% CI 0.70-1.81 in 2007, OR: 1.72, 95% CI 1.03-2.88 in 2012 and OR: 0.98, 95% CI 0.48-1.97 in 2017), smoking habits of family members (OR: 1.12, 95% CI 0.85-1.48 in 2012, OR: 1.23, 95% CI in 2017), poor drinking water quality (OR: 1.12, 95% CI 0.85-1.48 in 2012 and OR: 1.23, 95% CI in 2017), unavailable toilet facilities (OR: 1.27, 95% CI 1.04-1.56 in 2007, OR: 1.24, 95% CI 0.95-1.63 in 2012 and OR: 1.28, 95% CI 0.97-1.68 in 2017). **Conclusion.** There was a decrease in the prevalence of ARI symptoms among children in 2007, 2012, and 2017, with no prominent differences in other related factors. The lifestyle and household environmental factors such as the use of dirty fuel, the presence of smokers in the household, the poor quality of drinking water, unavailable toilet facilities in addition to the maternal age and child age were the determinant factors that must be prioritized and improved. Family self-awareness should also be enhanced for better prospects for toddler survival.

Keywords

ARI under 5 in Indonesia, lifestyle factors, household environmental factors, DHS 2007, 2012, 2017

Received November 25, 2021. Accepted for publication January 19, 2022.

Introduction

Acute Respiratory Infection (ARI) is considered one of the global leading causes of death among children under 5, especially in developing countries. An uncontrolled increase in population density was associated with a less organized community in terms of social, cultural, and health aspects.¹ This condition could affect toddlers especially in families with low socioeconomic status or

¹Universitas Airlangga, Surabaya, Indonesia

²Poltekkes Kemenkes Banjarmasin, Banjarbaru, Indonesia

³University College London, London

⁴Aisyiyah Bandung Health Sciences College, Bandung, Indonesia

Corresponding Author:

Leka Lutpiatina, Medical Laboratory Technology, Poltekkes
Kemenkes Banjarmasin, Mistar Cokrokusumo Street 4a, Banjarbaru,
Kalsel 70714, Indonesia.
Email: leka.zns@gmail.com



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

below the poverty line due to low intake of nutritious food and the inappropriate housing environment.²

The morbidity and mortality rate of ARI is relatively high, especially among toddlers.³ ARI is one of the leading causes of death in children under 5 (16%). High incidence of mortality was recorded mainly in South Asia and Africa.⁴ The percentage of ARI among children under 5 was 12.8% in Indonesia, with the highest distribution in 5 provinces: East Nusa Tenggara (18.6%), Banten (17.7%), East Java (17.2%), Bengkulu (16.4%), and Kalimantan Middle (15.1%).⁵

ARI could be linked to the lifestyles of toddlers and their household environments. A study showed the relationship between ARI among children under 5 and other factors such as smoking habits of family members, use of mosquito coils, occupancy density, and nutritional status.³² Furthermore, a study conducted in Nigeria stated that ARI incidence was related to population density, residential density, air pollution, and environmental sanitation.⁶ Moreover, a study conducted in Eastern Indonesia showed that ARI incidence was associated with the mother's low level of knowledge about child care, exclusive breastfeeding, being exposed to cigarette smoke, and improper householding due to poverty.⁷ Another study in the slums of Dibrugarh City mentioned that ARI incidence among toddlers was related to exclusive breastfeeding level, immunization, socio-economic characteristics, and air pollution level.⁸

A study in Indonesia showed the 25% of children under 5 experiencing ARI symptoms did not receive the required health service and medical treatment.⁹ Another study also analyzed the determinants of ARI among children under 5 in Indonesia.¹⁰ However, neither study assessed the progress related to ARI prevalence among toddlers nor compared the influence of ARI determinant factors in 2007, 2012, and 2017 in Indonesia. That is why this study aimed to analyze the difference in both prevalence and determinant factors of ARI among children under 5 in 2007, 2012, and 2017 in Indonesia.

Method and Material

Data Source

The study analyzed cross-sectional surveys (Indonesian Demographic and Health Survey, IDHS 2007, 2012, and 2017). A large-scale study estimated fertility, mortality, family planning, maternal and child healthcare services, and other relevant indicators across Indonesia at the national level. The IDHS data were obtained from several government agencies, such as the Indonesian Ministry of Health, the National Population and Family Planning Agency, and the Central Statistics Agency.

IDHS had a stratified 2-stage sampling design for both rural and urban areas. Some census blocks were selected by systematic probability proportional to the size of the household. Then, 25 households were chosen from each census block. After that, data were collected using interview forms, including household, male, female, and village forms.

Methodology

Both bivariate and multivariate analyses were used. Bivariate analysis showed the relationship between the study variables and children with ARI symptoms. Logistic regression was used in the multivariate analysis to show the influence of the characteristics of children, mothers, and households; besides relevant socio-economic and demographic variables on children with ARI symptoms. Data using Stata version 15 were presented in adjusted odds ratios (AORs) and 95% confidence intervals (CI).

Result Variable

In IDHS, children with ARI symptoms (dependent variable) were identified using the women's health questionnaire by asking eligible mothers (15-49 years) about the respiratory health of their children aged 0 to 59 months. Mothers were asked if their under-5 children had a cough during the last 2 weeks. If yes, mothers were asked whether their children were suffered from shortness of breath and rapid breathing due to fever. Children who met all of the abovementioned criteria were considered having ARI symptoms and coded with a value of 1 while children who did not meet the criteria were coded with a value of 0.

Variable Explanation

The study variables included the characteristics of children, mothers, and households, besides the theoretical relevant socio-economic and demographic characteristics. The characteristics of children were sex, age category (under 1, 1-2, and 3-4 years), the birth order (1-2, 3-4, and more than 4), children who were given vitamin A in the last 6 months and children who were given deworming medicine in the last 6 months.

The characteristics of mothers included the maternal age category (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49 years), the mother's education level (no school, not completed the first and second level of education, completed the first and second level of education and higher education), and the mother's employment status.

The characteristics of households included wealth quintiles (from poorest to richest), residence type (urban and rural), indoor smoking behavior of family members, area of residence (west, middle and east), cooking fuel (clean, unclean, and no food cooked), quality of drinking water source, handwashing habits and the availability of toilet facilities.

2 Ethical Approval

The study has ethical approval from the applied country Ethics Committee and ICF Macro. Research registration was carried out on the Demographic and Health Survey (DHS) website to obtain permission to use and analyze the data set.

