

Estimating mortality and disability in Peru before the COVID-19 pandemic: a systematic analysis from the Global Burden of the Disease Study 2019

RIOS-BLANCAS, Maria Jesus, PANDO-ROBLES, Victoria, RAZO, Christian, CARCAMO, Cesar P., MENDOZA, Walter, PACHECO-BARRIOS, Kevin, MIRANDA, J. Jaime, LANSINGH, Van Charles, DEMIE, Takele Gezahegn, SAHA, Manika, OKONJI, Osaretin Christabel, YIGIT, Arzu, CAHUANA-HURTADO, Lucero, CHACÓN-USCAMAITA, Pamela R., BERNABE, Eduardo, CULQUICHICON, Carlos, CHIRINOS-CACERES, Jesus Lorenzo, CÁRDENAS, Rosario, ALCALDE-RABANAL, Jacqueline Elizabeth, BARRERA, Francisco J., QUINTANILLA, Beatriz Paulina Ayala, SHOROFI, Seyed Afshin, WICKRAMASINGHE, Nuwan Darshana, FERREIRA, Nuno, ALMIDANI, Louay, GUPTA, Vivek Kumar, KARIMI, Hanie, ALAYU, Daniel Shewaye, BENZIGER, Catherine P., FUKUMOTO, Takeshi, MOSTAFAVI, Ebrahim, REDWAN, Elrashdy Moustafa Mohamed, GEBREHIWOT, Mesfin, KHATAB, Khaled <<http://orcid.org/0000-0002-8755-3964>>, KOYANAGI, Ai, KRAPP, Fiorella, LEE, Seung, NOORI, Maryam, QATTEA, Ibrahim, ROSENTHAL, Victor Daniel, SAKSHAUG, Joseph W., WAGAYE, Birhanu, ZARE, Iman, ORTEGA-ALTAMIRANO, Doris V., MURILLO-ZAMORA, Efrén, VERVOORT, Dominique, SILVA, Diego Augusto Santos, OULHAJ, Abderrahim, HERRERA-SERNA, Brenda Yuliana, MEHRA, Rahul, AMIR-BEHGHADAMI, Mehrdad, ADIB, Nasrin, CORTÉS, Sandra, DANG, Anh Kim, NGUYEN, Binh Thanh, MOKDAD, Ali H., HAY, Simon I., MURRAY, Christopher J. L., LOZANO, Rafael and GARCÍA, Patricia J.

Available from Sheffield Hallam University Research Archive (SHURA) at:

<http://shura.shu.ac.uk/32091/>

This document is the author deposited version. You are advised to consult the publisher's version if you wish to cite from it.

