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Serum CXCL10 and CXCL12 chemokine levels are associated with the severity of coronary artery disease and coronary artery occlusion

Vahid Tavakolian Ferdousie [a,b], Maryam Mohammadi [b], Gholamhossein Hassanshahi [a,c], Hossein Khorramdelazad [a], Soudeh Khanamani Falahati-pour [a], Mohsen Mirzaei [d], Mohammad Allah Tavakoli [e], Zahra Kamiab [f], Zahra Ahmadi [g], Reza Vazirinejad [h], Effat Shahrabadi [g], Ioanna Koniari [i], Nicholas G Kounis [i], Ali Esmaeili Nadimi [d,g,*]

[a] Molecular Medicine Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[b] Rafsanjan Cohort Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[c] Department of Immunology, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[d] Department of Cardiology, Medical School, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[e] Physiology-Pharmacology Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[f] Clinical Research Development Center, Department of Community Medicine, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[g] Occupational Environment Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[h] Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[i] Department of Cardiology, University of Patras Medical School, Rion, Patras, Achaia, Greece

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ABSTRACT

Background: Cardiovascular disease constitutes a major cause of death worldwide. Inflammation plays an important role in atherosclerosis formation, coronary artery disease progression, acute coronary thrombosis and occlusion. Chemokines are inflammatory mediators disposing several bio-functions, as leukocyte migration towards inflammatory signals and vascular injuries. The present study was designed to evaluate the potential correlation between serum levels of chemokines CXCL-10 and CXCL-12 and the degree of coronary artery occlusion.
Methods: Eighty eight patient candidates for coronary angiography with coronary artery disease symptoms and potentially high risk of coronary artery occlusion were recruited. Chemokine serum levels were measured with the ELISA method and patients underwent coronary angiography. All patients with coronary artery disease (CAD) were divided into four groups according to the Gensini score. Data were presented as mean ± SD. All P values <0.05 were considered significant.
Results: Our demographic data showed that of the 88 patients, 46 were male and 42 female. The mean age of patients was 57.95 ± 11.13. Following increased coronary artery occlusion the serum levels of chemokines were significantly increased (CXCL-10 and CXCL-12; $P < 0.0001$ and $P < 0.0001$, respectively).
Conclusion: In this novel study, a significant correlation between the serum levels of CXCL-10 and CXCL-12 and the severity of coronary artery occlusion was found. This could be attributed to the role of these chemokines in the processes of angiogenesis and angiostasis, a biological phenomenon that can play key role in the development of collateral circulation.

1. Introduction

Cardiovascular diseases are major causes of death in most countries across the world [1,2] Coronary artery disease (CAD) constitutes the most frequent cause of death in the USA [3]. Death due to cardiovascular disease occurs every 36 s [4]. According to the latest reports from the ministry of health of Iran, CAD is associated with a high mortality rate in patients aged over 35 years [5]. However, during the last decades the coronary artery disease mortality rate has significantly decreased in developed countries, fact that could be attributed to both primary and secondary care and prevention programs [6]. Several risk factors, such as family history, increased lipid levels, hypertension, smoking, diabetes mellitus, and obesity, are involved in CAD. Additional parameters, including fibrinogen levels, status of inflammation biomarkers, C-Reactive Protein (CRP), IL-1B and a variety of infectious bacteria such as chlamydia and helicobacter pylori have been also incriminated, as playing a role in cardiovascular disorders [7]. Furthermore, inflammation plays a crucial role in both atherosclerosis and acute coronary

* Corresponding author at: Department of Cardiology, Ali-ibn Abi Talib Hospital, Rafsanjan University of Medical Sciences, Rafsanjan, Iran.
E-mail address: dr_esmaeili_n@yahoo.com (A. Esmaeili Nadimi).

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Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017

*GBD 2017 Causes of Death Collaborators**

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*Collaborators listed at the end of the paper

Correspondence to: Dr Gregory Roth, Institute for Health Metrics and Evaluation, Seattle, WA 98121, USA
rothg@uw.edu

Summary

Background Global development goals increasingly rely on country-specific estimates for benchmarking a nation's progress. To meet this need, the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2016 estimated global, regional, national, and, for selected locations, subnational cause-specific mortality beginning in the year 1980. Here we report an update to that study, making use of newly available data and improved methods. GBD 2017 provides a comprehensive assessment of cause-specific mortality for 282 causes in 195 countries and territories from 1980 to 2017.

Methods The causes of death database is composed of vital registration (VR), verbal autopsy (VA), registry, survey, police, and surveillance data. GBD 2017 added ten VA studies, 127 country-years of VR data, 502 cancer-registry country-years, and an additional surveillance country-year. Expansions of the GBD cause of death hierarchy resulted in 18 additional causes estimated for GBD 2017. Newly available data led to subnational estimates for five additional countries—Ethiopia, Iran, New Zealand, Norway, and Russia. Deaths assigned International Classification of Diseases (ICD) codes for non-specific, implausible, or intermediate causes of death were reassigned to underlying causes by redistribution algorithms that were incorporated into uncertainty estimation. We used statistical modelling tools developed for GBD, including the Cause of Death Ensemble model (CODEm), to generate cause fractions and cause-specific death rates for each location, year, age, and sex. Instead of using UN estimates as in previous versions, GBD 2017 independently estimated population size and fertility rate for all locations. Years of life lost (YLLs) were then calculated as the sum of each death multiplied by the standard life expectancy at each age. All rates reported here are age-standardised.

Findings At the broadest grouping of causes of death (Level 1), non-communicable diseases (NCDs) comprised the greatest fraction of deaths, contributing to 73·4% (95% uncertainty interval [UI] 72·5–74·1) of total deaths in 2017, while communicable, maternal, neonatal, and nutritional (CMNN) causes accounted for 18·6% (17·9–19·6), and injuries 8·0% (7·7–8·2). Total numbers of deaths from NCD causes increased from 2007 to 2017 by 22·7% (21·5–23·9), representing an additional 7·61 million (7·20–8·01) deaths estimated in 2017 versus 2007. The death rate from NCDs decreased globally by 7·9% (7·0–8·8). The number of deaths for CMNN causes decreased by 22·2% (20·0–24·0) and the death rate by 31·8% (30·1–33·3). Total deaths from injuries increased by 2·3% (0·5–4·0) between 2007 and 2017, and the death rate from injuries decreased by 13·7% (12·2–15·1) to 57·9 deaths (55·9–59·2) per 100 000 in 2017. Deaths from substance use disorders also increased, rising from 284 000 deaths (268 000–289 000) globally in 2007 to 352 000 (334 000–363 000) in 2017. Between 2007 and 2017, total deaths from conflict and terrorism increased by 118·0% (88·8–148·6). A greater reduction in total deaths and death rates was observed for some CMNN causes among children younger than 5 years than for older adults, such as a 36·4% (32·2–40·6) reduction in deaths from lower respiratory infections for children younger than 5 years compared with a 33·6% (31·2–36·1) increase in adults older than 70 years. Globally, the number of deaths was greater for men than for women at most ages in 2017, except at ages older than 85 years. Trends in global YLLs reflect an epidemiological transition, with decreases in total YLLs from enteric infections, respiratory infections and tuberculosis, and maternal and neonatal disorders between 1990 and 2017; these were generally greater in magnitude at the lowest levels of the Socio-demographic Index (SDI). At the same time, there were large increases in YLLs from neoplasms and cardiovascular diseases. YLL rates decreased across the five leading Level 2 causes in all SDI quintiles. The leading causes of YLLs in 1990—neonatal disorders, lower respiratory infections, and diarrhoeal diseases—were ranked second, fourth, and fifth, in 2017. Meanwhile, estimated YLLs increased for ischaemic heart disease (ranked first in 2017) and stroke (ranked third), even though YLL rates decreased. Population growth contributed to increased total deaths across the 20 leading Level 2 causes of mortality between 2007 and 2017. Decreases in the cause-specific mortality rate reduced the effect of population growth for all but three causes: substance use disorders, neurological disorders, and skin and subcutaneous diseases.

(Prof M Hussen MA), Arba Minch University, Arba Minch, Ethiopia (M D Animut MPH); Social Determinants of Health Research Center (M Anjomshoa PhD), Rafsanjan University of Medical Sciences, Rafsanjan, Iran; Zahedan University of Medical Sciences, Iran (Prof H Ansari PhD); Department of Public Health (M G Ansha MPH, Prof T Kolola MPH), Department of Midwifery (M T Dinberu MA), Debre Berhan University, Debre Berhan, Ethiopia; Department of Health Policy and Administration (C T Antonio MD), Development and Communication Studies (E K Macarayan PhD), University of the Philippines Manila, Manila, Philippines; Research Unit (R Ofori-Asenso MSc), Independent Consultant, Kabul, Afghanistan (P Anwari MSc); School of Health Sciences, Birmingham City University, Birmingham, England (O Aremu PhD); School of Health and Social Studies, Dalarna University, Falun, Sweden (Prof J Ärnlöv PhD); School of Science and Health (A Arora PhD), School of Social Sciences and Psychology (Prof A M N Renzaho PhD), Western Sydney University, Sydney, NSW, Australia (F A Ogbo PhD); Oral Health Services, Sydney Local Health District, Sydney, NSW, Australia (A Arora PhD); Health Related Information Dissemination Amongst Youth, New Delhi, India (M Arora PhD); Department of Community Health Sciences, University of Manitoba, Winnipeg, MB, Canada (A Artaman PhD); DfID Nepal Health Sector Programme 3, Monitoring Evaluation and Operational Research Project, Abt Associates Nepal, Lalitpur, Nepal (K K Aryal PhD); Qom University of Medical Sciences, Qom, Iran (H Asayesh MSc); University Institute of Public Health, The University of Lahore, Lahore, Pakistan (S Atique PhD); Public Health Department (S Atique PhD), Department of Family and Community Medicine (Prof I A Ginawi MD), University of Hail, Hail, Saudi Arabia; Center for Clinical Global Health Education (S R Atre PhD), Department of Radiology (N Hafezi-Nejad MD, A Haj-Mirzaian MD), Department of Epidemiology (S Hutfless PhD, Prof J B Nachega PhD), Department of Health Policy and Management (Prof A T Khoja MD), School of Medicine (S Hutfless PhD), Johns Hopkins University, Baltimore, MD, USA; Dr D Y Patil Medical College (S R Atre PhD), Dr D Y Patil Vidyapeeth, Pune, India (A R Sawant MD); School of Business (Prof M Ausloos PhD), Department of Health Sciences (Prof T Brugha MD), University of Leicester, Leicester, UK; Conrol of Infectious Diseases, Laboratory of Studies and Research-Action in Health, Porto Novo, Benin (E F A Avokpaho MD); Indian Institute of Public Health, Gandhinagar, India (A Awasthi PhD); The Judith Lumley Centre (B Ayala Quintanilla PhD), School of Nursing and Midwifery (Prof D Edvardsson PhD), Austin Clinical School of Nursing (M Rahman PhD), La Trobe University, Melbourne, VIC, Australia; General Office for Research and Technological Transfer, Peruvian National Institute of Health, Lima, Peru (B Ayala Quintanilla PhD); Department of Community and Global Health (R Ayer MSc), Department of Global Health Policy (Prof S Nomura MSc), University of Tokyo, Tokyo, Japan; Global Adolescent Health Group, Burnet Institute, Melbourne, VIC, Australia (P S Azzopardi PhD); Department of Infectious Diseases, Center for Infectious Diseases Research, Babol, Iran (A Babazadeh MD, Prof S Ebrahimpour PhD); School of Health Sciences (U Bacha M Phil), School of Food and Agricultural Sciences (N Khalid PhD), University of Management and Technology, Lahore, Pakistan; Public Health Risk Sciences Division (A Badawi PhD), Applied Research Division (H M Orpana PhD), Public Health Agency of Canada, Toronto, ON, Canada; Department of Hypertension, Medical University of Lodz, Lodz, Poland (Prof M Banach PhD); Polish Mothers' Memorial Hospital Research Institute, Lodz, Poland (Prof M Banach PhD); Department of Mathematical Demography & Statistics (K Banerjee MSc), Department of Public Health & Mortality Studies (M H U Rahman M Phil, Prof U Ram PhD), International Institute for Population Sciences, Mumbai, India (S Goli PhD, P Kumar PhD, M H U Rahman M Phil); Faculty of Medicine, Alexandria University, Alexandria, Egypt (J A M Banoub MD); Department of Neurosciences, Rafael A Calderón Guardia Hospital (Prof M A Barboza MSc), Area de Estadística, Dirección Actuarial (Prof J Castillo Rivas MSc), Costa Rican Department of Social Security, San Jose, Costa Rica; School of Medicine (Prof M A Barboza MSc), School of Dentistry (Prof J Castillo Rivas MSc), University of Costa Rica, San Pedro, Costa Rica; School of Psychology (Prof S L Barker-Collo PhD), Molecular Medicine and Pathology (K B Tran MD), University of Auckland, Auckland, New Zealand; Institute of Public Health (Prof T W Bärnighausen MD, Prof J De Neve MD, B Moazen MSc, S Mohammed PhD), Department of Ophthalmology (Prof J B Jonas MD), Medical Clinic V (Prof W März MD), Augenpraxis Jonas (S Panda-Jonas MD), Heidelberg University, Heidelberg, Germany; Department of Global Health and Population (Prof T W Bärnighausen MD, A B Feigl PhD, Prof O F Norheim PhD), Department of Nutrition (E L Ding DSc, M S Farvid PhD), T H Chan School of Public Health (P C Gupta DSc), Ariadne Labs (E K Macarayan PhD), Department of Genetics (A Pereira PhD), Division of General Internal Medicine and Primary Care (Prof A Sheikh MSc), Heart and Vascular Center (M Vaduganathan MD), Department of Environmental Health (G R Wagner MD), Harvard University, Boston, MA, USA (N Islam PhD, M G Shrime MD, B Yakob PhD); Center for Nutrition and Health Research (E Denova-Gutiérrez DSc), Center for Health Systems Research (H Gómez-Dantés MSc, M Rios-Blancas MPH, Prof E Serván-Mori DSc), Center for Population Health Research (C Razo-García MSc), National Institute of Public Health, Cuernavaca, Mexico (S Barquera PhD, I R Campos-Nonato PhD, J Campuzano Rincon PhD, Prof R Lozano PhD); Department of Industrial Engineering, Pontifical Javeriana University, Bogota, Colombia (Prof L H Barrero DSc); Barcelona Institute for Global Health (Prof Q Bassat MD), Tuberculosis Department (A L Garcia-Basteiro MSc), Barcelona Institute for Global Health, Barcelona, Spain (Prof J V Lazarus PhD); Tuberculosis (A L Garcia-Basteiro MSc), Manhiça Health Research Center, Manhiça, Mozambique (Prof Q Bassat MD); Department of Medicine, Stanford University, Palo Alto, CA, USA (Prof S Basu PhD); Melbourne Medical School, Melbourne, VIC, Australia (Prof B T Baune PhD); Department of Psychiatry, Charles R Drew University of Medicine and Science, Los Angeles, CA, USA (Prof S Bazargan-Hejazi BEP); Department of Psychiatry and Biobehavioral Sciences, University of California Los Angeles, Los Angeles, CA, USA (Prof S Bazargan-Hejazi BEP); Department of Community Medicine, Gandhi Medical College Bhopal, Bhopal, India (Prof N Bedi MD); Jazan University, Jazan, Saudi Arabia (Prof N Bedi MD); Department of Neuroscience (E Beghi MD, G Giussani PhD), Department of Renal Medicine (B Bikbov MD, N Perico MD), Department of Oncology (C Bosetti PhD, M Cortinovis PhD), Department of Environmental Health Science (S Gallus DSc), Mario Negri Institute for Pharmacological Research, Milan, Italy (Prof G Remuzzi MD); Health Management and Economics Research Center (M Behzadifar PhD), Department of Ophthalmology (K Ghasemi Falavarjani MD), Air Pollution Research Center (B Heibati PhD), Preventive Medicine and Public Health Research Center (M Moradi-Lakeh MD, Prof A Tehrani-Banihashemi PhD), Department of Neuroscience (M Safdarian MD), Department of Health Policy (H Shabaninejad PhD), Department of Community Medicine (Prof A Tehrani-Banihashemi PhD), Physiology Research Center (M Yousefifard PhD), Iran University of Medical Sciences, Tehran, Iran (T Beyranvand PhD, F Farhadi MD); Social Determinants of Health Research Center (M Behzadifar PhD), Lorestan University of Medical Sciences, Khorramabad, Iran (M Behzadifar MS); Department of Neurology, University Hospital of Dijon, Dijon, France (Prof Y Béjot PhD); Dijon Stroke Registry - Ufr Sciences Santé, University of Burgundy, Dijon, France (Prof Y Béjot PhD); Public Health Department (B Bekele MPH, H Y Hassen MPH), Pharmacy Department (A T Kefale MSc), Mizan-tepi University, Teppi, Ethiopia (Prof A Henok MPH); School of Forestry and Environmental Studies (Prof M L Bell PhD), Department of Ophthalmology and Visual Science (Prof J J Huang MD), Yale University, New Haven, CT, USA; Department of Medicine, University of Alberta, Edmonton, AB, Canada (Prof A K Bello PhD); Nuffield Department of Population Health (D A Bennett PhD), Nuffield Department of Medicine (Prof P W Gething PhD), Department of Psychiatry (Prof C R J Newton MD), Nuffield Department of Women's and Reproductive Health (Prof K Rahimi MD), University of Oxford, Oxford, UK (Prof V Jha MD); Department of Internal Medicine (I M Bensenor PhD, Prof I S Santos PhD), Ribeirão Preto Medical School, Division of Ophthalmology (Prof J M Furtado MD), University Hospital, Internal Medicine Department (A C Goulart PhD), Department of Medicine (Prof P A Lotufo DrPH), Department of

Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017

*GBD 2017 Disease and Injury Incidence and Prevalence Collaborators**

Summary

Background The Global Burden of Diseases, Injuries, and Risk Factors Study 2017 (GBD 2017) includes a comprehensive assessment of incidence, prevalence, and years lived with disability (YLDs) for 354 causes in 195 countries and territories from 1990 to 2017. Previous GBD studies have shown how the decline of mortality rates from 1990 to 2016 has led to an increase in life expectancy, an ageing global population, and an expansion of the non-fatal burden of disease and injury. These studies have also shown how a substantial portion of the world's population experiences non-fatal health loss with considerable heterogeneity among different causes, locations, ages, and sexes. Ongoing objectives of the GBD study include increasing the level of estimation detail, improving analytical strategies, and increasing the amount of high-quality data.

Methods We estimated incidence and prevalence for 354 diseases and injuries and 3484 sequelae. We used an updated and extensive body of literature studies, survey data, surveillance data, inpatient admission records, outpatient visit records, and health insurance claims, and additionally used results from cause of death models to inform estimates using a total of 68 781 data sources. Newly available clinical data from India, Iran, Japan, Jordan, Nepal, China, Brazil, Norway, and Italy were incorporated, as well as updated claims data from the USA and new claims data from Taiwan (province of China) and Singapore. We used DisMod-MR 2.1, a Bayesian meta-regression tool, as the main method of estimation, ensuring consistency between rates of incidence, prevalence, remission, and cause of death for each condition. YLDs were estimated as the product of a prevalence estimate and a disability weight for health states of each mutually exclusive sequela, adjusted for comorbidity. We updated the Socio-demographic Index (SDI), a summary development indicator of income per capita, years of schooling, and total fertility rate. Additionally, we calculated differences between male and female YLDs to identify divergent trends across sexes. GBD 2017 complies with the Guidelines for Accurate and Transparent Health Estimates Reporting.

Findings Globally, for females, the causes with the greatest age-standardised prevalence were oral disorders, headache disorders, and haemoglobinopathies and haemolytic anaemias in both 1990 and 2017. For males, the causes with the greatest age-standardised prevalence were oral disorders, headache disorders, and tuberculosis including latent tuberculosis infection in both 1990 and 2017. In terms of YLDs, low back pain, headache disorders, and dietary iron deficiency were the leading Level 3 causes of YLD counts in 1990, whereas low back pain, headache disorders, and depressive disorders were the leading causes in 2017 for both sexes combined. All-cause age-standardised YLD rates decreased by 3·9% (95% uncertainty interval [UI] 3·1–4·6) from 1990 to 2017; however, the all-age YLD rate increased by 7·2% (6·0–8·4) while the total sum of global YLDs increased from 562 million (421–723) to 853 million (642–1100). The increases for males and females were similar, with increases in all-age YLD rates of 7·9% (6·6–9·2) for males and 6·5% (5·4–7·7) for females. We found significant differences between males and females in terms of age-standardised prevalence estimates for multiple causes. The causes with the greatest relative differences between sexes in 2017 included substance use disorders (3018 cases [95% UI 2782–3252] per 100 000 in males *vs* 1400 [1279–1524] per 100 000 in females), transport injuries (3322 [3082–3583] *vs* 2336 [2154–2535]), and self-harm and interpersonal violence (3265 [2943–3630] *vs* 5643 [5057–6302]).

Interpretation Global all-cause age-standardised YLD rates have improved only slightly over a period spanning nearly three decades. However, the magnitude of the non-fatal disease burden has expanded globally, with increasing numbers of people who have a wide spectrum of conditions. A subset of conditions has remained globally pervasive since 1990, whereas other conditions have displayed more dynamic trends, with different ages, sexes, and geographies across the globe experiencing varying burdens and trends of health loss. This study emphasises how global improvements in premature mortality for select conditions have led to older populations with complex and potentially expensive diseases, yet also highlights global achievements in certain domains of disease and injury.

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*Collaborators listed at the end of the paper

Correspondence to:
Prof Christopher J L Murray, Institute for Health Metrics Evaluation, University of Washington, Seattle, WA 98121, USA
cjlm@uw.edu

Health Sciences (Prof P Allebeck MD, Z El-Khatib PhD), Department of Neurobiology (Prof J Ärnlöv PhD), Department of Medical Epidemiology and Biostatistics (J J Carrero PhD, Prof E Weiderpass PhD), Department of Neurobiology, Care Sciences and Society (S Fereshtehnejad PhD), Karolinska Institutet, Stockholm, Sweden; Swedish Research Council for Health, Working Life, and Welfare, Stockholm, Sweden (Prof P Allebeck MD); Department of Medicine, University of Setif Algeria, Sétif, Algeria (Prof M M L Alouani PhD); Research Group on Health Economics, University of Cartagena, Cartagena, Colombia (Prof N Alvis-Guzman PhD); Research Group in Hospital Management and Health Policies, University of the Coast, Barranquilla, Colombia (Prof N Alvis-Guzman PhD); Sansom Institute (A Amare PhD), Wardliparingga Aboriginal Research Unit (P S Azzopardi PhD), South Australian Health and Medical Research Institute, Adelaide, SA, Australia; Department of Public Health Nutrition (N Fentahun PhD), Department of Psychiatry (T Mekonen MSc), Bahir Dar University, Bahir Dar, Ethiopia (A Amare PhD); School of Public Health (L N Aminde MD, F J Charlson PhD, H E Erskine PhD, A J Ferrari PhD, D F Santomauro PhD, J G Scott PhD), School of Dentistry (R Lalloo PhD), Institute for Social Science Research (A A Mamun PhD, J C Maravilla PhD), Queensland Brain Institute (Prof J J McGrath MD), The University of Queensland, Brisbane, QLD, Australia (J Leung PhD, Prof H A Whiteford PhD); Department of the Health Industrial Complex and Innovation in Health (Prof D A Silveira MD), Department of Diseases and Noncommunicable Diseases and Health Promotion (A M Soares Filho DSc), Federal Ministry of Health, Beirut, Lebanon (Prof W Ammar PhD); Faculty of Health Sciences, American University of Beirut, Beirut, Lebanon (Prof W Ammar PhD); Department of Internal Medicine, Komfo Anokye Teaching Hospital, Kumasi, Ghana (Y A Amoako MD); Faculty of Medicine (N H Anber PhD), Department of Clinical Pathology (Prof M El Sayed Zaki PhD), Mansoura University, Mansoura, Egypt (N H Anber PhD); Emergency Hospital of Bucharest (Prof M Beuran PhD, I Negoi PhD), Department of General Surgery (D V Davitoiu PhD, M Hostiuc PhD), Department of Legal Medicine and Bioethics (S Hostiuc PhD), Anatomy and Embryology Department (R I Negoi PhD), Carol Davila University of Medicine and Pharmacy, Bucharest, Romania (C Andrei PhD); Department of Medicine, University of Thessaly, Volos, Greece (S Androudi PhD); Department of Public Health (Y C D Geramo MSc), Arba Minch University, Arba Minch, Ethiopia (M D Animut MPH); Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran (M Anjomshoa PhD, L Jahangiry PhD); Department of Public Health (M G Ansha MPH, T Kolola MPH, K B Mruts MPH), Department of Midwifery (M T Dinberu MA), Debre Berhan University, Debre Berhan, Ethiopia; Department of Health Policy and Administration (C T Antonio MD), Development and Communication Studies (E K Macarayan PhD), University of the Philippines Manila, Manila, Philippines; Department of Applied Social Sciences (C T Antonio MD), School of Nursing (P H Lee PhD), Hong Kong Polytechnic University, Hong Kong, China; Independent Consultant, Kabul, Afghanistan (P Anwari MSc); Health Management and Economics Research Center (J Arabloo PhD, M Behzadifar PhD), Department of Ophthalmology (K Ghasemi Falavarjani MD), Air Pollution Research Center (B Heibati PhD), Preventive Medicine and Public Health Research Center (M Moradi-Lakeh MD, K Vosoughi MD, A Tehrani-Banihashemi PhD), Department of Neuroscience (M Safdarian MD), Department of Health Policy (H Shabaninejad PhD), Department of Community Medicine (A Tehrani-Banihashemi PhD), Physiology Research Center (M Yousefifard PhD), Iran University of Medical Sciences, Tehran, Iran (T Beyranvand PhD, F Farhadi MD, M Hosseinzadeh PhD); Stroke Clinic, National Institute of Neurology and Neurosurgery, Mexico City, Mexico (Prof A Arauz DrPH); School of Health Sciences, Birmingham City University, Birmingham, UK (O Aremu PhD); School of Health and Social Studies, Dalarna University, Falun, Sweden (Prof J Ärnlöv PhD); CERIMP, Tuscany Regional Centre for Occupational Injuries and Diseases, Firenze, Italy (F Ariani MSc); Social Determinants of Health Research Center, Saveh University of Medical Sciences, Saveh, Iran (B Armoon PhD); School of Science and Health (A Arora PhD), School of Social Sciences and Psychology (Prof A M N Renzaho PhD), Western Sydney University, Sydney, NSW, Australia (F A Ogbo PhD); Oral Health Services, Sydney Local Health District, Sydney, NSW, Australia (A Arora PhD); Department of Community Health Sciences, University of Manitoba, Winnipeg, MB, Canada (A Artaman PhD); Monitoring Evaluation and Operational Research Project, Abt Associates Nepal, Lalitpur, Nepal (K K Aryal PhD); Qom University of Medical Sciences, Qom, Iran (H Asayesh MSc); South Asian Public Health Forum, Lahore, Pakistan (R J Asghar MPH); Center for Clinical Global Health Education (S R Atre PhD), Department of Epidemiology (S H Ballew PhD), Bloomberg School of Public Health (J Coresh PhD), School of Medicine (M E Grams PhD), Division of Cardiovascular and Clinical Epidemiology (M E Grams PhD), Department of Radiology (N Hafezi-Nejad MD, A Haj-Mirzaian MD, Prof K Matsushita MD), Department of Health Policy and Management (A T Khoja MD), Epidemiology (Y Sang MSc), Department of Gastrointestinal and Hepatology (K Vosoughi MD), Johns Hopkins University, Baltimore, MD, USA; Dr D Y Patil Medical College (S R Atre PhD), Dr D Y Patil Vidyapeeth, Pune, India (A R Sawant MD); School of Business (Prof M Ausloos PhD), Department of Health Sciences (Prof T Brugha MD), University of Leicester, Leicester, UK; Center for Health Systems Research (L Avila-Burgos PhD, L Cahuana-Hurtado PhD, H Gómez-Dantés MSc, Prof E Serván-Mori DSc), Centro de Investigacion en Nutricion y Salud (F Mejia-Rodriguez MSc), National Institute of Public Health, Cuernavaca, Mexico; Contrôle Des Maladies Infectieuses (E F A Avokpaho MD), Non Communicable Disease Department (F G Gankpe MD), Laboratory of Studies and Research-Action in Health, Porto Novo, Benin; Indian Institute of Public Health, Gandhinagar, India (A Awasthi PhD); The Judith Lumley Centre (B Ayala Quintanilla PhD), School of Nursing and Midwifery (Prof D Edvardsson PhD), Austin Clinical School of Nursing (M Rahman PhD), Department of Psychology and Counselling (Prof T Wijeratne MD), La Trobe University, Melbourne, VIC, Australia; General Office for Research and Technological Transfer, Peruvian National Institute of Health, Lima, Peru (B Ayala Quintanilla PhD); Department of Community and Global Health (R Ayer MHSc), Department of Mental Health (Prof N Kawakami PhD), Department of Global Health Policy (S Nomura MSc, Prof K Shibuya MD), Department of Diabetes and Metabolic Diseases (T Yamada MD), University of Tokyo, Tokyo, Japan; Global Adolescent Health Group, Burnet Institute, Melbourne, VIC, Australia (P S Azzopardi PhD); Center for Infectious Diseases Research, Babol, Iran (A Babazadeh MD, S Ebrahimpour PhD); Public Health Risk Sciences Division, Public Health Agency of Canada, Toronto, ON, Canada (A Badawi PhD); Department of Hypertension, Medical University of Lodz, Lodz, Poland (Prof M Banach PhD); Polish Mothers' Memorial Hospital Research Institute, Lodz, Poland (Prof M Banach PhD); Faculty of Medicine, Alexandria University, Alexandria, Egypt (J A M Banoub MD); Department of Research, Public Health Perspective Nepal, Pokhara-Lekhnath Metropolitan City, Nepal (A Banstola MPH); Clinic for Infectious and Tropical Diseases, Clinical Center of Serbia, Belgrade, Serbia (A Barac PhD); Faculty of Medicine (A Barac PhD, E Dubljanin PhD), Centre School of Public Health and Health Management (Prof M M Santric Milicevic PhD), Faculty of Medicine Institute of Epidemiology (I S Vujcic PhD), University of Belgrade, Belgrade, Serbia; Department of Neurosciences (Prof M A Barboza MD), Area de Estadística, Dirección Actuarial (Prof J Castillo Rivas MSc), Costa Rican Department of Social Security, San Jose, Costa Rica; School of Medicine (Prof M A Barboza MD), School of Dentistry (Prof J Castillo Rivas MSc), University of Costa Rica, San Pedro, Costa Rica; School of Psychology (Prof S L Barker-Collo PhD), Molecular Medicine and Pathology (K B Tran MD), University of Auckland, Auckland, New Zealand; Institute of Public Health (Prof T W Bärnighausen MD, B Moazen MSc, S Mohammed PhD), Institute of Global Health (Prof J De Neve MD), Department of Ophthalmology (Prof J B Jonas MD), Medical Clinic V (Prof W März MD), Augenpraxis Jonas (S Panda-Jonas MD), Heidelberg University, Heidelberg, Germany; Department of Global Health and Population (Prof T W Bärnighausen MD, Prof O F Norheim PhD), Department of Nutrition (M S Farvid PhD), T H Chan School of Public Health (P C Gupta DSc), Ariadne Labs (E K Macarayan PhD), Division of General Internal Medicine and Primary Care (Prof A Sheikh MD), Heart and Vascular Center (M Vaduganathan MD), Harvard University, Boston, MA, USA (M G Shrime MD); Department of Industrial

