

ORIGINAL ARTICLE

Association between the health vulnerability of family members and concern about the contagion of COVID-19 in Peruvian residents after the pandemic

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Abstract

Background: The COVID-19 pandemic has created additional challenges for family health. Worry, fear, and anxiety associated with this disease can affect the perception of family health. The study's objective was to analyze the factors associated with health vulnerability of family members in the Peruvian population after pandemic.

Methods: Observational, cross-sectional, and analytical study. Sampling was nonprobabilistic. The sample consisted of 519 residents who met the following inclusion criteria: Peruvian resident, of both genders, over 18 years of age, who lives with their family, and who agrees to participate in the study. For data collection, the "SALUFAM" and "PRE-COVID-19" scales were used, which measure the health vulnerability of family members and concern about the contagion of COVID-19, respectively. Data collection was done between January and March, 2023.

Results: Living in the Coast region increases by 3.299 times (95% CI=1.55–9.28; $p=0.003$) the probability of lower family health vulnerability compared to residents from the Jungle region. In the same way, having a low concern about the contagion of COVID-19 increases 2.77 times (95% CI=1.02–7.53; $p=0.044$) the probability of less vulnerability to family health, unlike participants who are highly concerned about the contagion of COVID-19.

Conclusions: It should be necessary to design prevention and family health promotion strategies according to the geographical region; it is also essential to provide education on the risks and the importance of prevention measures for COVID-19, regardless of their initial level of concern.

KEYWORDS

concern, COVID-19, family health, health vulnerability, Peruvian population

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1 | INTRODUCTION

Families, in all their shapes and sizes, are the fundamental pillars of society and play a crucial role in promoting health at the individual and community levels. The understanding of families' influence on their members' health has been recognized in theoretical models and scientific research.^{1,2}

Health is not limited to the individual sphere but is socially constructed within homes, part of broader contextual systems such as the community and society. The family environment and the interactions between its members significantly impact the health and well-being of each individual, establishing patterns of behavior related to health and providing emotional and social support.²

In this sense, health promotion is crucial in leading efforts to include families in strategic alliances and public health programming. Recognizing the importance of the family as an agent of change and promoter of health is essential for designing and implementing effective interventions.³

Family health can be determined by the family's ability to fulfill functions, adapt to changes, and overcome family crises in the face of variations that can occur in the internal or external environment.⁴ A study in Seville-Spain revealed that the different stages of the family life cycle, the low level of education of the head of the household, and stressful life events were negatively associated with family health.⁵ In contrast, adequate perceived social support and the number of close friends and relatives were positively associated. Another study in Hubei-China found that gender, household income level, body mass index, presence of a nearby community hospital, and self-reported health status are associated with better family health.²

On the other hand, the vulnerability of family health means the need for care and the family itself is the one who facilitates the care of the member who requires it.⁶ Much of family activity is focused on taking care of its members, especially those who are susceptible to illness or because they simply do not feel satisfied with what they have achieved in life.⁶ In every society, there are communities, families, and individuals whose probability of dying, getting sick, or having an accident is greater than others. These groups are vulnerable, which implies that they have greater exposure to risk, which is designated to refer to the circumstance or situation that increases the probability of contracting disease or any other health problem.⁷

Peru shows great vulnerability to climatic variations, such as extreme episodes of rain and high temperatures and other natural disasters.⁸ Additionally, a recent study showed that 71.4% of Peruvian households experienced some degree of food insecurity during the COVID-19 pandemic.⁹ Peru also ranks second among Latin American countries with the highest percentage (38.6%) of violence against women and is among the countries with the highest rates of femicide.¹⁰ Furthermore, social inequality and poverty in Peru were further aggravated by the current crisis, due to the pandemic.^{11,12} These are some aspects that make Peru a country

with high levels of social vulnerability that affects the family health.