Published version

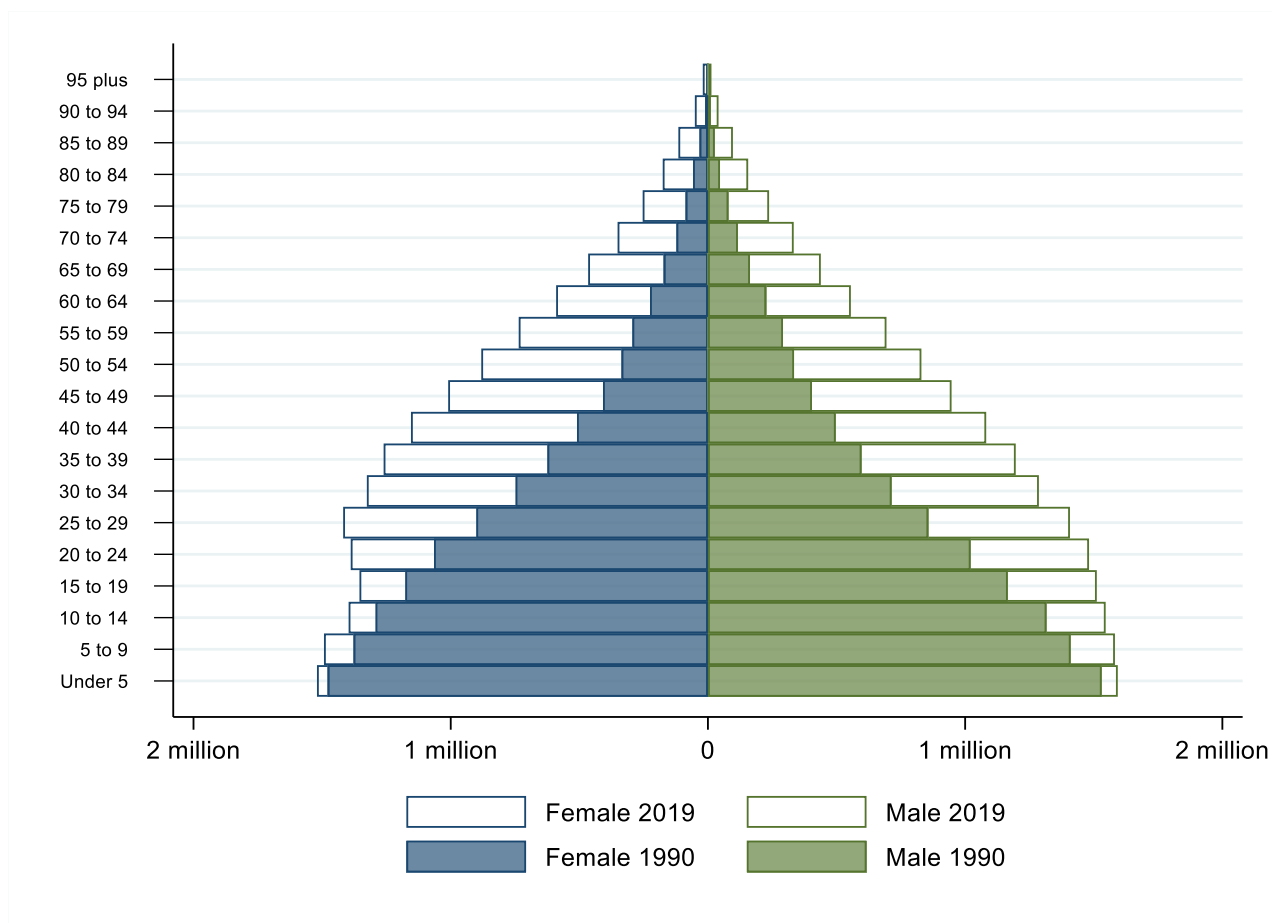
RIOS-BLANCAS, Maria Jesus, PANDO-ROBLES, Victoria, RAZO, Christian, CARCAMO, Cesar P., MENDOZA, Walter, PACHECO-BARRIOS, Kevin, MIRANDA, J. Jaime, LANSINGH, Van Charles, DEMIE, Takele Gezahegn, SAHA, Manika, OKONJI, Osaretin Christabel, YIGIT, Arzu, CAHUANA-HURTADO, Lucero, CHACÓN-USCAMAITA, Pamela R., BERNABE, Eduardo, CULQUICHICON, Carlos, CHIRINOS-CACERES, Jesus Lorenzo, CÁRDENAS, Rosario, ALCALDE-RABANAL, Jacqueline Elizabeth, BARRERA, Francisco J., QUINTANILLA, Beatriz Paulina Ayala, SHOROFI, Seyed Afshin, WICKRAMASINGHE, Nuwan Darshana, FERREIRA, Nuno, ALMIDANI, Louay, GUPTA, Vivek Kumar, KARIMI, Hanie, ALAYU, Daniel Shewaye, BENZIGER, Catherine P., FUKUMOTO, Takeshi, MOSTAFAVI, Ebrahim, REDWAN, Elrashdy Moustafa Mohamed, GEBREHIWOT, Mesfin, KHATAB, Khaled, KOYANAGI, Ai, KRAPP, Fiorella, LEE, Seung, NOORI, Maryam, QATTEA, Ibrahim, ROSENTHAL, Victor Daniel, SAKSHAUG, Joseph W., WAGAYE, Birhanu, ZARE, Iman, ORTEGA-ALTAMIRANO, Doris V., MURILLO-ZAMORA, Efrén, VERVOORT, Dominique, SILVA, Diego Augusto Santos, OULHAJ, Abderrahim, HERRERA-SERNA, Brenda Yuliana, MEHRA, Rahul, AMIR-BEHGHADAMI, Mehrdad, ADIB, Nasrin, CORTÉS, Sandra, DANG, Anh Kim, NGUYEN, Binh Thanh, MOKDAD, Ali H., HAY, Simon I., MURRAY, Christopher J. L., LOZANO, Rafael and GARCÍA, Patricia J. (2023). Estimating mortality and disability in Peru before the COVID-19 pandemic: a systematic analysis from the Global Burden of the Disease Study 2019. *Frontiers in Public Health*, 11.

