JAMA Oncology | Original Investigation

The Global, Regional, and National Burden of Adult Lip, Oral, and Pharyngeal Cancer in 204 Countries and Territories
A Systematic Analysis for the Global Burden of Disease Study 2019

GBD 2019 Lip, Oral, and Pharyngeal Cancer Collaborators

Supplemental content

IMPORTANCE Lip, oral, and pharyngeal cancers are important contributors to cancer burden worldwide, and a comprehensive evaluation of their burden globally, regionally, and nationally is crucial for effective policy planning.

OBJECTIVE To analyze the total and risk-attributable burden of lip and oral cavity cancer (LOC) and other pharyngeal cancer (OPC) for 204 countries and territories and by Socio-demographic Index (SDI) using 2019 Global Burden of Diseases, Injuries, and Risk Factors (GBD) Study estimates.

EVIDENCE REVIEW The incidence, mortality, and disability-adjusted life years (DALYs) due to LOC and OPC from 1990 to 2019 were estimated using GBD 2019 methods. The GBD 2019 comparative risk assessment framework was used to estimate the proportion of deaths and DALYs for LOC and OPC attributable to smoking, tobacco, and alcohol consumption in 2019.

FINDINGS In 2019, 370 000 (95% uncertainty interval [UI], 338 000-401 000) cases and 199 000 (95% UI, 181 000-217 000) deaths for LOC and 167 000 (95% UI, 153 000-180 000) cases and 114 000 (95% UI, 103 000-126 000) deaths for OPC were estimated to occur globally, contributing 5.5 million (95% UI, 5.0-6.0 million) and 3.2 million (95% UI, 2.9-3.6 million) DALYs, respectively. From 1990 to 2019, low-middle and low SDI regions consistently showed the highest age-standardized mortality rates due to LOC and OPC, while the high SDI strata exhibited age-standardized incidence rates decreasing for LOC and increasing for OPC. Globally in 2019, smoking had the greatest contribution to risk-attributable OPC deaths for both sexes (55.8% [95% UI, 49.2%-62.0%] of all OPC deaths in male individuals and 17.4% [95% UI, 13.8%-21.2%] of all OPC deaths in female individuals). Smoking and alcohol both contributed to substantial LOC deaths globally among male individuals (42.3% [95% UI, 35.2%-48.6%] and 40.2% [95% UI, 33.3%-46.8%] of all risk-attributable cancer deaths, respectively), while chewing tobacco contributed to the greatest attributable LOC deaths among female individuals (27.6% [95% UI, 21.5%-33.8%]), driven by high risk-attributable burden in South and Southeast Asia.

CONCLUSIONS AND RELEVANCE In this systematic analysis, disparities in LOC and OPC burden existed across the SDI spectrum, and a considerable percentage of burden was attributable to tobacco and alcohol use. These estimates can contribute to an understanding of the distribution and disparities in LOC and OPC burden globally and support cancer control planning efforts.

JAMA Oncol. 2023;9(10):1401-1416. doi:10.1001/jamaoncol.2023.2960
Published online September 7, 2023.

Group Information: The GBD 2019 Lip, Oral, and Pharyngeal Cancer Collaborators appear at the end of the article.

Corresponding Author: Amanda Ramos da Cunha, PhD, School of Public Health, University of São Paulo, 715 Doutor Arnaldo Ave, São Paulo-SP 01246904, Brazil (amandaracunha@usp.br).

In 2019, it was estimated that 10 million people died due to cancer worldwide.[1] While a relatively small percentage of global cancer deaths were caused by lip, oral cavity, and pharyngeal cancers (3.2%), there is broad variation in survival around the world,[2] and those who survive may have substantial reductions in their quality of life.[1,3] Reasons for differences in outcomes are multifactorial but likely include differences in access to early-stage detection and effective therapies, as well as potential differences in risk factor exposure patterns.[1] Established risk factors for oral and pharyngeal cancers are tobacco, alcohol, and betel quid consumption,[4,5] all of which increase cancer risk in a dose- and time-dependent fashion.[6,7] Infection with human papillomavirus (HPV) is also a known risk factor—established for oral cavity, tonsil, and oropharynx cancers[4,5]—which is especially relevant in certain geographic areas of the world.[8,9]