The Peruvian health system is fragmented into the public and private sectors. Those who have formal jobs are part of the social security system through EsSalud (20%) or, a small minority, through the private Health Services Entities (EPS), while the rest of the population is either affiliated to a special regime for the poor, the SIS (16.9%), or buy private insurance (3%), or simply remain unprotected (58%).¹³ The health system has responded poorly to the challenges of the pandemic, which is why Peru is one of the countries with the most deaths by number of infected people: For every 30 people infected, one died, as of March 31, 2021.¹⁴ Despite the existing evidence, the impact of the COVID-19 pandemic has created additional challenges for family health. Worry, fear, and anxiety associated with the disease can create tensions and ruptures in family dynamics, affecting the perception of family health and generating greater vulnerability.¹⁵ In addition, the contagion of new variants of the coronavirus and the start of new disease outbreaks pose additional health challenges for families.¹⁶

In this context, it is crucial to evaluate the factors associated with the health vulnerability of family members that could affect the Peruvian population. A population that has suffered at the regional level is among the most affected in the number of cases, deaths per million, and total excess of deaths.¹⁷ Understanding these factors will allow the development of health strategies and policies that address the needs and strengths of families, promoting a healthy and resilient family environment.¹⁸ Therefore, this study aimed to analyze the factors associated with the health vulnerability of family members in the Peruvian population after pandemic.

2 | MATERIALS AND METHODS

2.1 | Type of study, population, and sample

This is an observational and cross-sectional study. According to the snowball technique, the sampling was nonprobabilistic. We calculated the sample size based on a population of 33,000,000 inhabitants in Peru. We considered a conservative assumption that 20% of participants would have a high health vulnerability of the family members, with a confidence level of 95% and a margin of error of 5%, obtaining a necessary sample of 282 participants. We surveyed 536 subjects.

A sample of participants was obtained, chosen according to the following inclusion criteria: Peruvian resident, of both genders, over 18 years of age, who lives with their family, and who agrees to participate in the study. In turn, foreign residents, minors living alone, and who did not sign the informed consent were excluded. Missing data were excluded from the analyses. It was verified that there were 17 responses that did not have all the answers complete. This loss of data was random so it did not introduce bias in the results.

2.2 | Data collection and instruments

For the data collection, the survey technique was used, and the instrument was the digital questionnaire by Google Forms, which was shared by social networks (WhatsApp, Facebook, Twitter, among others) between January and March 2023.

Various sociodemographic variables were considered in the analysis, including age (divided into young adults, adults, and elder), gender, place of origin (coast, mountain, jungle), marital status (with partner and no partner), educational level (high school and university or higher education), work activity (employed and unemployed), income (less/more than 1025 soles, minimum wage in Peru), and health insurance coverage. Regarding the family structure, aspects such as the type of family, the number of members, the presence of chronic diseases, the existence of COVID-19 cases in the family, and the status of vaccination against COVID-19 were considered.

For the variable health vulnerability of family members, the SALUFAM scale was created by Puschel et al. in 2012 in Chile, which has reliability by Cronbach's alpha greater than 0.91, high content validity, concurrent validity, and clinical predictive value; the test-retest replicability obtained using the Pearson correlation index was 0.84. It is made up of 13 items; it is one-dimensional, with Lickert-type responses: never (1), rarely (2), sometimes (3), often (4), and always (5). The final family health scoring scale groups into greater vulnerability (≤ 38 points) and lesser vulnerability (≥ 39 points).¹⁹

To measure concern about the contagion of COVID-19, the "PRE-COVID-19" scale created by Caycho, Ventura, and Barboza in Peru in 2020 was used, with a reliability of 0.90 by Cronbach's alpha.²⁰ The instrument is one-dimensional and has 6 items with Likert-type response alternatives, ranging from never (1) to almost all the time (5). The final score scale classifies contagion concerns as high (≥ 13 points) and low (≤ 12 points).²⁰

2.3 | Data analysis

The statistical package SPSS v.24 was used for data analysis and processing. For the descriptive analysis, simple frequency tables were chosen for the categorical variables and measures of central tendency and dispersion (arithmetic mean and standard deviation) for the numerical variables. For the bivariate analysis, contingency tables and the chi-square test were used. Variables that were statistically significant with a p -value < 0.05 were included in the multivariate analysis through binary logistic regression. The perception of family health was considered a dependent variable and as an independent variable: Sociodemographic characteristics and concern about contagion by COVID-19 were considered. A p -value < 0.05 was considered statistically significant.