Results

Table 1 shows the distribution and percentage of the dependent variable (children with ARI symptoms), and independent variables (the characteristics of children, mothers, and households; area of residence; wealth quintile; and type of residence) in 2007, 2012, and 2017 in Indonesia. The percentage of children with ARI declined from 11.25% in 2007, then 5.12% in 2012 to 4.22% in 2017. Thus, the results reflect the improvement of healthcare in Indonesia. Furthermore, supporting data indicated an increase in the percentage of both children receiving vitamin A in the last 6 months (63.08% in 2007, 57.42% in 2012, and 75.14% in 2017) and children receiving deworming medicine in the last 6 months (23.49% in 2012 and 36.56% in 2017). Supporting data also presented an increase in the percentage of mothers with a higher level of education (7.61% in 2007, 12.69% in 2012, and 15.21% in 2017). They also stated an increase in the percentage of using clean cooking fuel (19.18% in 2007, 57.03% in 2012, and 77.05% in 2017), family members who did not smoke at home (19.13% in 2007, 23.74% in 2012 and 76.26% in 2017), availability of toilet facilities (73.95% in 2007, 82.54% in 2012, 90.38% in 2017).

Table 2 presents that age had a significant effect on the susceptibility of ARI symptoms among children aged (1-2 years) as follows: 13.6% in 2007, 5.87% in 2012, and 4.89% in 2017. Furthermore, data showed that mothers with low education had higher susceptibility to having children with ARI symptoms. For mothers who did not complete their first level of education, the percentage of children with ARI symptoms was as follows: 14.19% in 2007, 7.53% in 2012, and 5.67% in 2017. The better the maternal education, the less the possibility of experiencing ARI symptoms among their children. The percentage of mothers with higher

education who had children with ARI symptoms was as follows: 9.16% in 2007, 3.33% in 2012, and 3.73% in 2017. Moreover, the results presented that the wealth quintile was a significant variable. The children had better facilities in the richer families reducing the risk of experiencing ARI symptoms. The percentage of children with ARI symptoms among the richest families was as follows: 8.68% in 2007, 3.59% in 2012, and 2.99% in 2017. Data also showed that the central part of Indonesia had the highest percentage of children with ARI symptoms as follows: 13.00% in 2007, 6.63% in 2012, and 5.09% in 2017. Cooking fuel was also a significant factor as data showed that the percentage of children with ARI symptoms in families who cooked with dirty fuel was high: 11.62% in 2007, 6.2% in 2012, and 5.08% in 2017. The unavailability of toilet facilities was also associated with a higher percentage of children with ARI as follows: 14.37% in 2007, 7.13% in 2012, and 6.73% in 2017.

Table 3 showed the multivariate analysis for the dependent variable (children with ARI symptoms) with independent variable. Female children had a lower probability of experiencing ARI symptoms than male ones (OR: 0.89, 95% CI 0.77-1.04 in 2007, OR: 0.79, 95% CI 0.65-0.96 in 2012 and OR: 0.87, 95% CI 0.72-1.05 in 2017). Children in the 3rd and 4th born order had a higher risk of experiencing ARI symptoms (OR: 1.02, 95% CI 0.84-1.25 in 2007, OR: 1.59, 95% CI 1.25-2.02 in 2012 and OR: 1.12, 95% CI 0.86-1.47 in 2017). Younger maternal age (15-19 years) was significantly associated with a higher risk of having children experiencing ARI symptoms (OR: 1.13, 95% CI 0.70-1.81 in 2007, OR: 1.72, 95% CI 1.03-2.88 in 2012 and OR: 0.98, 95% CI 0.48-1.97 in 2017). On the other hand, the oldest maternal age group (45-49 years) was accompanied by a lower risk of having children with ARI symptoms (OR: 0.59, 95% CI 0.27-1.30 in 2007, OR: 0.28, 95% CI 0.12-0.65 in 2012 and OR: 0.35, 95% CI 0.15-0.84 in 2017). Moreover, children of non-working mothers had lower risk of ARI symptoms (OR: 0.87, 95% CI 0.74-1.02 in 2007, OR: 0.83, 95% CI 0.67-1.02 in 2012 and OR: 0.80, 95% CI 0.65-0.99 in 2017). Children in the richest families had low risk of experiencing ARI symptoms (OR: 0.77, 95% CI 0.54-1.09 in 2007, OR: 0.83, 95% CI 0.54-1.29 in 2012 and OR: 0.61, 95% CI 0.42-0.89 in 2017). In Eastern Indonesia, children had low possibility of experiencing ARI symptoms (OR: 0.65, 95% CI 0.49-0.86 in 2007, OR: 0.46, 95% CI 0.29-0.73 in 2012 and OR: 0.48, 95% CI 0.31-0.75 in 2017). Using of unclean cooking fuel was associated with a higher risk of experiencing ARI symptoms among children (OR: 1.15, 95% CI 0.82-1.63 in 2007, OR: 0.89, 95% CI 0.70-1.11 in 2012 and OR: 1.09, 95% CI

Table I. Socio-Demographic Characteristics of Participants in 2007, 2012, and 2017.

Variables	2007		2012		2017	
	N	%	N	%	N	%
<i>Child characteristics</i>						
Children with ARI symptoms						
Yes	2120	11.25	950	5.12	744	4.22
No	15 436	88.75	15 813	94.88	15 879	95.78
Sex						
Male	9156	51.89	8669	50.93	8520	50.78
Female	8310	48.11	8094	49.07	8103	49.22
Age						
Under 1 years old	3642	21.17	3462	20.99	3205	19.12
1-2 years old	6833	39.21	6695	40.24	6698	40.44
3-4 years old	6991	39.62	6606	38.78	6720	40.44
Child birth order						
1st-2nd	10 515	63.66	10 913	69.69	10 635	68.69
3rd-4th	4890	26.27	4299	22.99	4686	25.82
More than 4th	2061	10.07	1551	7.32	1302	5.5
Child who received Vitamin A in last 6 months						
Yes	10 781	63.08	9058	57.42	12 073	75.14
No	5949	32.97	5889	31.49	4225	23.07
Don't know	736	3.96	1816	11.09	325	1.8
Child who received the intestinal drug in last 6 months						
Yes	N/A	N/A	3899	23.49	5578	36.56
No	N/A	N/A	12 727	75.77	10 879	62.48
Don't know	N/A	N/A	137	0.74	166	0.96
<i>Mother characteristics</i>						
Age in years						
15-19	515	2.77	525	2.87	394	2.23
20-24	3454	20.53	3138	18.9	2549	16.18
25-29	5001	28.15	4729	27.83	4247	25.63
30-34	4282	23.95	4116	24.48	4427	26.42
35-39	2879	16.96	2843	17.2	3315	19.83
40-44	1090	6.11	1192	7.19	1395	7.99
45-49	245	1.53	220	1.51	296	1.72
Education level						
No education	739	3.43	510	2.05	240	1.08
Incomplete primary	2343	12.21	1662	8.43	1158	6.25
Complete primary	4513	28.87	3457	23.35	2968	19.49
Incomplete secondary	4262	25.04	4241	26.41	4283	28.29
Complete secondary	4263	42.63	4630	27.07	5021	29.68
Higher	761	7.61	2263	12.69	2953	15.21
Mother's occupation						
Not working	8874	51.44	7723	46.83	7865	49.29
Working	8592	48.56	9040	53.17	8758	50.71
<i>Household characteristics</i>						
Wealth quintile						
Poorest	5308	22.79	5008	21.6	4517	20.08
Poorer	3479	19.60	3362	19.41	3266	20.17
Middle	3044	19.62	3030	19.46	3087	20.46
Richer	2877	19.25	2826	20.4	2929	20.18
Richest	2758	18.74	2537	19.13	2824	19.11