Tracking spending on malaria by source in 106 countries, 2000–16: an economic modelling study

Annie Haakenstad, Anton Connor Harle, Golsum Tsakalos, Angela E Micah, Tianchan Tao, Mina Anjomshoa, Jessica Cohen, Nancy Fullman, Simon I Hay, Tomislav Mestrovic, Shafiu Mohammed, Seyyed Meysam Mousavi, Molly R Nixon, David Pigott, Khanh Tran, Christopher J L Murray, Joseph L Dieleman

Summary

Background Sustaining achievements in malaria control and making progress toward malaria elimination requires coordinated funding. We estimated domestic malaria spending by source in 106 countries that were malaria-endemic in 2000–16 or became malaria-free after 2000.

Methods We collected 36 038 datapoints reporting government, out-of-pocket (OOP), and prepaid private malaria spending, as well as malaria treatment-seeking, costs of patient care, and drug prices. We estimated government spending on patient care for malaria, which was added to government spending by national malaria control programmes. For OOP malaria spending, we used data reported in National Health Accounts and estimated OOP spending on treatment. Spatiotemporal Gaussian process regression was used to ensure estimates were complete and comparable across time and to generate uncertainty.

Findings In 2016, US$4·3 billion (95% uncertainty interval [UI] 4·2–4·4) was spent on malaria worldwide, an 8·5% (95% UI 8·1–8·9) per year increase over spending in 2000. Since 2000, OOP spending increased 3·8% (3·3–4·2) per year, amounting to $556 million (487–634) or 13·0% (11·6–14·5) of all malaria spending in 2016. Governments spent $1·2 billion (1·1–1·3) or 28·2% (27·1–29·3) of all malaria spending in 2016, increasing 4·0% annually since 2000. The source of malaria spending varied depending on whether countries were in the malaria control or elimination stage.

Interpretation Tracking global malaria spending provides insight into how far the world is from reaching the malaria funding target of $6·6 billion annually by 2020. Because most countries with a high burden of malaria are low income or lower-middle income, mobilising additional government resources for malaria might be challenging.

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Introduction

Between 2000 and 2017, tremendous progress was made in the fight against malaria, although the disease burden remains high in many countries.[1] Globally, malaria incidence fell by nearly 1% annually or 1·9 million cases per year and malaria death rates dropped 3·1% each year, averting an additional 14 000 deaths annually on average. Relative to 2000, 24·2 million fewer malaria cases and 226 000 fewer deaths occurred in 2016.[2–4] These declines were underpinned by a 30·2% increase in development assistance for malaria between 2000 and 2010.[5] More than US$10·3 billion in development assistance for health (DAH) was disbursed to control and eliminate malaria between 2000 and 2010.

Despite this progress, a large malaria health burden persists in many low-income and lower-middle-income countries and particularly in sub-Saharan Africa.[6] In 2017, 208·8 million cases of malaria occurred globally and 620 000 people died, including 328 000 children under the age of 5 years in sub-Saharan Africa.[3,4,7,8] Evidence suggests progress in the fight against malaria has stalled in some settings.[9] Moreover, between 2010 and 2018, development assistance for malaria decreased 1·9% annually on average.

Sustaining achievements in malaria control and making progress towards global malaria elimination goals requires funding above present levels of DAH. The Global Technical Strategy for Malaria, 2016–30, aims to reduce case incidence and mortality by 40% by 2020, eliminate malaria from at least ten countries, and prevent re-introduction of malaria in all malaria-free settings.[10] Achieving these aims requires an estimated $6·6 billion in malaria investments annually by 2020.[11,12]

With little growth in future DAH expected, it is crucial to better understand present health spending on malaria, including how much is financed by governments, households, and prepaid private sources in malaria-endemic countries.[5] To date, no comprehensive and comparable estimates of global spending on malaria exist. Country-specific information has increased, with malaria spending estimates for 149 years of data for numerous countries published in National Health Account (NHA) sub-accounts and System of National Health Accounts 2011 reports.[13] However, just 55 of these

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Harvard T H Chan School of Public Health, Boston, MA, USA (A Haakenstad MA, J Cohen PhD); Institute for Health Metrics and Evaluation, Seattle, WA, USA (A C Harle BA, G Tsakalos MS, A E Micah PhD, T Tao BA, N Fullman MPH, Prof S I Hay DSc, M R Nixon PhD, D Pigott DPhil, Prof C J L Murray DPhil, J L Dieleman PhD); Rafsanjan University of Medical Sciences Social Determinants of Health Research Center, Rafsanjan, Iran (M Anjomshoa PhD); Department of Health Management and Economics, Tehran University of Medical Sciences, Tehran, Iran (M Anjomshoa); Dr Zora Profozic Polyclinic Clinical Microbiology and Parasitology Unit, Zagreb, Croatia (T Mestrovic PhD); University Centre Varazdin, Varazdin, Croatia (T Mestrovic); Ahmadu Bello University, Zaria, Nigeria (S Mohammed PhD); Heidelberg University Institute of Public Health, Heidelberg, Germany (S Mohammed); Tehran University of Medical Sciences Department of Health Management and Economics, Tehran, Iran (M Anjomshoa, S M Mousavi PhD); University of Auckland Department of Molecular Medicine and Pathology, Auckland, New Zealand (K Tran MD); and Military Medical University Department of Clinical Hematology and Toxicology, Hanoi, Vietnam (K Tran)

Correspondence to: Dr Joseph L Dieleman, Institute for Health Metrics and Evaluation, Seattle, WA 98121, USA
dieleman@uw.edu

Mapping geographical inequalities in oral rehydration therapy coverage in low-income and middle-income countries, 2000–17

*Local Burden of Disease Diarrhoea Collaborators**

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*Collaborators listed at the end of the Article

Correspondence to:
Dr Robert C Reiner Jr, Institute for Health Metrics and Evaluation, Department of Health Metrics Science, School of Medicine, University of Washington, Seattle, WA 98121, USA
bcreiner@uw.edu

Summary

Background Oral rehydration solution (ORS) is a form of oral rehydration therapy (ORT) for diarrhoea that has the potential to drastically reduce child mortality; yet, according to UNICEF estimates, less than half of children younger than 5 years with diarrhoea in low-income and middle-income countries (LMICs) received ORS in 2016. A variety of recommended home fluids (RHF) exist as alternative forms of ORT; however, it is unclear whether RHF prevent child mortality. Previous studies have shown considerable variation between countries in ORS and RHF use, but subnational variation is unknown. This study aims to produce high-resolution geospatial estimates of relative and absolute coverage of ORS, RHF, and ORT (use of either ORS or RHF) in LMICs.

Methods We used a Bayesian geostatistical model including 15 spatial covariates and data from 385 household surveys across 94 LMICs to estimate annual proportions of children younger than 5 years of age with diarrhoea who received ORS or RHF (or both) on continuous continent-wide surfaces in 2000–17, and aggregated results to policy-relevant administrative units. Additionally, we analysed geographical inequality in coverage across administrative units and estimated the number of diarrhoeal deaths averted by increased coverage over the study period. Uncertainty in the mean coverage estimates was calculated by taking 250 draws from the posterior joint distribution of the model and creating uncertainty intervals (UIs) with the 2·5th and 97·5th percentiles of those 250 draws.

Findings While ORS use among children with diarrhoea increased in some countries from 2000 to 2017, coverage remained below 50% in the majority (62·6%; 12 417 of 19 823) of second administrative-level units and an estimated 6 519 000 children (95% UI 5 254 000–7 733 000) with diarrhoea were not treated with any form of ORT in 2017. Increases in ORS use corresponded with declines in RHF in many locations, resulting in relatively constant overall ORT coverage from 2000 to 2017. Although ORS was uniformly distributed subnationally in some countries, within-country geographical inequalities persisted in others; 11 countries had at least a 50% difference in one of their units compared with the country mean. Increases in ORS use over time were correlated with declines in RHF use and in diarrhoeal mortality in many locations, and an estimated 52 230 diarrhoeal deaths (36 910–68 860) were averted by scaling up of ORS coverage between 2000 and 2017. Finally, we identified key subnational areas in Colombia, Nigeria, and Sudan as examples of where diarrhoeal mortality remains higher than average, while ORS coverage remains lower than average.

Interpretation To our knowledge, this study is the first to produce and map subnational estimates of ORS, RHF, and ORT coverage and attributable child diarrhoeal deaths across LMICs from 2000 to 2017, allowing for tracking progress over time. Our novel results, combined with detailed subnational estimates of diarrhoeal morbidity and mortality, can support subnational needs assessments aimed at furthering policy makers' understanding of within-country disparities. Over 50 years after the discovery that led to this simple, cheap, and life-saving therapy, large gains in reducing mortality could still be made by reducing geographical inequalities in ORS coverage.

Funding Bill & Melinda Gates Foundation.

Introduction

Oral rehydration solution (ORS) is a simple treatment that can be prepared and used at home to prevent mortality due to dehydration and undernutrition in children with diarrhoea. This intervention is especially suitable in locations where intravenous fluids are scarce or unavailable,[1] and replaces indiscriminate and unnecessary use of antibiotics to treat diarrhoea.[2] ORS was discovered more than 50 years ago when a physician in Dhaka, Bangladesh, found that treating patients with cholera with glucose-electrolyte solutions in equivalent amounts to fluid losses could prevent the need for intravenous liquids in 80% of patients.[3] Shortly thereafter, its ability to prevent dehydration was shown in a trial in Kolkata, India,[4] and during a cholera outbreak among Bangladeshi refugees in India.[5] Since then,