3 | RESULTS

Of the 519 residents surveyed, 56.1% were female, and 96.5% belonged to the young adult (18–30 years old) and adult age

(31–59 years old) groups. On the other hand, 47.4% came from the Coast, followed by 40.1% from the Jungle. Regarding marital status, 63.2% stated they did not have a partner; 85.5% presented a higher education (University), and 60.9% indicated a job. Next, 77.1% of those surveyed mentioned a monthly economic income of more than 1025 soles (minimum wage in Peru), 81.1% had health insurance, 50.3% indicated that they did not have a family member with a chronic disease, and 59.9% came from a nuclear family, with an average number of members of 4 ± 1.7 people (Table 1).

Concerning COVID-19, 78.8% of those surveyed indicated that a family member has or has ever been infected with COVID-19. In addition, 90.4% of all family members have received the full schedule of vaccines against COVID-19 (Table 1). Regarding the descriptive analysis of the study variables, it was found that 66.9% of the residents have low concern about the contagion of COVID-19, and 33.1% have high concern; likewise, 94% perceive a lower vulnerability for their family's health, while 6% perceive a greater vulnerability (Table 1).

In the bivariate analysis, it was found that age ($p = 0.041$), place of origin ($p = 0.001$), a family member with a chronic disease ($p = 0.038$), and concern about the contagion of COVID-19 ($p = 0.038$) were related to the health vulnerability of family members with a p -value of less than 0.05 (Table 2).

Lastly, variables that were statistically significant with a p -value < 0.05 were included in the multivariate analysis (age, place of origin, family member with chronic disease, and concern about COVID-19 contagion). The multivariate analysis showed that being from the Coast region increases 3.8 times (95% CI = 1.55–9.28; $p = 0.003$) the probability of having lower family health vulnerability compared to residents from the Jungle region. In the same way, having a low concern about the contagion of COVID-19 increases 2.77 times (95% CI = 1.02–7.53; $p = 0.044$) the probability of having less vulnerability to family health, unlike participants who are highly concerned about the contagion of COVID-19 (Table 3).

4 | DISCUSSION

The growth and development of each family member are influenced by family health and the context created.²¹ Families play a role in health development, and family health is also influenced by individual health behaviors and outcomes.¹ Therefore, it is important to know the factors contributing to strong family health, which may reveal opportunities for family health promotion and targeted intervention. This study found that the geographical origin of the Coast region and having a low concern about the contagion of COVID-19 significantly increase the probability of having a perception of less vulnerability to family health.

The study participants were primarily women, from the Coast region, with a higher level of education, employed, and with high vaccination coverage against COVID-19. Similarly, previous studies have also found greater participation of women in research related to family health, and the geographic distribution may reflect

TABLE 1 Descriptive analysis of the study variables.

Variables		n = 519	%
Gender	Female	291	56.1
	Male	228	43.9
Age	Young adult and adult (18–59 years old)	501	96.5
	Elderly (≥60 years old)	18	3.5
Origin	Coast	246	47.4
	Mountain	65	12.5
	Jungle	208	40.1
Marital status	With partner	191	36.8
	No partner	328	63.2
Educational level	High school	75	14.5
	University	444	85.5
Work activity	Unemployed	203	39.1
	Employed	316	60.9
Monthly familiar income	Less than 1025 soles	119	22.9
	More than 1025 soles	400	77.1
Health insurance	Yes	421	81.1
	No	98	18.9
Type of family	Nuclear	311	59.9
	Extended	122	23.5
	Single-parent	86	16.6
Number of family members	Me±DS	4±1.7	
Does any family member have or have had COVID-19?	Yes	409	78.8
	No	110	21.2
Are all members of your family vaccinated against COVID-19?	Yes	469	90.4
	No	50	9.6
Does any family member suffer from any chronic disease?	Yes	258	49.7
	No	261	50.3
Concern about the contagion of COVID-19	High	172	33.1
	Low	347	66.9
Health vulnerability of family members	More vulnerability	31	6
	Less vulnerability	488	94

Abbreviations: Me, mean; SD, standard deviation.

regional differences in health and access to healthcare services.^{22,23} Likewise, educational level and employment determine individual and family health and well-being.^{24,25} The high vaccination coverage against COVID-19 in the sample can be attributed to the efforts of vaccination programs implemented at the national level. On the other hand, the majority perceived a lower vulnerability of family health and presented low concern about the contagion of COVID-19. This could be due to the availability of information on prevention measures and the actions taken by health authorities to control the contagion of the virus.²⁶