Copyright and re-use policy

See <http://shura.shu.ac.uk/information.html>

Supplementary figures

Supplementary Figure 1. Population pyramid from Peru in 1990 and 2019



Supplementary Figure 2. Top 15th leading causes of prevalent cases in Peru (1990 and 2019), with change (%) in the number of prevalent cases and all-ages prevalence.

Leading causes 1990	% of total prevalent cases	Leading causes 2019	% of total prevalent cases	Percentage change in number of prevalent cases, 1990–2019	Percentage change in all ages prevalence, 1990–2019
1 Oral disorders	54.2 (49.1 to 59.0)	1 Oral disorders	56.7 (52.2 to 61.1)	63.1 (57.6 to 69.1)	4.2 (0.8 to 8.1)
2 Tuberculosis	29.7 (26.0 to 33.6)	2 Headache disorders	29.6 (26.6 to 32.7)	72.1 (65.0 to 79.9)	10.0 (5.5 to 15.0)
3 Headache disorders	26.9 (24.0 to 29.7)	3 Sexually transmitted infections excluding HIV	27.2 (24.0 to 30.9)	101.3 (87.7 to 115.8)	28.7 (20.0 to 37.9)
4 Sexually transmitted infections excluding HIV	21.1 (19.3 to 22.9)	4 Gynecological diseases	23.1 (21.4 to 24.8)	82.6 (77.0 to 88.3)	16.7 (13.1 to 20.4)
5 Gynecological diseases	19.7 (18.1 to 21.4)	5 Age-related and other hearing loss	21.0 (19.8 to 22.3)	134.8 (128.8 to 141.7)	50.1 (46.3 to 54.5)
6 Dietary iron deficiency	19.7 (17.8 to 21.7)	6 Hemoglobinopathies and hemolytic anemias	18.2 (16.2 to 20.4)	71.9 (65.8 to 78.1)	9.9 (6.0 to 13.9)
7 Hemoglobinopathies and hemolytic anemias	16.6 (15.1 to 18.1)	7 Upper digestive system diseases	16.3 (14.6 to 17.9)	105.5 (100.0 to 110.6)	31.4 (27.9 to 34.6)
8 Age-related and other hearing loss	13.9 (13.1 to 14.8)	8 Tuberculosis	14.2 (12.5 to 16.2)	-25.6 (-33.2 to -16.5)	-52.4 (-57.3 to -46.6)
9 Intestinal nematode infections	13.0 (9.9 to 17.1)	9 Fungal skin diseases	13.3 (11.9 to 15.1)	78.4 (71.6 to 85.5)	14.1 (9.7 to 18.6)
10 Upper digestive system diseases	12.4 (11.0 to 13.7)	10 Cirrhosis and other chronic liver diseases	13.1 (11.9 to 14.3)	137.9 (129.3 to 146.2)	52.1 (46.5 to 57.4)
11 Fungal skin diseases	11.7 (10.2 to 13.2)	11 Dietary iron deficiency	10.8 (9.4 to 12.2)	-14.3 (-27.3 to 1.2)	-45.2 (-53.5 to -35.3)
12 Cirrhosis and other chronic liver diseases	8.6 (7.8 to 9.5)	12 Chronic kidney disease	10.0 (8.3 to 12.3)	192.9 (174.7 to 212.8)	87.2 (75.6 to 100.0)
13 Asthma	7.4 (5.8 to 9.4)	13 Blindness and vision loss	9.1 (7.9 to 10.5)	120.2 (110.4 to 130.4)	40.8 (34.5 to 47.3)
14 Other skin and subcutaneous diseases	6.8 (6.6 to 7.0)	14 Other skin and subcutaneous diseases	8.7 (8.4 to 9.0)	100.7 (97.1 to 104.4)	28.3 (26.0 to 30.6)
15 Blindness and vision loss	6.5 (5.7 to 7.3)	15 Other musculoskeletal disorders	6.5 (5.5 to 7.5)	152.6 (135.4 to 171.8)	61.5 (50.5 to 73.7)
16 Chronic kidney disease	5.3 (4.3 to 6.8)	17 Intestinal nematode infections	6.2 (4.6 to 8.1)	-26.2 (-51.1 to 8.7)	-52.8 (-68.7 to -30.5)
23 Other musculoskeletal disorders	4.0 (3.3 to 4.7)	23 Asthma	4.4 (3.3 to 5.9)	-7.1 (-22.8 to 9.7)	-40.6 (-50.6 to -29.9)

Communicable, maternal, neonatal, and nutritional diseases
 Non-communicable diseases

The level-3 causes of GBD disaggregation are presented. Lines between time periods connect causes; solid lines represent increases in rank, and dashed lines represent decreases.