(continued)

Table 1. (continued)

Variables	2007		2012		2017	
	N	%	N	%	N	%
Place of residence						
Rural	10818	58.31	9086	50.24	8425	51.34
Urban	6648	41.69	7677	49.76	8198	48.66
Region of residence						
West of Indonesia	9932	78.80	9710	80.02	9880	80.3
Middle of Indonesia	5571	18.64	5154	16.87	5090	16.5
East of Indonesia	1963	2.56	1899	3.11	1653	3.2
Cooking fuel						
Clean fuel	11 09	1918	7291	57.03	11 248	77.05
Unclean fuel	88.80	15 510	9436	42.73	5355	22.85
No Food cooked	0.11	38	36	0.24	20	0.11
Smoking pattern of house member inside the house						
Yes	N/A	N/A	13 778	80.87	13 029	76.26
No	N/A	N/A	2985	19.13	3594	23.74
Quality of drinking water source						
Good	11 078	64.58	8669	57.73	9785	63.52
Bad	6388	35.42	8094	42.27	6838	36.48
Handwashing habit						
Observed	N/A	N/A	16 235	97.76	15 573	94.47
Not Observed	N/A	N/A	528	2.24	1 050	5.53
Availability of toilet facilities						
Available	12 290	73.95	13 500	82.54	14 858	90.38
Not available	5176	26.05	3263	17.46	1 765	9.62
n Total	17 466		16 763		16 623	

Source: Indonesia Demographic and Health Survey; IDHS 2007, 2012 and 2017.

0.85-1.40 in 2017). Children of smoker family members were more prone to experience ARI symptoms (OR: 1.12, 95% CI 0.85-1.48 in 2012 and OR: 1.23, 95% CI in 2017). Drinking water with bad quality was associated with higher vulnerability to ARI symptoms among children (OR: 1.02, 95% CI 0.85-1.24 in 2007, OR: 1.21, 95% CI 0.99-1.48 in 2012 and OR: 1.06, 95% CI 0.85-1.32 in 2017). Unavailable toilet facilities were also related to a higher risk of children experiencing ARI symptoms (OR: 1.27, 95% CI 1.04-1.56 in 2007, OR: 1.24, 95% CI 0.95-1.63 in 2012 and OR: 1.28, 95% CI 0.97-1.68 in 2017).

The study showed a remarkable decline in the prevalence of ARI symptoms in children under 5 between 2012 and 2017 in Indonesia. The prevalence of children with ARI symptoms was significantly reduced from 5.12% in 2012 to 4.22% in 2017 (Table 1). This success was a result of the substantial progress of the Sustainable Development Goals (SDGs). The SDGs were created by the United Nations (UN) and promoted as a global goal for sustainable development. The SDGs declaration,

among others, aims to reduce child mortality and improves maternal health.¹¹

The results in Table 1 approved the improvement in maternal and child healthcare from 2012 to 2017 in Indonesia, including the increase of the percentage of children receiving vitamin A in the last 6 months, children receiving deworming medicine in the previous 6 months, the rate of the education level of both college-level mothers and mothers who completed the secondary education level. Supporting data also showed the increase in the percentage of clean cooking fuel, family members who do not smoke at home, and drinking water of good quality.

Socio-demographic factors had a significant influence on the prevalence of ARI symptoms in toddlers in Indonesia. The results showed that ARI symptoms were most among children aged (1-2 years) in 2012 and 2017 (Table 2). This finding aligns with another research¹² in addition to basic health research showing that the highest ARI symptoms were among children aged 1 to 2 years (14.4%).⁵ Children under 1 year had a

Table 2. The Relationship Between the Characteristics of Children and Mothers, Geographical Location, and Household Characteristics With the Status of Children With ARI Symptoms in 2007, 2012, and 2017 in Indonesia.

Characteristic	2007						2012						2017					
	Children with ARI symptoms		Children without ARI Symptoms		P-value	n	Children with ARI symptoms		Children without ARI symptoms		P-value	n	Children with ARI symptoms		Children without ARI symptoms		P-value	n
	n	%	n	%			n	%	n	%			n	%	n	%		
<i>Child characteristic</i>																		
<i>Sex of child</i>																		
Male	1168	11.79	7988	88.21	.151	545	5.69	8124	94.31	.0146*	397	4.46	8123	95.54	7756	96.04	8123	95.54
Female	952	10.67	7358	89.33		405	4.53	7689	95.47		347	3.96	7756	96.04			7756	96.04
<i>Age of child</i>																		
Under 1 years old	385	9.2	3257	90.8	.000*	157	4.11	3305	95.89	.0191*	105	3.12	3100	96.88			3100	96.88
1-2 years old	972	13.6	5861	86.4		441	5.87	6254	94.13		349	4.89	6349	95.11			6349	95.11
3-4 years old	763	10.02	6228	89.98		352	4.89	6254	95.11		290	4.06	6430	95.94			6430	95.94
<i>Child birth order</i>																		
1st-2nd	1265	11.4	9250	88.6	.475	588	4.66	10325	95.34	.0025*	473	4.17	10302	95.83			10302	95.83
3rd-4th	608	11.38	4282	88.62		277	6.54	4022	93.46		205	4.21	4481	95.79			4481	95.79
More than 4th	247	9.94	1814	90.06		85	5.05	1466	94.95		66	4.85	1236	95.15			1236	95.15
<i>Child who received Vitamin A in last 6 months</i>																		
Yes	1332	11.55	9449	88.45	.6497	552	5.67	8506	94.33	.0133*	566	4.23	11647	95.77			11647	95.77
No	726	10.81	5223	89.19		299	4.39	5590	95.61		171	4.42	4054	95.58			4054	95.58
Don't know	62	10.19	674	89.81		99	4.34	1717	95.66		7	1.2	318	98.8			318	98.8
<i>Child who received an intestinal drug in last 6 months</i>																		
Yes	N/A	N/A	N/A	N/A	N/A	231	5.93	3688	94.07	.2906	275	4.45	5303	95.55			5303	95.55
No	N/A	N/A	N/A	N/A		715	4.87	11992	95.13		467	4.11	10552	95.89			10552	95.89
Don't know	N/A	N/A	N/A	N/A		4	5.15	133	94.85		2	2.23	164	97.77			164	97.77
<i>Mother characteristic</i>																		
<i>Age of mother in years</i>																		
15-19	75	12.20	440	87.80	.169	49	7.12	476	92.88	.1245	17	4.47	377	95.53			377	95.53
20-24	501	12.67	2953	87.33		178	4.92	2960	95.08		136	4.68	2413	95.32			2413	95.32
25-29	599	11.74	4402	88.26		285	5.85	4444	94.15		200	4.34	4047	95.66			4047	95.66
30-34	487	10.52	3795	89.48		225	4.58	3891	95.42		201	4.59	4226	95.41			4226	95.41
35-39	321	10.86	2558	89.14		141	4.81	2702	95.19		124	3.46	3191	96.54			3191	96.54
40-44	113	8.78	977	91.22		63	5.32	1129	94.68		58	3.95	1337	96.05			1337	96.05
45-49	24	7.25	221	92.75		9	1.74	211	98.26		8	2.02	288	97.98			288	97.98