Health, Cuernavaca, Mexico; Erbil Technical Health College (B A Ali PhD), Erbil Polytechnic University, Erbil, Iraq; School of Pharmacy (B A Ali), Tishk International University, Erbil, Iraq (K A Mohammad PhD); Social Determinants of Health Research Center (M Alijanzadeh PhD), Qazvin University of Medical Sciences, Qazvin, Iran; Health Management and Economics Research Center (V Alipour PhD, J Arabloo PhD, S Azari PhD, A Ghashghaee BSc), Health Economics Department (V Alipour), Preventive Medicine and Public Health Research Center (M Asadi-Aliabadi MSc, E Babaee PhD, M Moradi-Lakeh MD, Prof M Nojomi MD), Student Research Committee (A Ghashghaee), Minimally Invasive Surgery Research Center (A Kabir MD), Pars Advanced and Minimally Invasive Medical Manners Research Center (A Kasaeian), Department of Neurosurgery (M Khosravi MD), Department of Ophthalmology (N Manafi MD), Department of Community and Family Medicine (Prof M Nojomi), Department of Health Services Management (H Shabaninejad PhD), Physiology Research Center (M Yousefifard PhD), Iran University of Medical Sciences, Tehran, Iran; Department of Health Policy and Management (Prof S M Aljunid PhD), Kuwait University, Safat, Kuwait; International Centre for Casemix and Clinical Coding (Prof S M Aljunid), National University of Malaysia, Bandar Tun Razak, Malaysia; Department of Environmental Health Engineering (Prof A Almasi PhD), Infectious Disease Research Center (Prof K Ghadiri MD), Pediatric Department (Prof K Ghadiri), Medical Biology Research Center (F Heydarpour PhD), Health Institute (A Jalali PhD), Substance Abuse Prevention Research Center (A Jalali), Research Center for Environmental Determinants of Health (Prof B Karami Matin PhD, A Kazemi Karyani PhD, M Moradi PhD, Prof F Najafi PhD, Prof M Pirsaheb PhD, F Rajati PhD, Prof E Sadeghi PhD, Y Safari PhD, K Sharafi PhD, S Soltani PhD), Department of Public Health (A Kazemi Karyani), Clinical Research Development Center (M Naderi PhD), Department of Epidemiology and Biostatistics (Prof F Najafi, Y Salimi PhD), Faculty of Public Health (R Safari-Faramani PhD), Department of Anatomical Sciences (M R Salahshoor PhD), Social Development and Health Promotion Research Center (Y Salimi, M Soofi PhD), Department of Sports Medicine and Rehabilitation (M Shamsi PhD), Department of Health Education and Health Promotion (S Siabani PhD, A Ziapour PhD), Department of Vascular and Endovascular Surgery (M Sobhiyeh MD), Kermanshah University of Medical Sciences, Kermanshah, Iran; Department of Epidemiology (A Almasi-Hashiani PhD), Health Services Management Department (S Amini PhD), Department of Pediatrics (J Nazari MD), Arak University of Medical Sciences, Arak, Iran; Medical Research Center (H M Al-Mekhlafi PhD), Jazan University, Jazan, Saudi Arabia (Prof N Bedi MD); Department of Parasitology (H M Al-Mekhlafi), Sana'a University, Sana'a, Yemen; Pediatric Intensive Care Unit (K A Altirkawi MD, M Temsah MD), Internal Medicine Department (Y Mohammad MD), King Saud University, Riyadh, Saudi Arabia; Research Group in Health Economics (Prof N Alvis-Guzman PhD), University of Cartagena, Cartagena, Colombia; Research Group in Hospital Management and Health Policies (Prof N Alvis-Guzman), Department of Economic Sciences (N J Alvis-Zakzuk MSc), University of the Coast, Barranquilla, Colombia; National Health Observatory (N J Alvis-Zakzuk), Colombian National Health Observatory (C A Castañeda-Orjuela MD), National Institute of Health, Bogota, Colombia; Department of Epidemiology and Biostatistics (A L Amit BS), Department of Health Policy and Administration (C T Antonio MD), Department of Nutrition (J F Lopez MD), University of the Philippines Manila, Manila, Philippines; School of Public Health (A L Amit), Department of Epidemiology (M Bairwa MD), Department of Radiology and Radiological Sciences (N Hafezi-Nejad, Ary Haj-Mirzaian MD), Center for Clinical Global Health Education (S R Atre PhD), Johns Hopkins University, Baltimore, MD, USA; Cardiology Department (C Andrei PhD), Department of General Surgery (D V Davitoiu PhD, A Manda MD, I Negoi PhD), Department of Infectious Diseases (L Preotescu PhD), Carol Davila University of Medicine and Pharmacy, Bucharest, Romania; Social Determinants of Health Research Center (M Anjomshoa PhD), Rafsanjan University of Medical Sciences, Rafsanjan, Iran; Research Center for Evidence Based Medicine (F Ansari PhD), School of Nursing and Midwifery (H Hassankhani PhD), Tabriz University of Medical Sciences, Tabriz, Iran (H Haririan PhD); Razi Vaccine and Serum Research Institute (F Ansari), Agricultural Research, Education, and Extension Organization, Tehran, Iran; Department of Applied Social Sciences (C T Antonio), School of Nursing (P H Lee PhD), Hong Kong Polytechnic University, Hong Kong, China; Menzies Institute for Medical Research (B Antony PhD, A Singh MTech), University of Tasmania, Hobart, TAS, Australia; Agribusiness Study Program (E Antriyandarti DrAgrSc), Sebelas Maret University, Surakarta, Indonesia; Neurology Department (Prof H M A Aref PhD, Prof N El Nahas MD, Prof A S Shalash PhD), Department of Obstetrics and Gynecology (Prof A F Nabhan PhD), Department of Entomology (A M Samy PhD), Ain Shams University, Cairo, Egypt; Department of Public Health (O Aremu PhD), Birmingham City University, Birmingham, UK; Social Determinants of Health Research Center (B Armoon PhD), Saveh University of Medical Sciences, Saveh, Iran; Social Determinants of Health Research Center (B Armoon), Yasuj University of Medical Sciences, Yasuj, Iran; School of Health Sciences (A Arora PhD), Western Sydney University, Campbelltown, NSW, Australia; Disciple of Child and Adolescent Health (A Arora), University of Sydney, Westmead, NSW, Australia; Monitoring Evaluation and Operational Research Project (K K Aryal PhD), Abt Associates Nepal, Lalitpur, Nepal; School of Nursing and Midwifery (A Arzani DrPH), Social Determinants of Health Research Center (A Bijani PhD, S Mouodi PhD), Department of Clinical Biochemistry (A Mosapour PhD), Student Research Committee (M Zamani MD), Babol University of Medical Sciences, Babol, Iran (A Arzani); Department of Nursing (H T Atalay MSc, G G Gebremeskel, D B Tadesse MSc, G T Weldesamuel MSc), School of Pharmacy (G T Demoz MSc, G G Kasahun MSc), Department of Biomedical Sciences (G G Kassa MSc), Aksum University, Aksum, Ethiopia; Department of Immunology (S Athari MPH), Zanjan University of Medical Sciences, Iran; Department of Biology (S Athari), Department of Pharmacology and Toxicology (A Eftekhari PhD), Department of Healthcare Management (E Hasanpoor PhD), Department of Microbiology (A Hasanzadeh), Department of Nutrition and Food Sciences (H Pourjafar PhD), Maragheh University of Medical Sciences, Maragheh, Iran; Dr DY Patil Medical College, Hospital and Research Centre (S R Atre), Dr DY Patil Vidyapeeth, Pune, India; School of Business (Prof M Ausloos PhD), University of Leicester, Leicester, UK; Department of Statistics and Econometrics (Prof M Ausloos, Prof C Herteliu PhD), Bucharest University of Economic Studies, Bucharest, Romania; Department of Nursing (N Awoke MSc, T Y Chichiabellu MSc), Department of Dermatology (A G Kelbore MSc), School of Public Health (T L Lenjebo MPH), Department of Midwifery (K Paulos MSc), Wolaita Sodo University, Wolaita Sodo, Ethiopia; The Judith Lumley Centre (B Ayala Quintanilla PhD), School of Nursing and Midwifery (Mu Rahman PhD), La Trobe University, Melbourne, VIC, Australia; General Office for Research and Technological Transfer (B Ayala Quintanilla), Peruvian National Institute of Health, Lima, Peru; School of Public Health (G Ayano MSc, B Duko MPH, D Hendrie PhD, T R Miller PhD), Curtin University, Perth, WA, Australia; Department of Health Policy Planning and Management (M A Ayanore PhD), Department of Family and Community Health (N Kugbey PhD), University of Health and Allied Sciences, Ho, Ghana; Department of Nursing (Y A Aynalem MSc, W S Shiferaw MSc), Debre Berhan University, Debre Berhan, Ethiopia; Global Adolescent Health Group (P S Azzopardi PhD), Burnet Institute, Melbourne, VIC, Australia; Wardliparingga Aboriginal Research Unit (P S Azzopardi), South Australian Health and Medical Research Institute, Adelaide, SA, Australia; Department of Public Health Medicine (T K Babalola MSc), Discipline of Public Health Medicine (T G Ginindza PhD), Department of Psychology and Health Promotion (N Kugbey), Discipline of Optometry (Prof K S Naidoo PhD), University of KwaZulu-Natal, Durban, South Africa (T G Ginindza); Department of Community Health and Primary Care (T K Babalola), Department of Psychiatry (A T Olagunju MD), University of Lagos, Lagos, Nigeria; Public Health Risk Sciences Division (A Badawi PhD), Public Health Agency of Canada, Toronto, ON, Canada; Department of Nutritional Sciences (A Badawi), Centre for Global Child Health (Prof Z A Bhutta PhD), Department of Medicine (V Chattu MD), University of Toronto, Toronto,

Article

Mapping routine measles vaccination in low- and middle-income countries

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Local Burden of Disease Vaccine Coverage Collaborators*

The safe, highly effective measles vaccine has been recommended globally since 1974, yet in 2017 there were more than 17 million cases of measles and 83,400 deaths in children under 5 years old, and more than 99% of both occurred in low- and middle-income countries (LMICs)[1–4]. Globally comparable, annual, local estimates of routine first-dose measles-containing vaccine (MCV1) coverage are critical for understanding geographically precise immunity patterns, progress towards the targets of the Global Vaccine Action Plan (GVAP), and high-risk areas amid disruptions to vaccination programmes caused by coronavirus disease 2019 (COVID-19)[5–8]. Here we generated annual estimates of routine childhood MCV1 coverage at 5 × 5-km^2 pixel and second administrative levels from 2000 to 2019 in 101 LMICs, quantified geographical inequality and assessed vaccination status by geographical remoteness. After widespread MCV1 gains from 2000 to 2010, coverage regressed in more than half of the districts between 2010 and 2019, leaving many LMICs far from the GVAP goal of 80% coverage in all districts by 2019. MCV1 coverage was lower in rural than in urban locations, although a larger proportion of unvaccinated children overall lived in urban locations; strategies to provide essential vaccination services should address both geographical contexts. These results provide a tool for decision-makers to strengthen routine MCV1 immunization programmes and provide equitable disease protection for all children.

The safe, highly effective vaccine against measles has been recommended since 1974 by the Expanded Programme on Immunization of the WHO (World Health Organization)[1–3]. A single valid dose of any MCV is approximately 93% effective in providing individuals with lifelong protection from measles[1]. Still, in 2017, there were an estimated 17,767,037 new global cases and 83,439 deaths attributable to measles in children under 5 years old[4]. Although high-income regions, such as the USA and Europe, have recently started experiencing extended measles outbreaks due to a lapse in vaccination coverage, more than 99% of cases and deaths still occur in LMICs[4,9].

Low vaccination rates and increasing vaccine hesitancy[10–12] contribute to the persistence of measles as a major cause of childhood morbidity and mortality. National-level MCV1 estimates from the Global Burden of Diseases, Injuries and Risk Factors Study (GBD) 2019 identified only 72 out of 204 countries in which routine coverage reached approximate herd immunity targets (≥95%) in 2019, and global MCV1 coverage[4,13] was 84.2%. Even in countries with high national coverage, these estimates mask important subnational heterogeneities that may sustain ongoing disease transmission and increase the risk of outbreaks[14–17], especially in light of the current service disruptions associated with the COVID-19 pandemic[7,8]. Global vaccination initiatives, such as the GVAP and Immunization Agenda 2030, recognize the importance of eliminating subnational coverage disparities, aiming for at least 90% of the target population in every country and 80% in every district to be covered[5,6].

Subnational routine MCV1 coverage

Since 2016, the WHO and UNICEF have collected subnational coverage data through their annual Joint Reporting process, although poor data quality and biases currently limit the use of administrative data to track progress towards GVAP targets[18–20]. For the 101 countries included in this study, 91 reported subnational data in 2018 in a total of 11,311 subnational geographical units. Of these countries, 71 reported MCV1 coverage greater than 100% in at least one unit and 55 reported such coverage in at least a quarter of units. Although researchers have estimated subnational MCV1 coverage in select countries or years for which there have been reliable surveys, to date, no comprehensive analysis of all available vaccine coverage data to produce subnational estimates of MCV1 coverage annually in all LMICs has been undertaken[21–24].

Building from our previous work mapping diphtheria–tetanus–pertussis vaccine coverage in Africa[14], here we present mapped high-spatial-resolution estimates of routine MCV1 coverage across 101 LMICs from 2000 to 2019, aggregated to policy-relevant second-level administrative units (hereafter districts). Using geolocated data on MCV1 coverage from 354 household-based surveys representing approximately 1.70 million children and a suite of environmental, sociodemographic and health-related geospatial and national-level covariates, we extended model-based geostatistical methods that have been used to map child mortality and its main components and risk factors[25–28] to predict MCV1 coverage and uncertainty

*A list of participants and their affiliations appears in the online version of the paper.

Fatemeh Zarei[673], Taddese Alemu Zerfu[674,675], Yunquan Zhang[676,677], Zhi-Jiang Zhang[678], Xiu-Ju George Zhao[679,680], Maigeng Zhou[681], Arash Ziapour[587], Simon I. Hay[1,151,682] ✉, Stephen S. Lim[1,151,682] ✉ & Jonathan F. Mosser[1,151,682] ✉