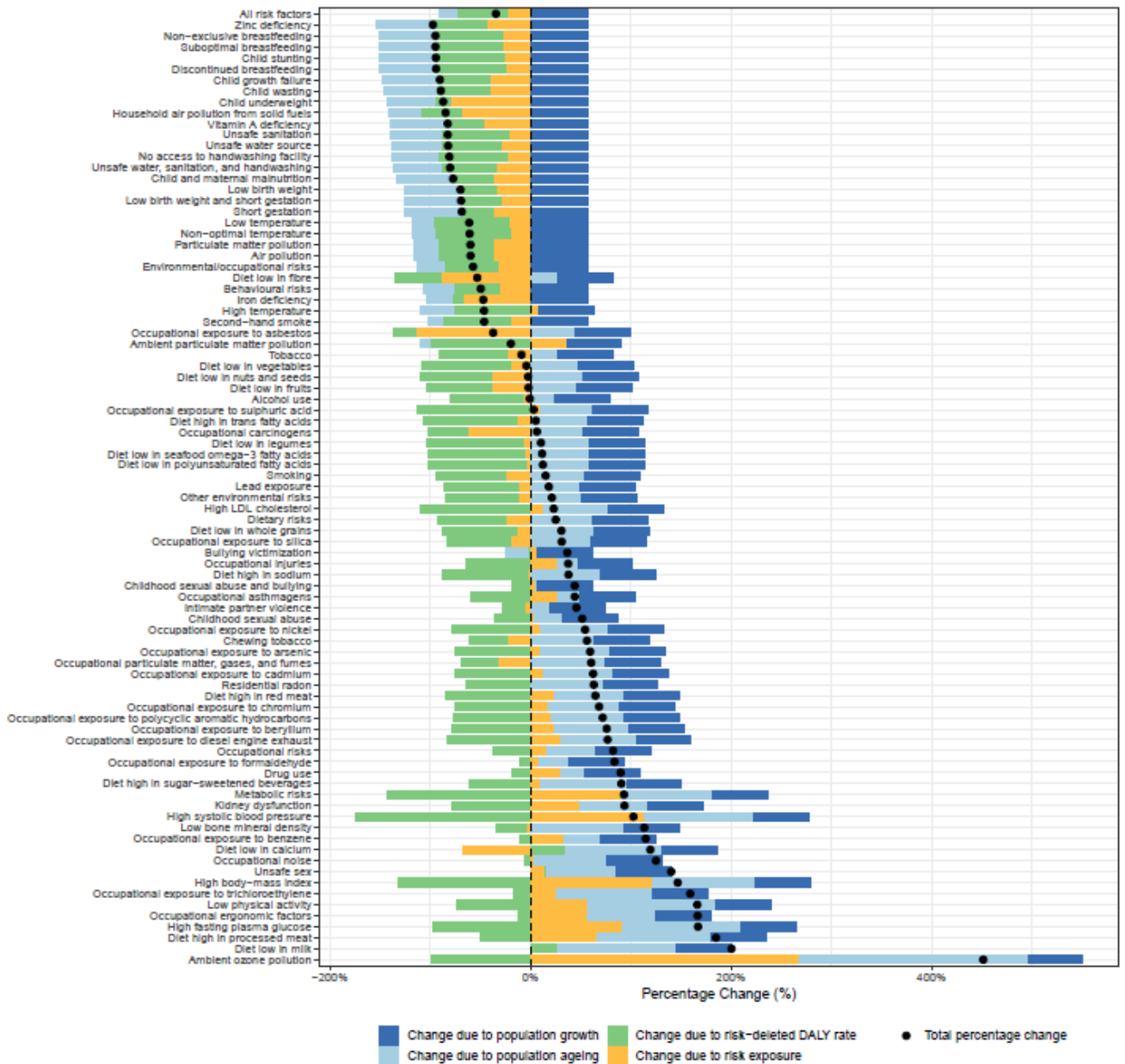
Supplementary Figure 3. Top 15th leading causes of incident cases in Peru (1990 and 2019), with change (%) in the number of incident cases and all ages-incidences