(continued)

Table 2. (continued)

Characteristic	2007					2012					2017					
	Children with ARI symptoms		Children without ARI symptoms		P-value	Children with ARI symptoms		Children without ARI symptoms		P-value	Children with ARI symptoms		Children without ARI symptoms		P-value	
	n	%	n	%		n	%	n	%		n	%	n	%		
Mother's level of education																
No education	97	15.5	642	84.50	.021*	28	5.62	482	94.38	.0006*	15	5.7	225	94.3	.0147*	
Incomplete primary	372	14.19	1971	85.81		121	7.53	1541	92.47		62	5.67	1096	94.33		
Complete primary	582	11.47	3931	88.53		216	5.19	3241	94.81		162	5.11	2806	94.89		
Incomplete secondary	524	10.34	3738	89.66		274	5.86	3967	94.14		201	4.3	4082	95.7		
Complete secondary	430	10.46	3833	89.54		218	4.39	4412	95.61		183	3.44	4838	96.56		
Higher	115	9.16	1229	90.84		93	3.33	2170	96.67		121	3.73	2832	96.27		
Mother's occupation																
Not working	1023	10.53	7851	89.47	.059	404	4.73	7319	95.27	.141	318	3.88	7547	96.12	.106	
Working	1097	12.01	7495	87.99		546	5.47	8494	94.53		426	4.54	8332	95.46		
Household characteristic																
Wealth quintile																
Poorest	787	13.86	4521	86.14	.001*	343	6.79	4665	93.21	.0002*	279	6.21	4238	93.79	.0000*	
Poorer	470	12.66	3009	87.34		223	6.04	3139	93.96		156	4.94	3110	95.06		
Middle	338	10.56	2706	89.44		155	4.89	2875	95.11		113	3.39	2974	96.61		
Richer	297	9.92	2580	90.08		131	4.13	2695	95.87		107	3.51	2822	96.49		
Richest	228	8.68	2530	91.32		98	3.59	2439	96.41		89	2.99	2735	97.01		
Place of residence																
Rural	1414	11.93	9404	88.07	.088	566	5.88	8520	94.12	.0038*	428	4.6	7997	95.4	.0619	
Urban	706	10.30	5942	89.70		384	4.36	7293	95.64		316	3.81	7882	96.19		
Region of residence																
West of Indonesia	1169	10.93	8763	89.07	.005*	532	4.88	9178	95.12	.0001*	402	4.1	9478	95.9	.0038*	
Middle of Indonesia	794	13.00	4777	87.00		357	6.63	4797	93.37		283	5.09	4807	94.91		
East of Indonesia	157	8.46	1806	91.54		61	3.04	1838	96.96		59	2.57	1594	97.43		

(continued)

Table 2. (continued)

Characteristic	2007						2012						2017						
	Children with ARI symptoms			Children without ARI Symptoms			Children with ARI symptoms			Children without ARI symptoms			Children with ARI symptoms			Children without ARI symptoms			
	n	%	P-value	n	%	P-value	n	%	P-value	n	%	P-value	n	%	P-value	n	%	P-value	
Cooking fuel																			
Clean fuel	162	8.38		1756	91.62	.008*	356	4.28		6935	95.72	.0018*	469	3.97		10919	96.03	.0171*	
Unclean fuel	1958	11.62		13572	88.38		592	6.2		8844	93.8		274	5.08		5081	94.92		
No food cooked	0	0		18	100		2	12.67		34	87.33		1	1.1		19	98.9		
Smoking pattern of House member inside the house																			
Yes	N/A	N/A		N/A	N/A	N/A	810	5.33		12968	94.67	.0864	625	4.52		12544	95.48	.081	
No	N/A	N/A		N/A	N/A		140	4.24		2845	95.76		119	3.26		3475	96.74		
Quality of drinking water source																			
Good	1268	10.57		9810	89.43	.037*	463	4.5		8206	95.5	.0032*	406	4.01		9379	95.99	.2030	
Bad	852	13.31		5536	86.69		487	5.96		7607	94.04		338	4.57		6500	95.43		
Handwashing habit																			
Observed	N/A	N/A		N/A	N/A	N/A	923	5.12		15312	94.88	.9560	697	4.17		15016	95.83	.3157	
Not observed	N/A	N/A		N/A	N/A		27	5.19		501	94.81		47	5.05		1003	94.95		
Availability of toilet facilities																			
Available	1367	10.15		10923	89.85	.000*	704	4.7		12796	95.3	.0001*	628	3.95		14370	96.05	.0000*	
Not available	753	14.37		4423	85.63		246	7.13		3017	92.87		116	6.73		1649	93.27		

Source: Indonesia Demographic and Health Survey: IDHS 2007, 2012, and 2017.

*Proportions are weighted.

*P-value < .05.

low risk of infection as the parents usually keep them away from pollution. Moreover, babies are less vulnerable to ARI symptoms due to mothers' compliance with exclusive breastfeeding along with complementary foods. Breastfeeding enhanced immunoglobulins of babies protecting them from ARI.¹³ However, other studies opposed these results showing that children under 1 year had a higher risk of ARI symptoms.¹⁴

The study showed that girls were less exposed to ARI symptoms compared to boys (Table 3). The data in 2012 and 2017 aligned with the results of previous research.¹⁵ Similarly, basic health research in Indonesia showed that the percentage of girls under 5 experiencing ARI symptoms (12.4%) was less compared to boys (13.2%).⁵ Boys like to move more outside and inside their homes exposing themselves to air pollution and increasing the risk of having lung infections.

The study revealed that younger maternal age (15-19 years) was significantly associated with a higher risk of having children experiencing ARI symptoms; similar results were approved in previous studies.^{14,16} Compared to older mothers, younger mothers may have less experience in caring for their children. Similarly, this study presented that children of the most senior maternal age group (45-49 years) had a lower risk of ARI symptoms in 2012 and 2017 (Table 3).

The results, mainly in 2017, showed that children of rich families were less vulnerable to ARI symptoms (Table 3). This is confirmed by other studies mentioning that the frequency and severity of ARI symptoms elevated along with poverty.¹⁷ In addition, data showed that poverty was associated with improper toilet facilities, crowding, and chronic malnutrition.¹⁷ In addition, poverty was linked to using both improper water sources¹⁸ and unclean fuel.¹⁹ Thus, the abovementioned factors could be considered as risk factors for experiencing ARI symptoms in children. This aligns with this study showing that dirty cooking fuel, inadequate drinking water quality, unavailable toilet facilities were associated with a higher risk of ARI symptoms in children (Table 3).