[1]Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA, USA. [2]Department of Infectious Disease Epidemiology, London School of Hygiene & Tropical Medicine, London, UK. [3]Social Determinants of Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran. [4]Advanced Diagnostic and Interventional Radiology Research Center, Tehran University of Medical Sciences, Tehran, Iran. [5]Department of Neurology, Cairo University, Cairo, Egypt. [6]The Institute of Pharmaceutical Sciences (TIPS), Tehran University of Medical Sciences, Tehran, Iran. [7]School of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran. [8]Department of Biostatistics, Near East University, Nicosia, Cyprus. [9]Department of Biostatistics and Health Informatics, Madda Walabu University, Bale Robe, Ethiopia. [10]Department of Public Health, Debre Markos University, Debre Markos, Ethiopia. [11]School of Public Health, Bahir Dar University, Bahir Dar, Ethiopia. [12]Department of Laboratory Medicine, Karolinska University Hospital, Huddinge, Sweden. [13]Research Center for Immunodeficiencies, Tehran University of Medical Sciences, Tehran, Iran. [14]Department of Pediatric Dentistry, Federal University of Minas Gerais, Belo Horizonte, Brazil. [15]Department of Research, Philippine Institute for Development Studies, Quezon City, The Philippines. [16]Department of Cardiovascular Medicine, Cleveland Clinic, Cleveland, OH, USA. [17]Department of Medicine, Ain Shams University, Cairo, Egypt. [18]Department of Disease Control, London School of Hygiene & Tropical Medicine, London, UK. [19]Clinical Research and Operations, Foundation for Scientific Research (FORS), Cotonou, Benin. [20]Hamadan University of Medical Sciences, Hamadan, Iran. [21]College of Medicine, University College Hospital, Ibadan, Ibadan, Nigeria. [22]Population Health Sciences, King's College London, London, UK. [23]Centre of Excellence for Epidemiological Modelling and Analysis, Stellenbosch University, Stellenbosch, South Africa. [24]Department of Global Health, Stellenbosch University, Cape Town, South Africa. [25]School of Health, Ardabil University of Medical Science, Ardabil, Iran. [26]Department of Dermatology, Mayo Clinic, Rochester, MN, USA. [27]Endocrinology and Metabolism Research Center, Tehran University of Medical Sciences, Tehran, Iran. [28]Department of Epidemiology and Biostatistics, Qom University of Medical Sciences, Qom, Iran. [29]Department of Epidemiology and Health Statistics, Southeast University, Nanjing, China. [30]Drug Applied Research Center, Tabriz University of Medical Sciences, Tabriz, Iran. [31]Department of Food Science and Technology, University of Tabriz, Tabriz, Iran. [32]Lincoln Medical School, Universities of Nottingham & Lincoln, Lincoln, UK. [33]Department of Epidemiology, , Jimma University, Jimma, Ethiopia. [34]Australian Center for Precision Health, , University of South Australia, Adelaide, South Australia, Australia. [35]Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia. [36]Health Information Management and Technology Department, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia. [37]Center for Health System Research, National Institute of Public Health, Cuernavaca, Mexico. [38]Department of Medical Laboratory Science, Woldia University, Woldia, Ethiopia. [39]Erbil Technical Health College, Erbil Polytechnic University, Erbil, Iraq. [40]School of Pharmacy, Tishk International University, Erbil, Iraq. [41]Department of Biotechnology, Quaid-i-Azam University, Islamabad, Pakistan. [42]Social Determinants of Health Research Center, Qazvin University of Medical Sciences, Qazvin, Iran. [43]Department of Health Care Management and Economics, Urmia University of Medical Science, Urmia, Iran. [44]Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran. [45]Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran. [46]Health Economics Department, Iran University of Medical Sciences, Tehran, Iran. [47]Infectious and Tropical Disease Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran. [48]Department of Health Policy and Management, Kuwait University, Safat, Kuwait. [49]International Centre for Casemix and Clinical Coding, National University of Malaysia, Bandar Tun, Razak, Malaysia. [50]Department of Environmental Health Engineering, Kermanshah University of Medical Sciences, Kermanshah, Iran. [51]Department of Epidemiology, Arak University of Medical Sciences, Arak, Iran. [52]Medical Research Center, Jazan University, Jazan, Saudi Arabia. [53]Department of Parasitology, Sana'a University, Sana'a, Yemen. [54]Pediatric Intensive Care Unit, King Saud University, Riyadh, Saudi Arabia. [55]Department of Pharmacology, Mekelle University, Mekelle, Ethiopia. [56]Health Services Management Department, Arak University of Medical Sciences, Arak, Iran. [57]Health Management and Economics Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. [58]Department of Radiology and Nuclear Medicine, Kermanshah University of Medical Sciences, Kermanshah, Iran. [59]Department of Epidemiology and Biostatistics, University of the Philippines Manila, Manila, The Philippines. [60]School of Public Health, Johns Hopkins University, Baltimore, MD, USA. [61]Maternal and Child Wellbeing, African Population and Health Research Center, Nairobi, Kenya. [62]Pharmacy Department, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania. [63]Cardiology Department, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania. [64]Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [65]Research Center for Evidence Based Medicine, Tabriz University of Medical Sciences, Tabriz, Iran. [66]Razi Vaccine and Serum Research Institute, Agricultural Research, Education, and Extension Organization (AREEO), Tehran, Iran. [67]Department of Epidemiology and Biostatistics, Zahedan University of Medical Sciences, Zahedan, Iran. [68]Department of Public Health, Debre Berhan University, Debre Berhan, Ethiopia. [69]Department of Health Policy and Administration, University of the Philippines Manila, Manila, The Philippines. [70]Department of Applied Social Sciences, Hong Kong Polytechnic University, Hong Kong, China. [71]Agribusiness Study Program, Sebelas Maret University, Surakarta, Indonesia. [72]Department of Parasitology, Mazandaran University of Medical Sciences, Sari, Iran. [73]Department of Parasitology, Iranshahr University of Medical Sciences, Iranshahr, Iran. [74]Social Determinants of Health Research Center, Birjand University of Medical Sciences, Birjand, Iran. [75]Department of Public Health, Birmingham City University, Birmingham, UK. [76]Social Determinants of Health Research Center, Saveh University of Medical Sciences, Saveh, Iran. [77]Social Determinants of Health Research Center, Yasuj University of Medical Sciences, Yasuj, Iran. [78]Monitoring Evaluation and Operational Research Project, Abt Associates Nepal, Lalitpur, Nepal. [79]School of Nursing and Midwifery, Babol University of Medical Sciences, Babol, Iran. [80]Babol University of Medical Sciences, Babol, Iran. [81]Preventive Medicine and Public Health Research Center, Iran University of Medical Sciences, Tehran, Iran. [82]Prevention of Metabolic Disorders Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran. [83]Social Development and Health Promotion Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran. [84]School of Business, University of Leicester, Leicester, UK. [85]Department of Statistics and Econometrics, Bucharest University of Economic Studies, Bucharest, Romania. [86]Department of Nursing, Wolaita Sodo University, Wolaita Sodo, Ethiopia. [87]The Judith Lumley Centre, La Trobe University, Melbourne, Victoria, Australia. [88]Department of Health Policy Planning and Management, University of Health and Allied Sciences, Ho, Ghana. [89]Department of Nursing, Debre Berhan University, Debre Berhan, Ethiopia. [90]Cellular and Molecular Biology Research Center, Babol University of Medical Sciences, Babol, Iran. [91]Public Health Risk Sciences Division, Public Health Agency of Canada, Toronto, Ontario, Canada. [92]Department of Nutritional Sciences, University of Toronto, Toronto, Ontario, Canada. [93]Department of Forensic Science, Government Institute of Forensic Science, Nagpur, India. [94]Department of Healthcare Management and Education, Shiraz University of Medical Sciences, Shiraz, Iran. [95]Unit of Biochemistry, Sultan Zainal Abidin University (Universiti Sultan Zainal Abidin), Kuala Terengganu, Malaysia. [96]Department of Health Policy, Management, and Economics, Tehran University of Medical Sciences, Tehran, Iran. [97]Department of Medical Microbiology, Haramaya University, Harar, Ethiopia. [98]Department of Hypertension, Medical University of Lodz, Lodz, Poland. [99]Polish Mothers' Memorial Hospital Research Institute, Lodz, Poland. [100]Department of Non-communicable Diseases, Bangladesh University of Health Sciences, Dhaka, Bangladesh. [101]Clinic for Infectious and Tropical Diseases, Clinical Center of Serbia, Belgrade, Serbia. [102]Faculty of Medicine, University of Belgrade, Belgrade, Serbia. [103]Razi Vaccine and Serum Research Institute, Agricultural Research, Education and Extension Organization (AREEO), Karaj, Iran. [104]Department of Epidemiology and Biostatistics, University of Gondar, Gondar, Ethiopia. [105]Center for Primary Care, Harvard University, Boston, MA, USA. [106]School of Public Health, Imperial College London, London, UK. [107]Health Human Resources Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. [108]Monitoring, Evaluation and Research Department, JSI Research & Training Institute, Addis Ababa, Ethiopia. [109]Department of Community Medicine, Gandhi Medical College Bhopal, Bhopal, India. [110]Jazan University, Jazan, Saudi Arabia. [111]Social Determinants of Health Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran. [112]School of the Environment, Yale University, New Haven, CT, USA. [113]Department of Public Health, Arba Minch University, Arba Minch, Ethiopia. [114]Department of Nutrition and Dietetics, Mekelle University, Mekelle, Ethiopia. [115]Department of Global Health, Global Institute for Interdisciplinary Studies, Kathmandu, Nepal. [116]Centre for Global Child Health, University of Toronto, Toronto, Ontario, Canada. [117]Centre of Excellence in Women & Child Health, Aga Khan University, Karachi, Pakistan. [118]Social Determinants of Health Research Center, Babol University of Medical Sciences, Babol, Iran. [119]Department of Pediatrics and Child Health Nursing, Bahir Dar University, Bahir Dar, Ethiopia. [120]Global Health Division, Research Triangle Institute International, Research Triangle Park, NC, USA. [121]School of Medicine, University of Nottingham, Nottingham, UK. [122]Department of Neurology, Institute of Post-Graduate Medical Education and Research and Seth Sukhlal Karnani Memorial Hospital, Kolkata, India. [123]Department of Veterinary Medicine, Islamic Azad University, Kermanshah, Iran. [124]Department of Biomedical Sciences, Nazarbayev University, Nur-Sultan City, Kazakhstan. [125]Department of Endocrinology, Hamadan University of Medical Sciences, Hamadan, Iran. [126]University of Genoa, Genoa, Italy. [127]Department of Biomedical Technologies, Bauman Moscow State Technical University, Moscow, Russia. [128]Department of Epidemiology and Evidence Based Medicine, I. M. Sechenov First Moscow State Medical University, Moscow, Russia. [129]Department of Community Medicine, Employee State Insurance Post Graduate Institute of Medical Sciences and Research, Bangalore, India. [130]School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, Canada. [131]Al Shifa School of Public Health, Al Shifa Trust Eye Hospital, Rawalpindi, Pakistan. [132]Internal Medicine Department, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina. [133]Board of Directors, Argentine Society of Medicine, Buenos Aires, Argentina. [134]Health and Nutrition Research Center, National Institute of Public Health, Cuernavaca, Mexico. [135]Centre for Population Health Sciences, Nanyang Technological University, Singapore, Singapore. [136]Department of Primary Care and Public Health, Imperial College London, London, UK. [137]Department of Health Care, Metropolitan Autonomous University, Mexico City, Mexico. [138]Research Unit on Applied Molecular Biosciences (UCIBIO), University of Porto, Porto, Portugal. [139]Department of Psychiatry, University of São Paulo, São Paulo, Brazil. [140]Gorgas Memorial Institute for Health Studies, Panama City, Panama. [141]Department of Medicine, University of Toronto, Toronto, Ontario, Canada. [142]Department of Biostatistics and Epidemiology, Babol University of Medical Sciences, Babol, Iran. [143]Epidemiology Research Center, Royan Institute, Tehran, Iran. [144]Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Victoria, Australia. [145]Melbourne Medical School, University of Melbourne, Parkville, Victoria, Australia. [146]Faculty of Biology, Hanoi National University of Education, Hanoi, Vietnam. [147]Environmental Health Department, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia. [148]Clinical Dermatology, IRCCS Istituto Ortopedico Galeazzi, University of Milan, Milan, Italy. [149]Department of Dermatology, Case Western Reserve University, Cleveland, OH, USA. [150]Public Health Foundation of India, Gurugram, India. [151]Department of Health Metrics Sciences, School of Medicine, University of Washington, Seattle, WA, USA. [152]Indian Council of Medical Research, New Delhi, India. [153]Immunization, Vaccines and Biologicals (IVB), World Health Organization (WHO), Geneva, Switzerland. [154]Global Delivery Programs, Bill & Melinda Gates Foundation, Seattle, WA, USA. [155]Department of Information Technology, University of Human Development, Sulaymaniyah, Iraq. [156]Department of Pediatrics, Tanta University, Tanta, Egypt. [157]Division of Women and Child Health, Aga Khan University, Karachi, Pakistan. [158]Heidelberg Institute of Global Health (HIGH), Heidelberg University, Heidelberg, Germany. [159]Department of Medical Laboratory Sciences, Bahir Dar University, Bahir Dar, Ethiopia. [160]Department of Nursing, Woldia University, Woldia, Ethiopia. [161]School of Nursing, Jimma University, Jimma, Ethiopia. [162]Center for Nutrition and Health Research, National Institute of Public Health, Cuernavaca, Mexico. [163]School of Nursing and Midwifery, Haramaya University, Harar, Ethiopia. [164]School of Pharmacy, Mekelle University, Mekelle, Ethiopia. [165]Department of Community Medicine, University of Peradeniya, Peradeniya, Sri Lanka. [166]Department of Microbiology, Far Western University, Mahendranagar, Nepal. [167]Department of Epidemiology and Biostatistics, Shahroud University of Medical Sciences, Shahroud, Iran. [168]Department of Epidemiology, Shiraz University of Medical Sciences, Shiraz, Iran. [169]Center of Complexity Sciences, National Autonomous University of Mexico, Mexico City, Mexico. [170]Faculty of Veterinary Medicine and

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Anemia prevalence in women of reproductive age in low- and middle-income countries between 2000 and 2018

Damaris Kinyoki[1,2], Aaron E. Osgood-Zimmerman[1], Natalia V. Bhattacharjee[1], Local Burden of Disease Anaemia Collaborators*, Nicholas J. Kassebaum[1,2,3,4] and Simon I. Hay[1,2] ✉

Anemia is a globally widespread condition in women and is associated with reduced economic productivity and increased mortality worldwide. Here we map annual 2000–2018 geospatial estimates of anemia prevalence in women of reproductive age (15–49 years) across 82 low- and middle-income countries (LMICs), stratify anemia by severity and aggregate results to policy-relevant administrative and national levels. Additionally, we provide subnational disparity analyses to provide a comprehensive overview of anemia prevalence inequalities within these countries and predict progress toward the World Health Organization's Global Nutrition Target (WHO GNT) to reduce anemia by half by 2030. Our results demonstrate widespread moderate improvements in overall anemia prevalence but identify only three LMICs with a high probability of achieving the WHO GNT by 2030 at a national scale, and no LMIC is expected to achieve the target in all their subnational administrative units. Our maps show where large within-country disparities occur, as well as areas likely to fall short of the WHO GNT, offering precision public health tools so that adequate resource allocation and subsequent interventions can be targeted to the most vulnerable populations.

Anemia occurs when the number of healthy red blood cells is insufficient to meet the body's physiological needs for oxygen delivery to the brain, heart, muscles and other vital tissues. Hemoglobin is the primary oxygen-carrying molecule within red blood cells, so anemia is most typically measured in terms of hemoglobin content of the blood rather than red blood cell volume[1,2]. Anemia can reduce cognitive and physical capacities and is associated with reduced economic productivity[3,4] and increased morbidity and all-cause mortality[5]. Maternal iron deficiency can lead to adverse pregnancy and newborn outcomes, including stillbirth, low birth weight and infant mortality[6], and anemia in pregnancy has been suggested as a potential marker of increased risk of major hemorrhage[7] and a risk factor for maternal death[8].

Causes of anemia can be divided into three non-mutually exclusive pathways: blood loss, increased red blood cell destruction and inadequate red blood cell production. Blood loss can be acute due to events such as injuries, maternal hemorrhage or surgery, or it can be chronic, due to conditions such as gastrointestinal disorders, helminthic infections, bleeding disorders or abnormal uterine bleeding[9,10]. Increased red blood cell destruction happens either as a consequence of abnormal red blood cell structure, such as in thalassaemia or sickle cell disease, or because of external mechanical, immune or infectious factors[11]. Inadequate production of red blood cells can happen when the bone marrow itself is depressed, such as in HIV[12] or some malignancies; because there are hormonal imbalances, such as with chronic inflammation;[13] or due to increased demand (such as during pregnancy), nutrient malabsorption or inadequate supply of red blood cell building blocks, such as protein, iron, vitamin A[14], folate or vitamin B-12 (ref. [15]) Iron deficiency is often thought of as the most common cause of anemia, which is true but also misleading, because absolute and/or functional iron deficiency can arise as a consequence of any of the three pathways and, therefore, as a consequence of multiple different causes. Women of reproductive age (WRA; ages 15–49 years) are at particularly increased risk of iron deficiency and, therefore, anemia, compared to men, due to physiological changes such as menstruation (blood loss pathway), pregnancy (inadequate production pathway due to increased demand) and bleeding in childbirth[16,17]. Additionally, unequal household food allocation can make WRA vulnerable to anemia as they might not have access to iron-rich foods[17].