Regarding the bivariate analysis of the variables, it was found that 67.7% of the participants with a relative who suffered from some chronic disease presented a greater vulnerability regarding their family health. Similar results were seen in a study published in Canada.²⁷

Parents of children with chronic diseases experienced more significant emotional stress and lower quality of life than parents whose children did not have a chronic disease. In addition, it was observed that the child's chronic disease also affected the couple's relationship and family dynamics. Similarly, a study of a North American population revealed that chronic disease in a family member was associated with higher levels of family stress, disruptions in daily routines, and changes in family dynamics.²⁸ In addition, parents reported difficulties balancing the needs of the affected member with the needs of the rest of the family. In turn, a review by Pinguat and Teubert showed that parents of children with chronic diseases experienced higher levels of stress, anxiety, and depression, which could affect the overall perception of family health.²⁹ In addition, siblings of children with chronic diseases were also found to face emotional challenges and may experience

TABLE 2 Bivariate analysis according to health vulnerability of family members in Peruvian residents, 2023.

Variables		Health vulnerability				p-Value
		More vulnerability		Less vulnerability		
		n	%	n	%	
Gender	Female	13	41.9	278	57.0	0.102
	Male	18	58.1	210	43.0	
Age	Young adult and adult	28	90.3	473	96.9	0.041*
	Elderly	3	9.7	15	3.1	
Origin	Coast	7	22.6	239	49.0	0.001*
	Mountain	2	6.5	63	12.9	
	Jungle	22	71.0	186	38.1	
Marital status	With partner	11	35.5	180	36.9	0.875
	No partner	20	64.5	308	63.1	
Educational level	High school	8	25.8	67	13.7	0.064
	University	23	74.2	421	86.3	
Work activity	Unemployed	15	48.4	188	38.5	0.275
	Employed	16	51.6	300	61.5	
Monthly family income	Less than 1025 soles	5	16.1	114	23.4	0.353
	More than 1025 soles	26	83.9	374	76.6	
Labor insurance	Yes	22	71.0	399	81.8	0.136
	No	9	29.0	89	18.2	
Type of family	Nuclear	18	58.1	293	60.0	0.953
	Extended	8	25.8	114	23.4	
	Single-parent	5	16.1	81	16.6	
Number of family members	Me±DS	4.34±1.59		3.99±1.71		0.597
Does any family member have or have had COVID-19?	Yes	22	71.0	387	79.3	0.271
	No	9	29.0	101	20.7	
Are all members of your family vaccinated against COVID-19?	Yes	29	93.5	440	90.2	0.536
	No	2	6.5	48	9.8	
Does any family member suffer from any chronic disease?	Yes	21	67.7	237	48.6	0.038*
	No	10	32.3	251	51.4	
Concern about the contagion of COVID-19	High	5	16.1	167	34.2	0.038*
	Low	26	83.9	321	65.8	

* $p < 0.005$.

resentment or exclusion. Then, families with members who suffer from chronic diseases should receive support from public health professionals to help them manage emotional aspects such as stress, anxiety, and depression to improve family health.

On the other hand, the study revealed a significant association between the geographic region and the perception of family health

vulnerability during the COVID-19 pandemic. The residents of the Coast region have 3999 greater probabilities of perceiving a lower vulnerability of family health compared with the Jungle region's residents. Similarly, a study of a Peruvian population showed that the provinces with high and very high social vulnerability indices are mostly located in rural areas, predominantly in the provinces in

TABLE 3 Multivariate analysis according to health vulnerability of family members in Peruvian residents, 2023.

Variables		OR	CI 95%	p-Value
Age	Young adult and adult	1	(Reference)	
	Elderly	0.989	(0.96–1.01)	0.449
Origin	Jungle	1	(Reference)	
	Coast	3801	(1.55–9.28)	0.003*
	Mountain	3299	0.74–14.69	0.117
Does any family member suffer from any chronic disease?	No	1	(Reference)	
	Yes	0.533	(0.24–1.20)	0.105
Concern about the contagion of COVID-19	High	1	(Reference)	
	Low	2.77	(1.02–7.53)	0.044*

Abbreviations: CI, confidence intervals; OR, odds ratio.