The study showed that children in families who use dirty cooking fuel had a high risk of developing ARI symptoms, although this relationship was not statistically significant (Table 3). However, the percentage of children with ARI symptoms was significantly higher in families using unclean cooking fuel in 2012 and 2017 as follows: 6.2% in 2012 and 5.08% in 2017 (Table 2). According to some literature, children who were exposed to smoke and lived in households that use dirty cooking fuel were more vulnerable to developing ARI symptoms compare to others who were not exposed to smoke and live in households using clean fuels.^{15,20} These results are consistent with previous research in

Nigeria showing that dirty cooking fuel was a significant risk factor for experiencing ARI symptoms in children.^{6,21}

In Indonesia, most households (72%) use clean fuel (liquefied petroleum gas or LPG). LPG is used more in urban areas (86%) than in rural areas (59%). While fewer households (23%) use dirty fuel (wood): 38% in rural areas, and 8% in urban areas.³¹ This goes along with a study in Bangladesh showing that the risk of ARI symptoms in children is higher in households using solid fuels by 18%.²² Similarly, in Afghanistan, children in families who cook with solid fuels were 1.19 times at risk of experiencing ARI than children from families that use cleaner fuels.²³ In Zimbabwe, the likelihood of developing ARI symptoms was more than double among children in households using solid fuels (ie, wood, dung, or straw) than others using cleaner fuels.²⁴ In Ethiopia, the children in households using high-polluting fuels were at a higher risk of experiencing ARI symptoms 3 times than others in families using low-polluting fuels.²⁵ Exposure to dirty fuels increases the risk of viral and bacterial infections caused by bronchial reactivity.

The study showed that toddlers of family members who smoke indoors had a higher risk of experiencing ARI symptoms, although this relationship was not statistically significant (Table 3); however, a study in Padang in Indonesia stated that this relation was significant among children under 5.²⁶ Furthermore, the smoking patterns of family members were related to the incidence of ARI symptoms among toddlers in Surabaya, Indonesia.²⁷ Similarly, Tazinya et al²⁸ showed that families who smoke were at greater risk of experiencing ARI than non-smokers in a hospital in Cameroon. Choube et al²⁹ also stated that the incidence of ARI increased among toddlers whose family members smoke inside the home. Children as passive smokers are at high risk since their immune system is still weak.

Data in Eastern Indonesia, prominently, showed a low percentage of children with ARI symptoms in 2 years (Table 3). Geographically, Eastern Indonesia has a high distribution of islands and consists of Sulawesi, Maluku, Irian/Papua, West Nusa Tenggara, and East Nusa Tenggara. According to the Indonesian Statistical Agency, the population of Eastern Indonesia was less than other regions which may play a role in the low number of children with ARI symptoms. IDHS data collection took place from 24th July to 30th September 2017 (IDHS, 2017). However, according to the Indonesian Meteorology, Climatology, and Geophysics Agency, the dry season reached its peak in July to September 2017. This could be linked to the high number of ARI cases in Indonesia in 2017 since pathogenic microbes survive longer in the air in dry weather. In

Table 3. Prediction of Children With ARI Symptoms in 2007, 2012, and 2017 in Indonesia.

Variable	2007			2012			2017		
	OR	95% CI		OR	95% CI		OR	95% CI	
		Lower	Upper		Lower	Upper		Lower	Upper
<i>Child characteristic</i>									
<i>Sex</i>									
Male	1.00			1.00			1.00		
Female	0.89	0.77	1.04	0.79*	0.65	0.96	0.87	0.72	1.05
<i>Age</i>									
Under 1 year old	0.66***	0.54	0.82	0.78	0.58	1.05	0.61***	0.45	0.82
1-2 years old	1.00			1.00			1.00		
3-4 years old	0.071***	0.59	0.85	0.83	0.67	1.02	0.82	0.66	1.01
<i>Child birth order</i>									
1st-2nd	1.00			1.00			1.00		
3rd-4th	1.02	0.84	1.25	1.59***	1.25	2.02	1.12	0.86	1.47
More than 4th	0.84	0.61	1.16	1.28	0.85	1.94	1.29	0.86	1.94
<i>Child who received Vitamin A in last 6 months</i>									
Yes	1.00			1.00			1.00		
No	0.94	0.76	1.16	0.76**	0.61	0.94	1.15	0.89	1.48
Don't know	0.86	0.55	1.35	0.76	0.57	1.03	0.29	0.78	1.13
<i>Child who received the intestinal drug in last 6 months</i>									
Yes	N/A	N/A	N/A	1.19	0.92	1.53	1.08	0.87	1.33
No	N/A	N/A	N/A	1.00			1.00		
Don't know	N/A	N/A	N/A	1.19	0.27	5.26	0.96	0.18	5.19
<i>Mother characteristic</i>									
<i>Age in years</i>									
15-19	1.13	0.70	1.81	1.72*	1.03	2.88	0.98	0.48	1.97
20-24	1.21	0.94	1.55	1.17	0.83	1.63	1.04	0.78	1.39
25-29	1.13	0.91	1.41	1.39*	1.08	1.80	0.97	0.74	1.27
30-34	1.00			1.00			1.00		
35-39	1.04	0.81	1.34	0.92	0.67	1.27	0.69*	0.51	0.95
40-44	0.82	0.56	1.19	0.98	0.61	1.57	0.76	0.51	1.14
45-49	0.59	0.27	1.30	0.28**	0.12	0.65	0.35*	0.15	0.84
<i>Education Level</i>									
No education	1.61	0.96	2.62	1.00	0.52	1.94	1.11	0.56	2.20
Incomplete primary	1.36*	1.04	1.79	1.17	0.81	1.68	1.12	0.73	1.71
Complete primary	1.09	0.86	1.37	0.83	0.64	1.09	1.10	0.82	1.48
Incomplete secondary	1.00			1.00			1.00		
Complete secondary	1.13	0.90	1.42	0.86	0.64	1.14	0.92	0.71	1.19
Higher	1.09	0.72	1.64	0.70	0.47	1.05	1.08	0.77	1.51
<i>Mother's occupation</i>									
Not working	0.87	0.74	1.02	0.83	0.67	1.02	0.80*	0.65	0.99
Working	1.00			1.00			1.00		
<i>Household characteristic</i>									
<i>Wealth quintile</i>									
Poorest	1.01	0.79	1.29	0.95	0.71	1.28	1.26	0.94	1.68
Poorer	1.00			1.00			1.00		
Middle	0.86	0.64	1.17	0.89	0.64	1.23	0.69*	0.49	0.95
Richer	0.85	0.65	1.11	0.82	0.58	1.17	0.71	0.51	1.01
Richest	0.77	0.54	1.09	0.83	0.54	1.29	0.61**	0.42	0.89
<i>Place of residence</i>									
Rural	1.00			1.00			1.00		
Urban	1.08	0.86	1.35	0.94	0.74	1.21	1.11	0.89	1.38