Anemia continues to affect millions of women worldwide and remains concentrated in LMICs as defined by the Global Burden of Disease (GBD) Socio-Demographic Index (SDI)[18]. In 2019, 30.1% of WRA were estimated to have anemia globally, with wide geographical variation[18], and dietary iron deficiency was among the highest-ranking conditions in both prevalence and years lived with disability (YLDs) among WRA in LMICs[19]. The WHO has set a GNT to reduce anemia in WRA by 50% by 2025 (refs. [2,20]); this target and other related WHO GNTs have since been extended to 2030 (ref. [21]). In October 2019, the percentage of WRA with anemia was officially added as an indicator to track progress toward the Sustainable Development Goal (SDG) 2.2 to end all forms of malnutrition by 2030 (refs. [22,23]). Although the WHO provides national-level anemia estimates and tracking tools, available reports do not show the subnational heterogeneity needed to inform within-country planning, annual changes to track progress or anemia severity stratifications[20,24]. Maps of comparable estimates across space and time at policy-relevant administrative levels are vital to identify the most vulnerable populations, track progress toward international

[1]Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA, USA. [2]Department of Health Metrics Sciences, School of Medicine, University of Washington, Seattle, WA, USA. [3]Department of Anesthesiology & Pain Medicine, University of Washington, Seattle, WA, USA. [4]Department of Global Health, University of Washington, Seattle, WA, USA. *A list of authors and their affiliations appears at the end of the paper. ✉e-mail: sihay@uw.edu

Nutrition and Health, Wageningen University & Research, Wageningen, Netherlands. [82]Nutrition & Food Science Research Directorate, Ethiopian Public Health Institute, Addis Ababab, Ethiopia. [83]Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [84]Research Center for Evidence Based Medicine, Tabriz University of Medical Sciences, Tabriz, Iran. [85]Razi Vaccine and Serum Research Institute, Agricultural Research, Education, and Extension Organization (AREEO), Tehran, Iran. [86]Department of Epidemiology and Biostatistics, Zahedan University of Medical Sciences, Zahedan, Iran. [87]Department of Epidemiology, Bahir Dar University, Bahir Dar, Ethiopia. [88]Agribusiness Study Program, Sebelas Maret University, Surakarta, Indonesia. [89]Department of Parasitology, Mazandaran University of Medical Sciences, Sari, Iran. [90]Department of Parasitology, Iranshahr University of Medical Sciences, Iranshahr, Iran. [91]Department of Pathology, Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia. [92]Department of Psychology, Foundation University Islamabad, Rawalpandi, Pakistan. [93]Social Determinants of Health Research Center, Birjand University of Medical Sciences, Birjand, Iran. [94]Department of Public Health, Birmingham City University, Birmingham, UK. [95]School of Nursing and Midwifery, Addis Ababa University, Addis Ababa, Ethiopia. [96]Independent Consultant, Windsor, MB, Canada. [97]School of Nursing and Midwifery, Babol University of Medical Sciences, Babol, Iran. [98]Babol University of Medical Sciences, Babol, Iran. [99]Department of Plastic Surgery, The University of Texas Health Science Center at Houston, Houston, TX, USA. [100]Preventive Medicine and Public Health Research Center, Iran University of Medical Sciences, Tehran, Iran. [101]Epilepsy Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. [102]Department of Neurology, Thomas Jefferson University, Philadelphia, PA, USA. [103]School of Public Health, Bahir Dar University, Bahir Dar, Ethiopia. [104]Department of Biostatistics and Epidemiology, Tabriz University of Medical Sciences, Tabriz, Iran. [105]Department of Biostatistics and Epidemiology, Zanjan University of Medical Sciences, Zanjan, Iran. [106]School of Public Health, Mekelle University, Mekelle, Ethiopia. [107]Department of Medical Laboratory Science, Haramaya University, Harar, Ethiopia. [108]Department of Biology, Maragheh University of Medical Sciences, Maragheh, Iran. [109]Department of Immunology, Zanjan University of Medical Sciences, Zanjan, Iran. [110]Faculty of Nursing, Philadelphia University, Amman, Jordan. [111]School of Business, University of Leicester, Leicester, UK. [112]Department of Nursing, Wolaita Sodo University, Wolaita Sodo, Ethiopia. [113]The Judith Lumley Centre, La Trobe University, Melbourne, VIC, Australia. [114]School of Public Health, Curtin University, Perth, WA, Australia. [115]Department of Health Policy Planning and Management, University of Health and Allied Sciences, Ho, Ghana. [116]Department of Nursing, Debre Berhan University, Debre Berhan, Ethiopia. [117]Department of Pharmacology and Toxicology, Mekelle University, Mekelle, Ethiopia. [118]Cellular and Molecular Biology Research Center, Babol University of Medical Sciences, Babol, Iran. [119]Department of Community Medicine, Manipal Academy of Higher Education, Mangalore, India. [120]Department of Public Health Medicine, University of KwaZulu-Natal, Durban, South Africa. [121]Department of Community Health and Primary Care, University of Lagos, Lagos, Nigeria. [122]Public Health Risk Sciences Division, Public Health Agency of Canada, Toronto, ON, Canada. [123]Department of Nutritional Sciences, University of Toronto, Toronto, ON, Canada. [124]Department of Forensic Science, Government Institute of Forensic Science, Nagpur, India. [125]Department of Healthcare Management and Education, Shiraz University of Medical Sciences, Shiraz, Iran. [126]Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi, India. [127]Department of Forensic Medicine and Toxicology, Manipal Academy of Higher Education, Manipal, India. [128]Department of Non-communicable Diseases, Bangladesh University of Health Sciences, Dhaka, Bangladesh. [129]Department of Epidemiology and Biostatistics, University of Gondar, Gondar, Ethiopia. [130]Department of Neurosciences, Costa Rican Department of Social Security, San Jose, Costa Rica. [131]School of Medicine, University of Costa Rica, San Pedro, Costa Rica. [132]School of Public Health and Community Medicine, Aden College, Aden, Yemen. [133]Center for Primary Care, Harvard University, Boston, MA, USA. [134]School of Public Health, Imperial College London, London, UK. [135]Health Human Resources Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. [136]Department of Public Health, Ambo University, Ambo, Ethiopia. [137]Department of Community Medicine, Gandhi Medical College Bhopal, Bhopal, India. [138]Jazan University, Jazan, Saudi Arabia. [139]Department of Public Health, Wollega University, Nekemte, Ethiopia. [140]School of the Environment, Yale University, New Haven, CT, USA. [141]Department of Internal Medicine, University of São Paulo, São Paulo, Brazil. [142]Department of Nutrition and Dietetics, Mekelle University, Mekelle, Ethiopia. [143]College of Medicine and Health Sciences, Adigrat University, Adigrat, Ethiopia. [144]Department of Biostatistics, Mekelle University, Mekelle, Ethiopia. [145]School of Public Health, University of Adelaide, Adelaide, SA, Australia. [146]Public Health Research Laboratory, Tribhuvan University, Kathmandu, Nepal. [147]Department of Anatomy, Government Medical College Pali, Pali, India. [148]Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences, Jodhpur, India. [149]School of Public Health, All India Institute of Medical Sciences, Jodhpur, India. [150]Department of Statistical and Computational Genomics, National Institute of Biomedical Genomics, Kalyani, India. [151]Department of Statistics, University of Calcutta, Kolkata, India. [152]Department of Global Health, Global Institute for Interdisciplinary Studies, Kathmandu, Nepal. [153]Centre for Global Child Health, University of Toronto, Toronto, ON, Canada. [154]Centre of Excellence in Women & Child Health, Aga Khan University, Karachi, Pakistan. [155]Social Determinants of Health Research Center, Babol University of Medical Sciences, Babol, Iran. [156]Mario Negri Institute for Pharmacological Research, Ranica, Italy. [157]Department of General Surgery and Medical-Surgical Specialties, University of Catania, Catania, Italy. [158]Department of Pediatrics and Child Health Nursing, Bahir Dar University, Bahir Dar, Ethiopia. [159]Transport and Road Safety (TARS) Research Centre, University of New South Wales, Sydney, NSW, Australia. [160]European & Developing Countries Clinical Trials Partnership, Cape Town, South Africa. [161]Department of Medicine, University of Cape Town, Cape Town, South Africa. [162]Department of Veterinary Medicine, Islamic Azad University, Kermanshah, Iran. [163]Department of Computer Science and Information Technology, Institute for Advanced Studies in Basic Sciences, Zanjan, Iran. [164]Department of Research and Innovation, Petanux Research GmBH, Bonn, Germany. [165]Department of Internal Medicine, Manipal Academy of Higher Education, Mangalore, India. [166]Department of Endocrinology, Hamadan University of Medical Sciences, Hamadan, Iran. [167]University of Genoa, Genoa, Italy. [168]Department of Epidemiology, University of Florida, Gainesville, FL, USA. [169]Cancer Population Sciences Program, University of Florida Health Cancer Center, Gainesville, FL, USA. [170]Department of Psychiatry, University of São Paulo, São Paulo, Brazil. [171]Department of Community Medicine, Employee State Insurance Post Graduate Institute of Medical Sciences and Research, Bangalore, India. [172]School of Public Health and Health Systems, University of Waterloo, Waterloo, ON, Canada. [173]Al Shifa School of Public Health, Al Shifa Trust Eye Hospital, Rawalpindi, Pakistan. [174]Institute of Microengineering, Federal Polytechnic School of Lausanne, Lausanne, Switzerland. [175]Internal Medicine Department, Italian Hospital of Buenos Aires (Hospital Italiano de Buenos Aires), Buenos Aires, Argentina. [176]Board of Directors, Argentine Society of Medicine, Buenos Aires, Argentina. [177]Centre for Population Health Sciences, Nanyang Technological University, Singapore, Singapore. [178]Department of Primary Care and Public Health, Imperial College London, London, UK. [179]Department of Health Care, Metropolitan Autonomous University, Mexico City, Mexico. [180]Research Unit on Applied Molecular Biosciences (UCIBIO), University of Porto, Porto, Portugal. [181]Colombian National Health Observatory, National Institute of Health, Bogota, Colombia. [182]Epidemiology and Public Health Evaluation Group, National University of Colombia, Bogota, Colombia. [183]Gorgas Memorial Institute for Health Studies, Panama City, Panama. [184]Infection and Global Health Research, University of St. Andrews, St. Andrews, UK. [185]Regional Infectious Diseases Unit, NHS National Services Scotland, Edinburgh, UK. [186]Institute of Public Health, University of Gondar, Gondar, Ethiopia. [187]School of Public Health, Haramaya University, Harar, Ethiopia. [188]Department of Pharmacology, All India Institute of Medical Sciences, Jodhpur, India. [189]Department of Microbiology & Infection Control, Medanta Medicity, Gurugram, India. [190]Department of Medicine, University of Toronto, Toronto, ON, Canada. [191]Research Department, D. Y. Patil University, Pune, India. [192]Heidelberg Institute of Global Health (HIGH), Heidelberg University, Heidelberg, Germany. [193]Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, VIC, Australia. [194]Melbourne Medical School, University of Melbourne, Parkville, VIC, Australia. [195]Maternal and Child Health Division, International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, Bangladesh. [196]Department of Epidemiology and Biostatistics, University of South Carolina, Columbia, SC, USA. [197]Department of Epidemiology, University of Gondar, Gondar, Ethiopia. [198]Department of Environmental Health and Occupational Health and Safety, University of Gondar, Gondar, Ethiopia. [199]Department of Human Physiology, University of Gondar, Gondar, Ethiopia. [200]Department of Community Medicine, Ahmadu Bello University,

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Burden of transport-related injuries in the eastern Mediterranean region: A systematic analysis for the global burden of disease study 2017

GBD 2017 EMR Transport Injuries Collaborators

Saeid Safiri
Tabriz University of Medical Sciences, Tabriz, Iran

Mark J M. Sullman
University of Nicosia, Nicosia, Cyprus

Timo Lajunen
Norwegian University of Science and Technology, Trondheim, Norway

Tetiana Hill
University of Hertfordshire, Hatfield, UK.

See next page for additional authors

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Burden of Transport-Related Injuries in the Eastern Mediterranean Region: A Systematic Analysis for the Global Burden of Disease Study 2017

GBD 2017 EMR Transport Injuries Collaborators, Saeid Safiri, PhD[1,2*]; Mark J. M. Sullman, PhD[3,4]; Timo Lajunen, PhD[5]; Tetiana Hill, PhD[6]; Amir Almasi-Hashiani, PhD[7]; Maziar Moradi-Lakeh, MD[8]; Farshad Farzadfar, MD[9]; Sadaf G. Sepanlou, MD[10,11]; Eman Abu-Gharbieh, PhD[12]; Teamur Aghamolaei, PhD[13]; Tauseef Ahmad, PhD[14]; Suliman A. Alghnam, PhD[15,16]; Samar Al-Hajj, PhD[17,18]; Vahid Alipour, PhD[19,20]; Syed Mohamed Aljunid, MD, PhD[21,22]; Mina Anjomshoa, PhD[23]; Alireza Ansari-Moghaddam, PhD[24]; Jalal Arabloo, PhD[19]; Mohsen Bayati, PhD[25]; Neeraj Bedi, MD[26,27]; Salaheddine Bendak, PhD[28,29]; Zulfiqar A Bhutta, PhD[30,31]; Ali Bijani, PhD[32]; Saad M A Dahlawi, PhD[33]; Mostafa Dianatinasab, MSc[34,35]; Zahra Sadat Dibaji Forooshani, PhD[36]; Hala Rashad Elhabashy, MD[37]; Amir Emami Zeydi, PhD[38]; Sharareh Eskandarieh, PhD[39]; Mansour Ghafourifard, PhD[40]; Ahmad Ghashghaee, BSc[19,41]; Michal Grivna, MD, PhD[42,43]; Mohammed Ibrahim Mohialdeen Gubari, PhD[44]; Randah R Hamadeh, PhD[45]; Samer Hamidi, DrPH[46]; Khezar Hayat, MSc[47,48]; Enayatollah Homaie Rad, PhD[49,50]; Mehdi Hosseinzadeh, PhD[51,52]; Mowafa Househ, PhD[53]; Seyed Sina Naghibi Irvani, MD[54]; Mohammad Ali Jahani, PhD[32]; Leila R Kalankesh, PhD[55]; Rohollah Kalhor, PhD[56,57]; Ibrahim Kamel, MD[58,59]; Mohammad Khammarnia, PhD[60]; Maseer Khan, MD[61]; Habibolah Khazaie, MD[62]; Hamidreza Komaki, MD[63,64]; Amitis Lahimchi, BDent[65]; Mohammed Madadin, MD[66]; Shokofeh Maleki, MSc[67]; Navid Manafi, MD[68,69]; Fariborz Mansour-Ghanaei, MD[70,71]; Mohammad Ali Mansournia, MD, PhD[72]; Ritesh G Menezes, MD[73]; Yousef Mohammad, MD[74]; Abdollah Mohammadian-Hafshejani, PhD[75]; Farnam Mohebi, MD[9,76]; Ghobad Moradi, MD, PhD[77,78]; Rahmatollah Moradzadeh, PhD[7]; Seyyed Meysam Mousavi, PhD[79]; Mehdi Naderi, PhD[67]; Rajan Nikbakhsh, MD[80]; Keyvan Pakshir, PhD[81]; Akram Pourshams, MD[10]; Navid Rabiee, MSc[82]; Alireza Rafiei, PhD[83 84]; Reza Rawassizadeh, PhD[85]; Aziz Rezapour, PhD[19]; Basema Saddik, PhD[86]; Sahar Saeedi Moghaddam, MSc[9]; Payman Salamati, MD[87]; Marwa Rashad Salem, MD[88]; Hosni Salem, MD[89]; Abdallah M Samy, PhD[90]; Brijesh Sathian, PhD[91 92]; Saeed Shahabi, PhD[93]; Masood Ali Shaikh, MD[94]; Mehran Shams-Beyranvand, MSc[95]; Morteza Shamsizadeh, MSc[96]; Mohammad Reza Sobhiyeh, MD[97]; Amin Soheili, PhD[98]; Arash Tehrani-Banihashemi, PhD[8,99]; Yasir Waheed, PhD[100]; Hasan Yusefzadeh, PhD[101]; Telma Zahirian Moghadam, PhD[102]; Leila Zaki, PhD[103]; Mohammad Zamani, MD[104]; Hamed Zandian, PhD[102,105]; Reza Malekzadeh, MD[10,11]; and Mohsen Naghavi, MD, PhD[106,107*]