* $p < 0.005$.

the country's south and highlands.²⁹ In addition, the United Nations International Children's Emergency Fund (UNICEF) points out that people in urban areas perceive less vulnerability compared to people in rural areas, who have been more affected by the abrupt loss of family income and difficulty in accessing essential goods and services, such as health, social protection programs, and economic support, availability of nutritious food, lack of sanitary infrastructure and access to water, as well as the lack of connectivity options and distance education.³⁰

Another additional explanation for the greater vulnerability observed in the mountain and jungle regions is the regional economic inequality that exists in the country. Peru is known for its larger gap between the rich and the poor.³¹ Toward the end of 2017, the National Household Survey (ENAH) showed the deterioration of poverty indicators, and in particular the increase in poor people in this country, something that had not occurred since 2002.¹¹ By areas of residence, it affected the inhabitants of the countryside more than those of the urban area. By region, the highest poverty rates were recorded in the rural Sierra (48.7%) and the rural Jungle (41.4%).³² This regional inequality maximizes the presence of regional disparities in health matters. The populations of the mountain and jungle regions have fewer resources (budget, number of doctors, number of nurses, and number of hospitals) compared to the capital. These disparities were reflected in the mortality caused by the pandemic.³³

Likewise, the study found that having a low concern about the contagion of COVID-19 increases the probability of having a perception of less vulnerability to family health by 2.77 times compared to residents with high concern about the contagion of the disease. However, a study in the US demonstrated that exposure to a stressful event such as COVID-19, preexisting vulnerabilities, and racial diversity status significantly affected family resilience.³⁴ Another study revealed that participants who were worried that their family members would contract COVID-19 had a more significant psychological impact of the outbreak and higher levels of stress, anxiety, and depression.³⁵ In addition, a study of an Asian population showed that those with low concern about the disease were less likely to adopt prevention behaviors, such as frequent hand washing and the

use of masks.³⁶ These findings suggest that the perception of low vulnerability may influence the adoption of preventive measures, which may affect family health.

4.1 | Implications of the study

The fact that belonging to the Coast region increases the probability of having a perception of lower family health vulnerability compared to the Jungle region suggests a geographic difference in how families perceive their family vulnerability. This has implications for the planning and execution of medical and public health interventions. It is important to consider the mountain and jungle regions as disadvantaged and increase the budget, health professionals, and hospitals.

On the other hand, low concern about the contagion of COVID-19 was associated with less health vulnerability of family members. This highlights the importance of addressing the population's perceptions and attitudes about the disease. Health professionals must provide clear and accurate information about the risks of COVID-19 and the necessary prevention measures. Likewise, it is important to establish a better relationship between family members and contacts with their neighbors. In addition, attention should be paid to psychological and emotional factors that may influence perceptions of vulnerability, such as fear and anxiety, and appropriate support to address these concerns.

Finally, it is essential to provide adequate education and awareness about the risks and the importance of prevention measures in all populations, regardless of their initial level of concern. Health professionals can be key in disseminating accurate information and promoting healthy behaviors to protect family health.

4.2 | Limitations

Despite the significant findings of the study, it is important to note the limitations of the study. First, the sample was obtained through

nonprobability sampling, which may have introduced a selection bias. Furthermore, the data collection was done using the Internet, and people without Internet access did not have the option to participate. This is observed especially in the mountain and jungle regions, so there is a risk of having focused on the population with better economic conditions and lower risk of vulnerability. Furthermore, the response rate could not be calculated because of the use of Internet survey. Additionally, data collection was based on participant self-reports, which could be subject to recall or response bias. In addition, the cross-sectional nature of the design precludes establishing causal relationships. Despite these limitations, this study was conducted with robust data analysis and covers a very important public health issue in a country that has high-risk family health vulnerability. For future research, a longitudinal study design is recommended to evaluate changes in the perception of family health over time. In addition, it is suggested to incorporate mixed methodologies that combine quantitative and qualitative data to obtain a complete understanding of the factors associated with the health vulnerability of family members. It would also be valuable to explore other relevant variables, such as access to health services, the quality of the health care system, and the pandemic's psychosocial impact on the Peruvian population's family health. These approaches could provide a more comprehensive vision of the challenges and needs of families in contexts of health crises.