(continued)

Table 3. (continued)

Variable	2007			2012			2017		
	OR	95% CI		OR	95% CI		OR	95% CI	
		Lower	Upper		Lower	Upper		Lower	Upper
Region of residence									
West of Indonesia	1.00			1.00			1.00		
Middle of Indonesia	1.09	0.94	1.29	1.16	0.95	1.41	1.07	0.87	1.32
East of Indonesia	0.65	0.49	0.86	0.46***	0.29	0.73	0.48***	0.31	0.75
Cooking fuel									
Clean fuel	1.00			0.89	0.70	1.11	1.09	0.85	1.40
Unclean fuel	1.15	0.82	1.63	1.00			1.00		
No food cooked	1.00	N/A	N/A	2.40	0.43	13.58	0.28	0.03	2.33
Smoking pattern of House member inside house									
Yes	N/A	N/A	N/A	1.12	0.85	1.48	1.23	0.95	1.59
No	N/A	N/A	N/A	1.00			1.00		
Drinking water source quality									
Good	1.00			1.00			1.00		
Bad	1.02	0.85	1.24	1.21	0.99	1.48	1.06	0.85	1.32
Handwashing habit									
Observed	N/A	N/A	N/A	1.00			1.00		
Not observed	N/A	N/A	N/A	0.83	0.48	1.44	0.89	0.59	1.32
Toilet facility									
Available	1.00			1.00			1.00		
Not available	1.27*	1.04	1.56	1.24	0.95	1.63	1.28	0.97	1.68

Source: Indonesia Demographic and Health Survey, 2007, 2012 and 2017.

Proportions are weighted.

*P-value < .05. **P-value < .01. ***P-value < .001.

turn, pathogenic microbes can cause respiratory problems in children.³⁰

The main limitation of this study was the use of secondary data. Moreover, possible bias, related to the prevalence of ARI symptoms, could happen during data collection of mothers' self-reported information. The data were cross-sectional, therefore a causal relationship between factors was not assessed. Moreover, the study did not assess the children who received intestinal drugs last 6 months, smoke patterns of family members, and handwashing habits from IDHS 2007.

The strength of this study was the ability to show the trend and progress in prevalence and factors associated with ARI symptoms among children under 5 in 2007, 2012, and 2017 in Indonesia. Demographic Health Survey (DHS) data has been validated, thus the results can be generalized. The DHS survey variables were defined in the same way in different countries to compare the results across countries.

Conclusion

This study approved the success of Indonesia in decreasing the prevalence of ARI symptoms among toddlers in

2007, 2012, and 2017 respectively with little differences in other related factors. Lifestyle and household environmental factors such as the use of dirty fuel, the presence of smokers in the household, the poor quality of drinking water, low availability of toilet facilities in addition to the maternal age and child age were all determinant factors that should be prioritized and improved. Health workers must immediately implement interventions especially for families with inadequate lifestyles and poor household environments. Moreover, family self-awareness should be enhanced for better prospects for toddler survival.

Acknowledgments

The authors thank the MEASURE DHS project for its support and for providing free access to the original data.

Author Contributions

Leka Lutpiatina: Conceptualization, Methodology, Data curation, Formal analysis, Writing - original draft, Writing - review & editing.

Lilis Sulistyorini: Conceptualization, Methodology, Data curation, Formal analysis, Writing - original draft, Writing - review & editing.

Hari Basuki Notobroto: Conceptualization, Methodology, Data curation, Formal analysis, Writing - original draft, Writing - review & editing.

Reynie Purnama Raya: Conceptualization, Methodology, Data curation, Formal analysis, Writing - review & editing.

Ricko Darmadji Utama: Conceptualization, Methodology, Data curation, Formal analysis, Writing - original draft, Writing - review & editing.

Anny Thuraidah: Methodology, Data curation, Formal analysis, Writing - review & editing.

6


Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Leka Lutpiatina  <https://orcid.org/0000-0003-3349-4978>

References

- Adesanya OA, Chiao C. Environmental risks associated with symptoms of acute respiratory infection among preschool children in north-western and south-southern Nigeria communities. *Int J Environ Res Public Health*. 2017;14(11):1396. doi:10.3390/ijerph14111396
- Kolawole O, Oguntoye M, Dam T, Chunara R. Etiology of respiratory tract infections in the community and clinic in Ilorin, Nigeria. *BMC Res Notes*. 2017;10(1):712. doi:10.1186/s13104-017-3063-1
- Solomon OO, Odu OO, Amu EO, et al. Prevalence and risk factors of acute respiratory infection among under fives in rural communities of Ekiti state, Nigeria. *Glob J Med Public Health*. 2018;7(1):1-12.
- WHO. *Pneumonia*. World Health Organization. 2016. <https://www.who.int/news-room/fact-sheets/detail/pneumonia>
- Riskesmas. *Laporan Nasional Riset Kesehatan Dasar 2018*. Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan RI; 2018.
- Akinyemi JO, Morakinyo OM. Household environment and symptoms of childhood acute respiratory tract infections in Nigeria, 2003-2013: a decade of progress and stagnation. *BMC Infect Dis*. 2018;18(1):296. doi:10.1186/s12879-018-3207-5
- Shibata T, Wilson J, Watson L, et al. Childhood acute respiratory infections and household environment in an eastern Indonesian urban setting. *Int J Environ Res Public Health*. 2014;11(12):12190-12203. doi:10.3390/ijerph111212190
- Nirmolia N, Mahanta TG, Boruah M, Rasaily R, Kotoky RP, Bora R. Prevalence and risk factors of pneumonia in under five children living in slums of Dibrugarh town. *Clin Epidemiol Glob Health*. 2018;6(1):1-4. doi:10.1016/j.cegh.2017.07.004
- Titaley CR, Que BJ, de Lima FVI, et al. Health care-seeking behavior of children with acute respiratory infections symptoms: analysis of the 2012 and 2017 Indonesia demographic and health surveys. *Asia Pac J Public Health*. 2020;32(6-7):310-319.
- Windi R, Efendi F, Qona'ah A, Adnani QES, Ramadhan K, Almutairi WM. Determinants of acute respiratory infection among children under-five years in Indonesia. *J Pediatr Nurs*. 2021;60:e54-e59. doi:10.1016/j.pedn.2021.03.010
- United Nations. *Transforming Our World: The 2030 Agenda for Sustainable Development*. United Nations; 2015.
- Acharya P, Mishra SR, Berg-Beckhoff G. Solid fuel in kitchen and acute respiratory tract infection among under five children: evidence from Nepal demographic and health survey 2011. *J Community Health*. 2015;40(3):515-521.
- Ujunwa F, Ezeonu C. Risk factors for acute respiratory tract infections in under-five children in Enugu southeast Nigeria. *Ann Med Health Sci Res*. 2014;4(1):95-99.
- Dagne H, Andualem Z, Dagnaw B, Taddese AA. Acute respiratory infection and its associated factors among children under five years attending pediatrics ward at University of Gondar Comprehensive Specialized Hospital, northwest Ethiopia: institution-based cross-sectional study. *BMC Pediatr*. 2020;20(1):1-7.
- Mondal D, Paul P. Effects of indoor pollution on acute respiratory infections among under-five children in India: evidence from a nationally representative population-based study. *PLoS One*. 2020;15(8):e0237611. doi:10.1371/journal.pone.0237611
- Cardoso AM, Coimbra CEA, Werneck GL. Risk factors for hospital admission due to acute lower respiratory tract infection in Guarani indigenous children in southern Brazil: a population-based case-control study. *Trop Med Int Health*. 2013;18(5):596-607.
- Douglas RM. Acute respiratory infections in children in the developing world. *Semin Resp Infect*. 1991;6:217-224.
- Morakinyo OM, Adebawale SA, Olorunfoba EO. Wealth status and sex differential of household head: implication for source of drinking water in Nigeria. *Arch Public Health*. 2015;73:58.
- Larrea C, Kawachi I. Does economic inequality affect child malnutrition? The case of Ecuador. *Soc Sci Med*. 2005;60:165-178.
- Pandey S, Lin Y. Adjusted effects of domestic violence, tobacco use, and indoor air pollution from use of solid fuel on child mortality. *Matern Child Health J*. 2013;17:1499-1507.
- Adesanya OA, Chiao C. A multilevel analysis of lifestyle variations in symptoms of acute respiratory infection among young children under five in Nigeria. *BMC Public Health*. 2016;16(880):880. doi:10.1186/s12889-016-3565-0