[1]Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran
[2]Department of Community Medicine, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran
[3]Department of Social Sciences, University of Nicosia, Nicosia, Cyprus
[4]Department of Life and Health Sciences, University of Nicosia, Nicosia, Cyprus
[5]Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway
[6]Hertfordshire Business School, University of Hertfordshire, Hatfield, UK
[7]Department of Epidemiology, Arak University of Medical Sciences, Arak, Iran
[8]Preventive Medicine and Public Health Research Center, Iran University of Medical Sciences, Tehran, Iran
[9]Non-communicable Diseases Research Center, Tehran University of Medical Sciences, Tehran, Iran
[10]Digestive Diseases Research Institute, Tehran University of Medical Sciences, Tehran, Iran
[11]Non-communicable Disease Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
[12]Department of Clinical Sciences, University of Sharjah, Sharjah, United Arab Emirates
[13]Department of Health Education and Health Promotion, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
[14]Department of Epidemiology and Health Statistics, Southeast University, Nanjing, China
[15]Population Health Research Section, King Abdullah International Medical Research Center, Riyadh, Saudi Arabia
[16]King Abdullah International Medical Research Center, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia
[17]Faculty of Health Sciences, American University of Beirut, Beirut, Lebanon
[18]British Columbia Injury Research Prevention Unit, British Columbia Children's Hospital Research Institute, Vancouver, BC, Canada
[19]Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran
[20]Department of Health Economics, Iran University of Medical Sciences, Tehran, Iran
[21]Department of Health Policy and Management, Kuwait University, Kuwait City, Kuwait
[22]International Centre for Casemix and Clinical Coding, National University of Malaysia, Bandar Tun Razak, Malaysia
[23]Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran
[24]Department of Epidemiology and Biostatistics, Zahedan University of Medical Sciences, Zahedan, Iran
[25]Health Human Resources Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
[26]Department of Community Medicine, Gandhi Medical College Bhopal, Bhopal, India
[27]Jazan University, Jazan, Saudi Arabia

***Corresponding Author:** Saeid Safiri, PhD, Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran; Department of Community Medicine, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran. Tel: 0098-4133364673; Email: safiris@tbzmed.ac.ir
Mohsen Naghavi, MD, PhD; Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA, USA; Department of Health Metrics Sciences, School of Medicine, University of Washington, Seattle, WA, USA. Tel: 001- 2068972800; Emails: nagham@uw.edu

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Mapping inequalities in exclusive breastfeeding in low- and middle-income countries, 2000–2018

Natalia V. Bhattacharjee[1], Lauren E. Schaeffer[2,3], Simon I. Hay[1,4] ✉ and Local Burden of Disease Exclusive Breastfeeding Collaborators*

Exclusive breastfeeding (EBF)—giving infants only breast-milk for the first 6 months of life—is a component of optimal breastfeeding practices effective in preventing child morbidity and mortality. EBF practices are known to vary by population and comparable subnational estimates of prevalence and progress across low- and middle-income countries (LMICs) are required for planning policy and interventions. Here we present a geospatial analysis of EBF prevalence estimates from 2000 to 2018 across 94 LMICs mapped to policy-relevant administrative units (for example, districts), quantify subnational inequalities and their changes over time, and estimate probabilities of meeting the World Health Organization's Global Nutrition Target (WHO GNT) of ≥70% EBF prevalence by 2030. While six LMICs are projected to meet the WHO GNT of ≥70% EBF prevalence at a national scale, only three are predicted to meet the target in all their district-level units by 2030.

Exclusive breastfeeding (EBF)—giving infants only breast-milk (and medications, vitamins or oral rehydration solution (ORS) as needed) for the first 6 months of life—is effective in preventing deaths from diarrhoea, pneumonia and other leading causes of child mortality[1–4]. Breast-milk has been characterized as a 'personalized medicine' for infants[2] due to its nutritional properties, natural growth stimulators and tailored immune-protective properties, which collectively contribute to infant growth, development and survival[5–8]. Furthermore, evidence suggests long-term health benefits of breastfeeding, including reduced risks of cardiovascular diseases and increased benefits to human capital in adulthood[2,9,10]. The introduction of supplementary food and water during the first 6 months of life, particularly in settings lacking reliable access to clean water, can expose infants to infections from a range of pathogens[1,3]. Along with the initiation of breastfeeding within the first hour after birth and continued breastfeeding to 2 years, the World Health Organization (WHO) considers EBF to be an optimal breastfeeding practice[11] and included it as a proven protective intervention in the Global Action Plan for Pneumonia and Diarrhoea (GAPPD)[1]. Despite the benefits, the proportion of exclusively breastfed children remains low in many low- and middle-income countries (LMICs), where most child deaths attributed to suboptimal breastfeeding occur[12]. Accelerated uptake in EBF is required to successfully achieve the World Health Organization's Global Nutrition Target (WHO GNT) of at least 50% EBF prevalence by 2025[11] and the recently updated WHO GNT of at least 70% EBF prevalence by 2030[13].

This study is a part of a body of work mapping high-spatial-resolution estimates to track progress toward the WHO GNTs[14–17]. Building on our previous geospatial analysis of EBF prevalence in sub-Saharan Africa[14], we synthesized data from 349 geo-referenced household surveys from years 1998 to 2018 representing 302,435 infants under 6 months to produce annual 2000–2018 subnational estimates for the proportion and absolute number of exclusively breastfed infants for 94 LMICs. We used 14 geographically distinct modelling regions which were determined on the basis of epidemiological homogeneity and geographical contiguity by the Global Burden of Disease (GBD) study[18] (Supplementary Table 4 and Supplementary Fig. 7). We first mapped estimates on a 5 × 5-km grid to align with the resolution of many of the covariates used in this study and then aggregated to more policy-relevant second- and first-administrative-level units for each country in our analysis. Here we provide mapped annual estimates of EBF prevalence and trends at policy-relevant administrative and national levels from 2000 to 2018, as well as the estimated number of infants not receiving EBF. On the basis of trends in the most recent years, we project these estimates to the years 2025 and 2030, and determine the probability of meeting the WHO GNTs of ≥50% and ≥70% EBF prevalence in the respective target years. Furthermore, we examine relative and absolute subnational inequalities of EBF prevalence within LMICs and compare areas with low EBF prevalence to areas with high disease burden and low coverage of mitigating interventions. The full array of our model outputs—at various spatial levels and aggregations—is available through an online visualization tool (https://vizhub.healthdata.org/lbd/ebf), with additional results in the Supplementary Information.

Results

Regional, national and subnational trends in EBF prevalence. EBF prevalence varied widely between and within LMICs from 2000 to 2018 (Fig. 1a,b). General increases in mean EBF prevalence occurred across LMICs over the study period, from 28.6% (95% uncertainty interval: 22.9–35.4%) in 2000 to 38.7% (28.3–49.9%) in 2018. Regionally, most LMICs in Andean South America, South Asia and East Asia had relatively high EBF levels throughout the study period; for example, Peru (63.6% (60.9–66.4%) in 2000; 69.2% (57.6–79.1%) in 2018), Nepal (64.2% (49.1–76.9%) in 2000; 64.5% (53.6–74.3%) in 2018) and Mongolia (51.9% (49.3–54.4%) in 2000; 55.1% (52.1–58.1%) in 2018) all maintained high national EBF prevalence. Several countries in other regions maintained low EBF prevalence throughout the study, including the Dominican Republic (13.2% (9.7–17.8%) in 2000; 8.2% (4.7–14.3%) in 2018),

[1]Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA, USA. [2]Medical Teams International, Seattle, WA, USA. [3]Department of Pediatric Newborn Medicine, Brigham and Women's Hospital, Boston, MA, USA. [4]Department of Nursing, Adigrat University, Adigrat, Ethiopia. *A list of authors and their affiliations appears at the end of the paper. ✉e-mail: sihay@uw.edu

Abdur Razzaque Sarker[419], Benn Sartorius[126,420,421], Brijesh Sathian[422,423], Deepak Saxena[378,424], Alyssa N. Sbarra[1], Debarka Sengupta[425], Subramanian Senthilkumaran[426], Feng Sha[427], Omid Shafaat[428,429], Amira A. Shaheen[430], Masood Ali Shaikh[431], Ali S. Shalash[432], Mohammed Shannawaz[433], Aziz Sheikh[434,435], B. Suresh Kumar Shetty[393], Ranjitha S. Shetty[436], Kenji Shibuya[437], Wondimeneh Shibabaw Shiferaw[61], Jae Il Shin[438], Diego Augusto Santos Silva[439], Narinder Pal Singh[440], Pushpendra Singh[441], Surya Singh[442], Yitagesu Sintayehu[443], Valentin Yurievich Skryabin[444], Anna Aleksandrovna Skryabina[445], Amin Soheili[446], Shahin Soltani[233], Muluken Bekele Sorrie[183], Emma Elizabeth Spurlock[1], Krista M. Steuben[1], Agus Sudaryanto[447], Mu'awiyyah Babale Sufiyan[448], Scott J. Swartz[449,450], Eyayou Girma Tadesse[451], Animut Tagele Tamiru[241], Leili Tapak[231,452], Md. Ismail Tareque[453], Ingan Ukur Tarigan[454], Getayeneh Antehunegn Tesema[455], Fisaha Haile Tesfay[456,457], Abinet Teshome[451], Zemenu Tadesse Tessema[458], Kavumpurathu Raman Thankappan[459], Rekha Thapar[220], Nihal Thomas[460], Roman Topor-Madry[461,462], Marcos Roberto Tovani-Palone[463,464], Eugenio Traini[465], Bach Xuan Tran[466], Phuong N. Truong[467], Berhan Tsegaye B. T. Tsegaye[236], Irfan Ullah[468], Chukwuma David Umeokonkwo[469], Bhaskaran Unnikrishnan[470], Era Upadhyay[471], Benjamin S. Chudi Uzochukwu[472], John David VanderHeide[473], Francesco S. Violante[474,475], Bay Vo[476], Yohannes Dibaba Wado[477], Yasir Waheed[478], Richard G. Wamai[479,480], Fang Wang[481], Yafeng Wang[482], Yuan-Pang Wang[102], Nuwan Darshana Wickramasinghe[483], Kirsten E. Wiens[484], Charles Shey Wiysonge[219,341], Lauren Woyczynski[1], Ai-Min Wu[485], Chenkai Wu[486,487], Tomohide Yamada[488], Sanni Yaya[489,490], Alex Yeshaneh[491], Yigizie Yeshaw[458], Yordanos Gizachew Yeshitila[299], Mekdes Tigistu Yilma[492], Paul Yip[493,494], Naohiro Yonemoto[495,496], Tewodros Yosef[339], Mustafa Z. Younis[497,498], Abdilahi Yousuf Yousuf[349], Chuanhua Yu[482], Yong Yu[499], Deniz Yuce[500], Shamsa Zafar[501,502], Syed Saoud Zaidi[503], Leila Zaki[504], Josefina Zakzuk[505], Maryam Zamanian[315], Heather J. Zar[506,507], Mikhail Sergeevich Zastrozhin[508,509], Anasthasia Zastrozhina[510], Desalege Amare Zelellw[511], Yunquan Zhang[512,513], Zhi-Jiang Zhang[514], Xiu-Ju George Zhao[481,515], Sanjay Zodpey[516], Yves Miel H. Zuniga[517,518] and Simon I. Hay[1,126]

[5]Department of Neurology, Cairo University, Cairo, Egypt. [6]Department of Public Health, Arba Minch University, Arba Minch, Ethiopia. [7]Debre Markos University, Debre Markos, Ethiopia. [8]Department of Public Health, Debre Berhan University, Debre Brehan, Ethiopia. [9]Department of Pediatric Dentistry, Federal University of Minas Gerais, Belo Horizonte, Brazil. [10]Department of Research, Philippine Institute for Development Studies, Quezon City, Philippines. [11]Department of Clinical Sciences, University of Sharjah, Sharjah, United Arab Emirates. [12]Harvard Medical School, Harvard University, Boston, MA, USA. [13]Department of Medicine, Ain Shams University, Cairo, Egypt. [14]Community Medicine Department, Bayero University Kano, Kano, Nigeria. [15]Infectious Diseases Epidemiology, London School of Hygiene & Tropical Medicine, London, UK. [16]Department of Sociology, Olabisi Onabanjo University, Ago-Iwoye, Nigeria. [17]School of Medicine, Griffith University, Gold coast, QLD, Australia. [18]Population Health Sciences, King's College London, London, England. [19]Centre of Excellence for Epidemiological Modelling and Analysis, Stellenbosch University, Stellenbosch, South Africa. [20]Department of Global Health, Stellenbosch University, Cape Town, South Africa. [21]Center for Policy, Population & Health Research, National Autonomous University of Mexico, Mexico City, Mexico. [22]Faculty of Medicine and Public Health, Jenderal Soedirman University, Purwokerto, Indonesia. [23]Department of Health Policy and Management, University of Ibadan, Ibadan, Nigeria. [24]Department of Health Policy and Management, University College Hospital, Ibadan, Ibadan, Nigeria. [25]Department of Human Nutrition and Food Sciences, Debre Markos University, Debre Markos, Ethiopia. [26]Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia. [27]Health Information Management and Technology Department, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia. [28]Center for Health System Research, National Institute of Public Health, Cuernavaca, Mexico. [29]College of Medicine and Health Science, Arba Minch University, Arba Minch, Ethiopia. [30]Department of Midwifery, Arba Minch University, Injbara, Ethiopia. [31]Institute of Health Research, University of Health and Allied Sciences, Ho, Ghana. [32]Erbil Technical Health College, Erbil Polytechnic University, Erbil, Iraq. [33]School of Pharmacy, Tishk International University, Erbil, Iraq. [34]Department of Information Systems, College of Economics and Political Science, Sultan Qaboos University, Muscat, Oman. [35]Department of Health Care Management and Economics, Urmia University of Medical Science, Urmia, Iran. [36]Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran. [37]Health Economics Department, Iran University of Medical Sciences, Tehran, Iran. [38]School of Medicine and Public Health, Ateneo De Manila University, Manila, Philippines. [39]College of Medicine, University of the Philippines Manila, Manila, Philippines. [40]Maternal and Child Wellbeing, African Population and Health Research Center, Nairobi, Kenya. [41]Department of Public Health, Samara University, Samara, Ethiopia. [42]Pharmacy Department, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania. [43]Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [44]Research Center for Evidence Based Medicine, Tabriz University of Medical Sciences, Tabriz, Iran. [45]Razi Vaccine and Serum Research Institute, Agricultural Research, Education, and Extension Organization (AREEO), Tehran, Iran. [46]Department of Health Policy and Administration, University of the Philippines Manila, Manila, Philippines. [47]Department of Applied Social Sciences, Hong Kong Polytechnic University, Hong Kong, China. [48]Department of Parasitology, Mazandaran University of Medical Sciences,