5 | CONCLUSION

The study concludes that being from the Coast region and having low concern about the contagion of COVID-19 increase the probability of having a perception of less vulnerability in family health. According to these results, it should be necessary to design prevention and family health promotion strategies according to the geographical region; it is also essential to provide education on the risks and the importance of prevention measures for COVID-19, regardless of their initial level of concern.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICS APPROVAL STATEMENT

This study complies with international ethical standards established in the Declaration of Helsinki (2000), and all procedures involving human beings were approved by the Research and Ethics Committee of the Universidad Peruana Unión (CEUPeU-035-2022).

PATIENT CONSENT STATEMENT

All participants were volunteers. The first electronic page containing the invitation to participate in the survey provided a brief description of the study and its objective and informed consent. All subjects consented to participate in the study after clicking on the "accept" icon, meaning they accepted the terms of the informed consent.

CLINICAL TRIAL REGISTRATION

None.


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REFERENCES

- Hanson CL, Crandall A, Barnes MD, Magnusson B, Novilla MLB, King J. Family-focused public health: supporting homes and families in policy and practice. *Front Public Health*. 2019;7:59.
- Li G, Li M, Peng S, Wang Y, Ran L, Chen X, et al. Current status and influential factors for family health management during quarantine: a latent category analysis. *PLoS One*. 2022;17(4):e0265406.
- van Weel C, Kidd MR. Why strengthening primary health care is essential to achieving universal health coverage. *CMAJ*. 2018;190(15):e463–e466.
- Ortiz Gómez MT. La Salud Familiar. *Rev Cubana Med Gen Integr*. 1999;15:439–45.
- Lima-Rodríguez JS, Domínguez-Sánchez I, Lima-Serrano M. Family and social variables associated with family health. *West J Nurs Res*. 2022;44(10):920–31.
- Lizcano CMR, Alvarado MLS, De La Cruz LSU, Chávez WAV, Ramírez YAA, Blanco KJH, et al. Vulnerabilidad familiar en Salud. *Cuidado Ocupación Humana*. 2020;8(2):48–57.
- Araujo GR. Vulnerabilidad y riesgo en salud: ¿ dos conceptos concomitantes? *Rev Novedades Población*. 2015;11(21):89–96.
- Moncada MJA, Nitschke RG, Arias GFG, Espinoza CHR, Tholl AD, Carrion FAA. Vulnerability and social impact of natural disasters in the daily lives of Peruvian families. *Rev Cubana Enferm*. 2021;37(3):1–19.
- Anampa-Canales MM, Huancahuire-Vega S, Newball-Noriega EE, Morales-García WC, Galvez CA. Food insecurity associated with self-reported mental health outcomes in Peruvian households during the COVID-19 pandemic. *Front Nutr*. 2022;9:1005170.
- Ilanzo MPQ, Urbano OMC, Delgado MC, Ramírez NP, Mendoza GMP, García AEO. Extreme violence against women and femicide in Peru. *Rev Cubana Salud Púb*. 2018;44(2):278–94.
- Seminario B, Zegarra MA, Palomino L. Estimación del PIB Departamental y Análisis de la Desigualdad Regional en el Perú: 1795–2017. IDB working paper series 2019.
- Merino Núñez M, Córdova Chirinos JW, Aguirre Pintado JM, García Yovera AJ, López Ñiquen KE. Nivel de percepción sobre la pobreza en el Perú, causas y efectos sociales. *Rev Univ Soc*. 2020;12:46–53.
- MINSA. MdS. Cuentas Nacionales de Salud, Perú 1995–2012. Dirección General de Planeamiento y Presupuesto Unidad Funcional de Estudios Económicos en Salud 2015.
- Ponce de León Z. Sistema de Salud en el Perú y el COVID-19. 2021.
- Lane J, Therriault D, Dupuis A, Gosselin P, Smith J, Ziam S, et al. The impact of the COVID-19 pandemic on the anxiety of adolescents in Québec. *Child Youth Care Forum*. 2022;51(4):811–33.
- Luoma E, Rohrer R, Parton H, Hughes S, Omeregíe E, Taki F, et al. Notes from the field: epidemiologic characteristics of SARS-CoV-2 recombinant variant XBB.1.5 – New York City, November 1, 2022–January 4, 2023. *MMWR Morb Mortal Wkly Rep*. 2023;72(8):212–4.
- Fraser B. COVID-19 strains remote regions of Peru. *Lancet*. 2020;395(10238):1684.