22. Hasan M, Tasfina S, Haque SMR, et al. Association of biomass fuel smoke with respiratory symptoms among children under 5 years of age in urban areas: results from Bangladesh urban health survey, 2013. *Environ Health Prev Med.* 2019;24(1):65. doi:10.1186/s12199-019-0827-3
23. Rana J, Uddin J, Peltier R, Oulhote Y. Associations between indoor air pollution and acute respiratory infections among under-five children in Afghanistan: do SES and sex matter? *Int J Environ Res Public Health.* 2019;16(16):2910.
24. Mishra V. Indoor air pollution from biomass combustion and acute respiratory illness in preschool age children in Zimbabwe. *Int J Epidemiol.* 2003;32(5):847-853. doi:10.1093/ije/dyg240
25. Sanbata H, Asfaw A, Kumie A. Association of biomass fuel use with acute respiratory infections among under-five children in a slum urban of Addis Ababa, Ethiopia. *BMC Public Health.* 2014;14(1):1122.
26. Hidayanti R, Yetti H, Putra AE. Risk factors for acute respiratory infection in children under five in Padang, Indonesia. *Matern Child Health J.* 2019;4(2):62-69. doi:10.26911/thejmch.2019.04.02.01
27. Mahendrayasa IGAP. Hubungan antara kondisi fisik rumah dengan kejadian infeksi saluran pernafasan atas pada Balita di Surabaya. *Jurnal Berkala Epidemiologi.* 2018;6(3):227-235. doi:10.20473/jbe.v6i32018.227-235
28. Tazinya AA, Halle-Ekane GE, Mbuagbaw LT, Abanda M, Atashili J, Obama MT. Risk factors for acute respiratory infections in children under five years attending the Bamenda Regional Hospital in Cameroon. *BMC Pulm Med.* 2018;18(1):7. doi:10.1186/s12890-018-0579-7
29. Choube A, Kumar B, Mahmood S, Srivastava A. Potential risk factors contributing to acute respiratory infections in under five age group children. *Int J Med Sci Public Health.* 2014;3(11):1385-1389. doi:10.5455/ijm-sph.2014.200820141
30. Darrow LA, Klein M, Flanders WD, Mulholland JA, Tolbert PE, Strickland MJ. Air pollution and acute respiratory infections among children 0-4 years of age: an 18-year time-series study. *Am J Epidemiol.* 2014;180(10):968-977.
31. Indonesian Demographic and Health Survey (IDHS). (2017). <https://dhsprogram.com/pubs/pdf/FR342/FR342.pdf>
32. Taksande AM, Yeole M. Risk factors of acute respiratory infection (ARI) in underfives in a rural hospital of central India. *J Pediatr Neonat Individual Med.* 2015;5(1):e050105. doi:10.7363/050105

Multilevel Analysis of Lifestyle and Household Environment for Toddlers With Symptoms of Acute Respiratory Infection (ARI) in Indonesia in 2007, 2012, and 2017

ORIGINALITY REPORT

18%

SIMILARITY INDEX

15%

INTERNET SOURCES

14%

PUBLICATIONS

0%

STUDENT PAPERS

PRIMARY SOURCES

1	assets.publishing.service.gov.uk Internet Source	1%
2	ppm-poltekkeskemenkesbanjarmasin.com Internet Source	1%
3	dspace.cvut.cz Internet Source	1%
4	bmcwomenshealth.biomedcentral.com Internet Source	1%
5	www.science.gov Internet Source	1%
6	journals.sagepub.com Internet Source	1%
7	link.springer.com Internet Source	1%
8	journals.plos.org Internet Source	1%

9

Yan Cui, Hal Morgenstern, Sander Greenland, Donald P. Tashkin, Jenny Mao, Wei Cao, Wendy Cozen, Thomas M. Mack, Zuo-Feng Zhang. "Polymorphism of Xeroderma Pigmentosum group G and the risk of lung cancer and squamous cell carcinomas of the oropharynx, larynx and esophagus", International Journal of Cancer, 2006

Publication

<1 %

10

core-cms.prod.aop.cambridge.org

Internet Source

<1 %

11

Brittany Lapin, Sara Davin, Mary Stilphen, Joshua K. Johnson, Edward Benzel, Ghaith Habboub, Irene L. Katzan. "Stratification of Spine Patients based on Self-Reported Clinical Symptom Classes", The Spine Journal, 2022

Publication

<1 %

12

bmcinfectdis.biomedcentral.com

Internet Source

<1 %

13

repositori.uic.es

Internet Source

<1 %

14

Restu Windi, Ferry Efendi, Arina Qona'ah, Qorinah Estiningtyas Sakilah Adnani, Kadar Ramadhan, Wedad M. Almutairi. "Determinants of Acute Respiratory Infection Among Children Under-Five Years in Indonesia", Journal of Pediatric Nursing, 2021