Leading causes 1990	% of total incident cases	Leading causes 2019	% of total incident cases	Percentage change in number of incident cases, 1990–2019	Percentage change in all ages incidence, 1990–2019
1 Upper respiratory infections	48.0 (44.5 to 51.7)	1 Upper respiratory infections	44.7 (41.6 to 48.0)	46.6 (38.7 to 55.3)	-6.3 (-11.3 to -0.7)
2 Diarrheal diseases	13.0 (11.7 to 14.3)	2 Diarrheal diseases	17.2 (15.6 to 18.9)	109.1 (92.7 to 126.2)	33.6 (23.2 to 44.6)
3 Oral disorders	9.8 (8.4 to 11.2)	3 Oral disorders	8.9 (7.8 to 10.1)	43.6 (36.5 to 52.2)	-8.2 (-12.8 to -2.7)
4 Fungal skin diseases	4.5 (3.9 to 5.1)	4 Fungal skin diseases	5.1 (4.5 to 5.8)	79.1 (71.4 to 86.9)	14.5 (9.6 to 19.4)
5 Bacterial skin diseases	3.0 (2.7 to 3.2)	5 Bacterial skin diseases	3.1 (2.9 to 3.3)	64.7 (60.4 to 68.9)	5.3 (2.5 to 7.9)
6 Urinary diseases and male infertility	2.0 (1.7 to 2.3)	6 Urinary diseases and male infertility	2.4 (2.1 to 2.8)	88.2 (70.2 to 110.2)	20.3 (8.8 to 34.3)
7 Lower respiratory infections	1.9 (1.7 to 2.1)	7 Gynecological diseases	1.9 (1.6 to 2.2)	80.9 (74.5 to 86.7)	15.6 (11.5 to 19.3)
8 Scabies	1.7 (1.5 to 2.1)	8 Sexually transmitted infections excluding HIV	1.6 (1.4 to 1.9)	80.5 (73.0 to 87.6)	15.3 (10.6 to 19.9)
9 Gynecological diseases	1.7 (1.4 to 1.9)	9 Lower respiratory infections	1.6 (1.4 to 1.7)	34.6 (24.9 to 45.1)	-14.0 (-20.2 to -7.3)
10 Headache disorders	1.4 (1.2 to 1.6)	10 Scabies	1.6 (1.3 to 1.8)	42.2 (36.1 to 48.5)	-9.1 (-13.0 to -5.1)
11 Sexually transmitted infections excluding HIV	1.4 (1.2 to 1.7)	11 Headache disorders	1.4 (1.3 to 1.6)	58.7 (49.9 to 67.0)	1.4 (-4.2 to 6.7)
12 Other skin and subcutaneous diseases	1.1 (1.0 to 1.2)	12 Other skin and subcutaneous diseases	1.4 (1.3 to 1.5)	99.5 (95.9 to 103.1)	27.5 (25.2 to 29.8)
13 Otitis media	1.0 (0.6 to 1.4)	13 Upper digestive system diseases	1.1 (1.0 to 1.2)	101.1 (95.3 to 106.4)	28.6 (24.8 to 31.9)
14 Upper digestive system diseases	0.9 (0.7 to 1.0)	14 Dermatitis	0.9 (0.7 to 1.0)	79.2 (72.9 to 85.3)	14.5 (10.5 to 18.4)
15 Dermatitis	0.8 (0.7 to 0.9)	15 Otitis media	0.7 (0.5 to 1.0)	14.0 (10.8 to 18.9)	-27.2 (-29.1 to -24.0)

 Communicable, maternal, neonatal, and nutritional diseases
 Non-communicable diseases

The level-3 causes of GBD disaggregation are presented. Lines between time periods connect causes; solid lines represent increases in rank, and dashed lines represent decreases.

Supplementary Figure 4. Percentage change in the absolute number of risk-attributable DALYs in Peru from 1990-2019 due to population growth, population aging, changes in exposure to each GBD risk factor, and changes in risk-deleted DALY rates for both sexes and all causes combined.



Supplementary Figure 5. Age-standardized rate of top four causes of DALYs attributable to risk factors in Peru in 1990 and 2019.