18. Alshamrani BM, Aljuhani RO, Basaqr KM, Bin Mahfouz EA, Alhawsawi EM, Alqahtani R. Public awareness and perception of family medicine in Jeddah, Saudi Arabia. *Cureus*. 2022;14(3):e23320.
19. Puschel K, Repetto P, Solar MO, Soto G, González K. Diseño y validación del instrumento SALUFAM: un instrumento de valoración de la salud familiar con alto valor predictivo clínico para la atención primaria chilena. *Rev Med Chil*. 2012;140(4):417-25.
20. Caycho-Rodríguez T, Ventura-León J, Barboza-Palomino M. Design and validation of a scale to measure worry for contagion of the COVID-19 (PRE-COVID-19). *Enferm Clin (Engl Ed)*. 2021;31(3):175-83.
21. Smith SL, DeGrace B, Ciro C, Bax A, Hambrick A, James J, et al. Exploring families' experiences of health: contributions to a model of family health. *Psychol Health Med*. 2017;22(10):1239-47.
22. McLean G, Gunn J, Wyke S, Guthrie B, Watt GCM, Blane DN, et al. The influence of socioeconomic deprivation on multimorbidity at different ages: a cross-sectional study. *Br J Gen Pract*. 2014;64(624):e440-e447.
23. Morera Salas M, Aparicio Llanos A, Barber Pérez P, Xirinachs Salazar Y, Hernández Villafuerte K, Vargas Brenes JR. Determinants and differences of health status between geographic regions in Costa. *Población y Salud en Mesoamérica*. 2009;7(1):1-13.
24. Lahelma E, Martikainen P, Laaksonen M, Aittomäki A. Pathways between socioeconomic determinants of health. *J Epidemiol Community Health*. 2004;58(4):327-32.
25. Cutler DM, Lleras-Muney A. Education and health: evaluating theories and evidence. Cambridge, MA: National Bureau of Economic Research; 2006.
26. Lassi ZS, Naseem R, Salam RA, Siddiqui F, Das JK. The impact of the COVID-19 pandemic on immunization campaigns and programs: a systematic review. *Int J Environ Res Public Health*. 2021;18(3):1-22.
27. Brehaut JC, Kohen DE, Raina P, Walter SD, Russell DJ, Swinton M, et al. The health of primary caregivers of children with cerebral palsy: how does it compare with that of other Canadian caregivers? *Pediatrics*. 2004;114(2):e182-e191.
28. Leonard BJ, Jang YP, Savik K, Plumbo MA. Adolescents with type 1 diabetes: family functioning and metabolic control. *J Fam Nurs*. 2005;11(2):102-21.
29. Zegarra Zamalloa CO, Contreras PJ, Orellana LR, Riega Lopez PA, Prasad S, Cuba Fuentes MS. Social vulnerability during the COVID-19 pandemic in Peru. *PLoS Glob Public Health*. 2022;2(12):e0001330.
30. UNICEF. Encuesta de percepción y actitudes de la población: El impacto de la pandemia COVID-19 en las familias con niñas, niños y adolescentes. Argentina 2021. Available from: <https://www.unicef.org/argentina/media/8646/file/tapapdf>. Accessed 12 June 2023
31. Flachsbarth I, Schotte S, Lay J, Garrido A. Rural structural change, poverty and income distribution: evidence from Peru. *J Econ Inequality*. 2018;16(4):631-53.
32. Narváez LA. Desigualdad y hambre en el Perú: 2001-2017. *Invest Sociales*. 2020;22(42):287-301.
33. Maraví SDD. Pandemia y disparidades regionales de salud en el Perú: 1997-2020. *RSocialium*. 2022;6(1):e939.
34. Perry KJ, Penner F, Contreras HT, Santos RP, Sarver DE. A U.S. National Study of family resilience during the COVID-19 pandemic. *J Child Fam Stud*. 2023;32(6):1627-42.
35. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health*. 2020;17(5):1-25.
36. Jang WM, Cho S, Jang DH, Kim UN, Jung H, Lee JY, et al. Preventive behavioral responses to the 2015 Middle East respiratory syndrome coronavirus outbreak in Korea. *Int J Environ Res Public Health*. 2019;16(12):1-11.

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