<1 %

-
- 15 www.ghsupplychain.org <1 %
Internet Source
-
- 16 pubmed.ncbi.nlm.nih.gov <1 %
Internet Source
-
- 17 www.genderbias.net <1 %
Internet Source
-
- 18 Rayhan Sk, Mohammad Hafiz Rasooly, Somdutta Barua. "Do fuel type and place of cooking matter for acute respiratory infection among Afghan children? Evidence from the Afghanistan DHS 2015", *Journal of Biosocial Science*, 2019
Publication
-
- 19 assets.grenfelltowerinquiry.org.uk <1 %
Internet Source
-
- 20 jpmph.org <1 %
Internet Source
-
- 21 Daniel Geleta, Abebe Kebede, Gebeyehu Bulcha, Hyder Usman, Kunuz Hajibediru, Selass kebede, Sileshi Dubale, Getu Degu. "Prevalence and Predictors of Contraceptive Use Among Women of Premenopausal Period in Ethiopia: A Retrospective Cross-Sectional Data Analysis", *Open Access Journal of Contraception*, 2021
Publication
-

22 Sanni Yaya, Olalekan A. Uthman, Friday Okonofua, Ghose Bishwajit. "Decomposing the rural-urban gap in the factors of under-five mortality in sub-Saharan Africa? Evidence from 35 countries", BMC Public Health, 2019
Publication <1 %

23 www.mdpi.com
Internet Source <1 %

24 downloads.hindawi.com
Internet Source <1 %

25 bmcpublichealth.biomedcentral.com
Internet Source <1 %

26 www.ejurnal-analiskesehatan.web.id
Internet Source <1 %

27 T Osayomi, O B Ogbonnaiye, A E Iyanda. "Hotspots and drivers of acute respiratory infection among children in Nigeria", South African Journal of Child Health, 2020
Publication <1 %

28 www.panafrican-med-journal.com
Internet Source <1 %

29 Sitawa R. Kimuna. "Gender Based Violence: Correlates of Physical and Sexual Wife Abuse in Kenya", Journal of Family Violence, 07/2008
Publication <1 %

- | | | |
|----|--|------|
| 30 | Joshua Odunayo Akinyemi, Oyewale Mayowa Morakinyo. "Household environment and symptoms of childhood acute respiratory tract infections in Nigeria, 2003–2013: a decade of progress and stagnation", BMC Infectious Diseases, 2018
Publication | <1 % |
| 31 | oamjms.eu
Internet Source | <1 % |
| 32 | economist.com.na
Internet Source | <1 % |
| 33 | www.jiasociety.org
Internet Source | <1 % |
| 34 | Chi Chiao, Oluwafunmilade Deji-Abiodun. "A global analysis of the regional variation in the symptoms of acute respiratory infection during childhood: Epidemics and their association with environmental vulnerability", Health & Place, 2020
Publication | <1 % |
| 35 | equityhealthj.biomedcentral.com
Internet Source | <1 % |
| 36 | www.earlylearningalliance.org
Internet Source | <1 % |
| 37 | bmcpediatr.biomedcentral.com
Internet Source | <1 % |

38	researchonline.jcu.edu.au Internet Source	<1 %
39	Capmh.Biomedcentral.Com Internet Source	<1 %
40	Katherine E. Woolley, G. Neil Thomas, Bruce Kirenga, Gabriel Okello et al. "Association of household cooking location behaviour with acute respiratory infections among children aged under five years; a cross sectional analysis of 30 Sub-Saharan African Demographic and Health Surveys", Atmospheric Environment, 2022 Publication	<1 %
41	academic.oup.com Internet Source	<1 %
42	bradscholars.brad.ac.uk Internet Source	<1 %
43	www.eric.ed.gov Internet Source	<1 %
44	Abraham Geremew, Selamawit Gebremedhin, Yohannes Mulugeta, Tesfaye Assebe Yadeta. "Place of food cooking is associated with acute respiratory infection among under-five children in Ethiopia: multilevel analysis of 2005–2016 Ethiopian Demographic Health	<1 %

45

GOVINDA P. DAHAL. "MATERNAL SMOKING AND ACUTE RESPIRATORY INFECTION SYMPTOMS AMONG YOUNG CHILDREN IN NEPAL: MULTILEVEL ANALYSIS", Journal of Biosocial Science, 06/29/2009

Publication

<1 %

46

Jean-Modeste Harerimana, Leatitia Nyirazinyoye, Dana R. Thomson, Joseph Ntaganira. "Social, economic and environmental risk factors for acute lower respiratory infections among children under five years of age in Rwanda", Archives of Public Health, 2016

Publication

<1 %

47

Marios K. Georgakis, Paraskevi Papathoma, Anton Ryzhov, Snezana Zivkovic-Perisic et al. "Malignant central nervous system tumors among adolescents and young adults (15-39 years old) in 14 Southern-Eastern European registries and the US Surveillance, Epidemiology, and End Results program: Mortality and survival patterns", Cancer, 2017

Publication

<1 %

48

Mohammad Shayan Babar Khan, Heman D. Lohano. "Household air pollution from

<1 %

cooking fuel and respiratory health risks for children in Pakistan", Environmental Science and Pollution Research, 2018

Publication

49

Sanni Yaya, Ghose Bishwajit. "Trends in the prevalence and care-seeking behaviour for acute respiratory infections among Ugandan infants", Global Health Research and Policy, 2019

Publication

<1 %

50

media.neliti.com

Internet Source

<1 %

51

pdfs.semanticscholar.org

Internet Source

<1 %

52

s-space.snu.ac.kr

Internet Source

<1 %

53

tropmedhealth.biomedcentral.com

Internet Source

<1 %

54

www.dovepress.com

Internet Source

<1 %

55

www.medrxiv.org

Internet Source

<1 %

56

www.scipublications.com

Internet Source

<1 %

57

Christiana Rialine Titaley, Bertha J. Que, Filda V. I. de Lima, Ony W. Angkejaya et al. "Health

<1 %

Care-Seeking Behavior of Children With Acute Respiratory Infections Symptoms: Analysis of the 2012 and 2017 Indonesia Demographic and Health Surveys", Asia Pacific Journal of Public Health, 2020

Publication

58

Oluwafunmilade Deji-Abiodun, David Ferrandiz-Mont, Vinod Mishra, Chi Chiao. "A multilevel analysis of the social determinants associated with symptoms of acute respiratory infection among preschool age children in Pakistan: A population-based survey", PLOS ONE, 2021

Publication

<1 %

59

Tarikul Islam, Salim Mandal, Pradip Chouhan. "Influence of socio-demographic factors on coverage of full vaccination among children aged 12-23 months: a study in Indian context (2015-2016)", Human Vaccines & Immunotherapeutics, 2021

Publication

<1 %

60

&NA;. "ISEE 20th Annual Conference, Pasadena, California, October 12-16, 2008", Epidemiology, 11/2008

Publication

<1 %

61

Oluwafunmilade A. Adesanya, Chi Chiao. "A multilevel analysis of lifestyle variations in symptoms of acute respiratory infection

<1 %

among young children under five in Nigeria", BMC Public Health, 2016

Publication

Exclude quotes Off

Exclude matches Off

Exclude bibliography On

Multilevel Analysis of Lifestyle and Household Environment for Toddlers With Symptoms of Acute Respiratory Infection (ARI) in Indonesia in 2007, 2012, and 2017

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13