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Prevalence of dyslipidemia and its association with opium consumption in the Rafsanjan cohort study

Zahra Jamali[1], Mojgan Noroozi Karimabad[2], Parvin Khalili[3], Tabandeh Sadeghi[4], Ahmadreza Sayadi[5], Faegheh Mohammadakbari Rostamabadi[1], Carlo La Vecchia[6] & Ali Esmaeili-Nadimi[1]✉

The potential effects of opium consumption on lipid profile remain unquantified. We considered the association between opium use and dyslipidemia. In this cross-sectional study, we used data obtained from the Rafsanjan cohort study, as a part of the prospective epidemiological research studies in IrAN (PERSIAN) with detailed and validated data on opium consumption and selected other exposures. A total of 9932 adults were included in the study. Logistic regression models were used to assess the relationships of opium consumption with the prevalence of dyslipidemia and lipid disorders. In this population, 73.33% had dyslipidemia and the prevalence rates of high TC, high TG, high LDL and low HDL were 54.24%, 47.45%, 34.43% and 11.91% respectively. After adjustment for all confounders, opium users compared with non-users had lower odds ratios (OR) of high TC and high LDL [0.81 (95% confidence interval, CI 0.71–0.92) and 0.80 (95% CI 0.69–0.93) respectively] and greater OR of low HDL [1.30 (95% CI 1.04–1.62)]. Longer duration of opium consumption resulted in lower ORs of high TC, 0.68 (95% CI 0.55–0.84) and high LDL, 0.82 (95% CI 0.67–0.99), and shorter duration of opium consumption resulted in increased odds of low HDL, 1.30 (95% CI 1.02–1.66). High dose of opium consumption was associated with an OR of dyslipidemia of 0.80 (95% CI 0.65–0.97), high TC of 0.80 (95% CI 0.67–0.95), and high LDL of 0.78 (95% CI 0.64–0.96) and low dose of opium consumption, with an OR of low HDL of 1.30 (95% CI 1.02–1.65). In relation to route of consumption, opium smoking was a risk factor for low HDL with an adjusted odds ratio of 1.31 (1.04–1.63). Opium use was associated with selected changes on serum lipid levels, but opium users had higher frequency of cardiovascular disease history.

Cardiovascular disease (CVD) is one of the major causes of death worldwide, and its prevalence is increasing because the major risk factors of CVD such as hypertension, diabetes, obesity, and dyslipidemia are rising[1,2]. A total of 40–45% of deaths is attributed to CVD[3]. Atherosclerosis is the main cause of CVD and dyslipidemia is one of the important modifiable risk factors[4]. Proper controlling of lipid levels can reduce the risk of CVD[5]. Successfully management of dyslipidemia risk factors are important in attaining this goal[6].

Opium is traditionally used in many South and central Asian countries, including Iran. Iran is one of the most important markets for opium due to the easy access to this substance[7] and disbelief about its role on diabetes mellitus, insulin resistance, and lipid profile disturbances[8]. A previous study reported that Kerman an eastern province of Iran, had the highest opium usage in this country[9]. Opium is likely to alter the blood lipid levels[10–12]. There are many controversies about opium effects on lipid profile and risk of CVD. Previous reports show that

[1]Non-Communicable Diseases Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [2]Molecular Medicine Research Center, Research Institute of Basic Medical Sciences, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [3]Department of Epidemiology, School of Public Health, Social Determinants of Health Research Centre, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [4]Department of Pediatric Nursing, School of Nursing and Midwifery, Non-Communicable Diseases Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [5]Department of Psychiatric Nursing, School of Nursing and Midwifery, Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [6]Department of Clinical Sciences and Community Health, Università Degli Studi Di Milano, 20133 Milan, Italy. ✉email: dr_esmaeili_n@yahoo.com

vaccines

Review

The Effect of Long COVID-19 Infection and Vaccination on Male Fertility; A Narrative Review

Soheila Pourmasumi [1,2], Alireza Nazari [1,3], Zahra Ahmadi [4], Sophia N. Kouni [5], Cesare de Gregorio [6], Ioanna Koniari [7], Periklis Dousdampanis [8], Virginia Mplani [9], Panagiotis Plotas [10], Stelios Assimakopoulos [11], Christos Gogos [12], Georgios Aidonisdis [13], Pavlos Roditis [14], Nikos Matsas [15], Dimitrios Velissaris [16], Gianfranco Calogiuri [17,18], Ming-Yow Hung [19,20,21], Servet Altay [22] and Nicholas G. Kounis [23,*]

1 Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan 7717933777, Iran
2 Clinical Research Development Unit, Ali-Ibn Abi-Talib Hospital, Rafsanjan University of Medical Sciences, Rafsanjan 7717933777, Iran
3 Department of Surgery, School of Medicine, Rafsanjan University of Medical Sciences, Rafsanjan 7717933777, Iran
4 Pistachio Safety Research Center, Rafsanjan University of Medical Sciences, Rafsanjan 7717933777, Iran
5 Speech Therapy Practice, 26221 Patras, Greece
6 Department of Clinical and Experimental Medicine, University of Messina Medical School, 98122 Messina, Italy
7 Department of Internal Medicine, Division of Cardiology, University Hospital of South Manchester NHS Foundation Trust, Manchester M23 9LT, UK
8 Department of Nephrology, Saint Andrews State General Hospital, 26221 Patras, Greece
9 Intensive Care Unit, Patras University Hospital, 26500 Patras, Greece
10 Department of Speech Therapy, University of Patras, 26500 Patras, Greece
11 Department of Internal Medicine, Division of Infectious Diseases, University of Patras Medical School, 26500 Patras, Greece
12 COVID-19 Unit, Papageorgiou General Hospital, 56403 Thessaloniki, Greece
13 Interbalkan Medical Center, 57001 Thessaloniki, Greece
14 Department of Cardiology, Mamatsio Kozanis General Hospital, 50100 Kozani, Greece
15 Cardiology Private Practice, 30131 Agrinion, Greece
16 Department of Internal Medicine, University of Patras, 26500 Patras, Greece
17 Pneumonology Department, Civil Hospital "Ninetto Melli", Pietro Vernoti, 72027 Brindisi, Italy
18 Department of Internal Medicine, Immunology and Infectious Diseases, Section of Allergology and Clinical Immunology, University of Bari Medical School, 70121 Bari, Italy
19 Division of Cardiology, Department of Internal Medicine, Shuang Ho Hospital, Taipei Medical University, New Taipei City 23561, Taiwan
20 Division of Cardiology, Department of Internal Medicine, School of Medicine, College of Medicine, Taipei Medical University, Taipei 110, Taiwan
21 Taipei Heart Institute, Taipei Medical University, Taipei 110, Taiwan
22 Department of Cardiology, Faculty of Medicine Trakya University, Edirne 22030, Turkey
23 Department of Internal Medicine, Division of Cardiology, University of Patras Medical School, 26500 Patras, Greece
* Correspondence: ngkounis@otenet.gr

Abstract: Earlier research has suggested that the male reproductive system could be particularly vulnerable to SARS-CoV-2 (COVID-19) infection, and infections involving this novel disease not only pose serious health threats but could also cause male infertility. Data from multi-organ research during the recent outbreak indicate that male infertility might not be diagnosed as a possible consequence of COVID-19 infection. Several review papers have summarized the etiology factors on male fertility, but to date no review paper has been published defining the effect of COVID-19 infection on male fertility. Therefore, the aim of this study is to review the published scientific evidence regarding male fertility potential, the risk of infertility during the COVID-19 pandemic, and the impact of COVID-19 vaccination on the male reproductive system. The effects of COVID-19 infection and the subsequent vaccination on seminal fluid, sperm count, sperm motility, sperm morphology, sperm viability, testes and sex hormones are particularly reviewed.

Keywords: infertility; COVID-19; sperm; SARS; vaccine

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Nurses' clinical competency and its correlates: before and during the COVID-19 outbreak

Tian Hui[1], Mohammad Ali Zakeri[2,3], Yaser Soltanmoradi[4], Neda Rahimi[5], Sayed Mortaza Hossini Rafsanjanipoor[2], Majid Nouroozi[6] and Mahlagha Dehghan[7,8*]

Abstract

Background Clinical competency is the ability to integrate knowledge, skills, attitudes and values into a clinical situation and it is very important in nursing education, clinical settings, nursing management, and crises. This study aimed to investigate nurses' professional competence and its correlates before and during the COVID-19 pandemic.

Methods We conducted this cross-sectional study before and during the COVID-19 outbreak and recruited all nurses working in hospitals affiliated to Rafsanjan University of Medical Sciences, southern Iran, so we included 260 and 246 nurses in the study before and during the COVID-19 epidemic, respectively. Competency Inventory for Registered Nurses (CIRN) was used to collect data. After inputting the data into SPSS24, we analysed them using descriptive statistics, chi-square and multivariate logistic tests. A significant level of 0.05 was considered.

Results The mean clinical competency scores of nurses were 156.97 ± 31.40 and 161.97 ± 31.36 before and during the COVID-19 epidemic, respectively. The total clinical competency score before the COVID-19 epidemic was not significantly different from that during the COVID-19 epidemic. Interpersonal relationships ($p = 0.03$) and desire for research/critical thinking ($p = 0.01$) were significantly lower before the COVID-19 outbreak than during the COVID-19 outbreak. Only shift type had an association with clinical competency before the COVID-19 outbreak, while work experience had an association with clinical competency during the COVID-19 epidemic.

Conclusion The clinical competency among nurses was moderate before and during the COVID-19 epidemic. Paying attention to the clinical competence of nurses can improve the care conditions of patients, and nursing managers should improve the clinical competence of nurses in different situations and crises. Therefore, we suggest further studies identifying factors improving the professional competency among nurses.

Keywords Study, Nursing, COVID-19, Professional competence

*Correspondence:
Mahlagha Dehghan
m_dehghan86@yahoo.com; m_dehghan@kmu.ac.ir
Full list of author information is available at the end of the article

on their positions, type of hospital, type of management governing their workplaces and the wards where they are working.

The study results showed an association between shift type and clinical competence before the COVID-19 outbreak, as well as between work experience and clinical competence during the COVID-19 outbreak. Keshavarzi et al. (2021) demonstrated that the type of shift work had a significant relationship with nurses' overall clinical skills in neonatal intensive care units [50] (36). Arshadi Bostanabad et al. (2022) found a positive and significant relationship between the clinical competence and work experience of the nurses working in the intensive care unit who cared for patients with COVID-19 [51]. Faraji et al. (2019) also indicated a significant relationship between work experience and clinical competence [40]. Manoochehri et al. (2015) studied the clinical competence among nurses working in the hospitals affiliated to Hormozgan University of Medical Sciences in southern Iran and reported that experienced nurses were more clinically competent than novice nurses [52]. Liou et al. (2013) revealed that work experience increased clinical competence [53]; Istomina et al. (2011) believed that nurses' experience and training led to their professional developments, strengthened their learning, and increased their skills [54]. Blomberg et al. (2019) demonstrated that work experience insured development of clinical competency [55]. When allocating patients with sensitive conditions in different wards, including COVID-19, nurse managers must remember that nurses with more work experiences will be more clinically competent.

However, Bahreini et al. (2011) reported no significant relationship between work experience and clinical competence [56]. As studies on the COVID-19 are limited, further studies are necessary to determine the correlation between work experience and clinical competence during the COVID-19 outbreak. Qualitative studies with the aim of discovering the roots of unexpected results can be useful.

Limitations

This study had some limitations: we studied nurses living in a city in southeastern Iran, so the generalization of the results to other societies should be done with caution due to the cultural and social differences. Another limitation was the economic, social and cultural conditions of the participants, which were beyond our control. In the review of the literature, it was found that no study was found to examine the clinical qualifications of nurses during and before the COVID-19 outbreak, so caution should be taken in interpreting the results.

Conclusion

According to the study results, work experience can be one of the factors influencing the clinical competence among nurses. Nursing as a clinical discipline is developing and nurses are key members in various settings. Nurses must maintain their professional competences and evaluate and prioritize their clinical competence indicators to improve the healthcare system. Evaluation of clinical competence is particularly important in critical situations, which can improve patients' condition. Therefore, we suggest policymakers and nurse managers recognizing and increasing nurses' clinical competences, particularly in critical situations so that they can provide more correct and effective care to the patients. Future studies should focus on the recognition of factors and critical conditions affecting the clinical competence of nurses.

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Authors' contributions

M.A.Z., M.D., and N.R. contributed to the study design. M.A.Z., M.D., and T.H. provided critical feedback on the study and statistical analysis, and inputted to the draft of this manuscript. Y.S., S.M.H.R., and M.N. collected data. All authors have read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

All study protocols were approved by Ethical Committee of Rafsanjan University of Medical Sciences (IR.RUMS.REC.1397.213 and IR.RUMS.REC.1399.262). Nurses were given the necessary explanations about the study goals and importance, compliance with ethical requirements, voluntary participation and information confidentiality. After giving the necessary explanations, we received informed consent from the study participants, who then completed the questionnaires. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Affiliated Hospital of Jiangnan University, Wuxi 214122, China. [2]Social Determinants of Health Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [3]Non-Communicable Diseases Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [4]Faculty Member, School of Paramedicine, Department of Operating Room Technology, Rafsanjan University Medical of Sciences, Rafsanjan, Iran. [5]Department of Surgical Nursing, Nursing and Midwifery School, Rafsanjan University of Medical, Rafsanjan, Iran. [6]Clinical Research Development Unit, Ali-Ibn Abi-Talib Hospital, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [7]Nursing Research Centre, Kerman