Monitoring the magnitude of cancer burden, as well as the demographic, spatial, and temporal variations in cancer burden, is necessary for tailoring health planning and setting priorities for future clinical care and research.[10,11] Policymakers require locally relevant information on the burden of different cancers to assess the effect of cancer control programs, benchmark progress, and allocate resources in their health care systems, but some countries do not have cancer surveillance systems in place. Global cancer estimation frameworks, including the Global Burden of Diseases, Injuries, and Risk Factors (GBD) Study from the Institute for Health Metrics and Evaluation and the GLOBOCAN study from the International Agency for Research on Cancer provide estimates of cancer burden where data are scarce or do not exist. Prior studies have reported on the global incidence and mortality estimates of oral and pharyngeal cancers from previous iterations of the GBD study[12,13] and GLOBOCAN.[14] However, to our knowledge, there has not been a publication from the GBD Collaborator Network on these 2 cancer types, and the existing analyses do not provide a comprehensive global overview of their burden over time nor quantify the role of risk factors on their global distribution. Understanding the distribution of these 2 types of cancer worldwide and their associated risk factors is particularly relevant at present, given the adoption of an oral health resolution at the World Health Organization (WHO) 2021 World Health Assembly that includes oral cavity cancers and calls for prevention strategies among other actions.[15]

This systematic analysis aimed to analyze the incidence, mortality, and disability-adjusted life years (DALYs) of lip and oral cavity cancer (LOC) and other pharyngeal cancer (OPC; ie, pharyngeal other than nasopharyngeal) globally, regionally, nationally, and by Socio-demographic Index (SDI) from 1990 to 2019, as well as to assess the burden of these cancers attributable to tobacco and alcohol use in 2019 by using estimates from the GBD 2019 study.

Key Points

Question What was the burden of lip and oral cavity cancer (LOC) and other pharyngeal cancer (OPC) globally, regionally, and across Socio-demographic Index (SDI) strata between 1990 and 2019?

Findings In this systematic analysis of estimates from the Global Burden of Diseases, Injuries, and Risk Factors Study 2019, the global age-standardized mortality rate due to LOC and OPC in 2019 was 3.8 and 2.2 deaths per 100 000, respectively, and the age-standardized incidence rate was 7.1 and 3.2 new cases per 100 000, respectively. Low-middle and low SDI regions consistently showed the highest age-standardized mortality rates from 1990 to 2019.

Meanings Tackling the inequities across SDI strata should be a priority to global LOC and OPC control efforts.

Methods

Overview

The estimates that are presented in this report originated from the GBD 2019 study.[1,10] With each new edition of the GBD, data are updated and new methods are used; thus, estimates for the entire time series supplant previously reported GBD round estimates. In this section, we provide information on the key methodological steps for the estimates reported in this study. More detailed descriptions of the methods are available in the eMethods in Supplement 1 and in the literature produced by the GBD 2019 study.[10,16]

The University of Washington Institutional Review Board committee approved the GBD 2019 study. Informed consent was waived because of the use of deidentified data. The GBD complies with the Guidelines for Accurate and Transparent Health Estimates Report (GATHER) statement.[17] This article was produced through the GBD Collaborator Network and in accordance with the GBD Protocol.[18]

Definitions

All estimates are reported for adults, defined in this study as 20 years and older. The estimates are presented by sex, 5-year age groups (20-24, 25-29, 30-34, ... ≥95 years), globally, and by region for the years 1990 to 2019. The estimates by region are based on 3 geographic classifications: GBD super-regions (7 total), GBD world regions (21 total), and countries or territories (204 total) (eFigures 3-5 and eTable 7 in Supplement 1).[10] The countries were also classified by SDI quintiles for presentation of select results (eTable 7 in Supplement 1). All rates are presented for every 100 000 people per year, and age-standardized rates use the GBD world population standard (eMethods in Supplement 1). All estimates are reported with 95% uncertainty intervals (UIs), which are created from the 25th and 975th values of 1000 draws and propagated through each estimation step. Lip and oral cavity cancer includes *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* (*ICD-10*) codes C00 to C08, and OPC includes *ICD-10* codes C09 to C10 and C12 to C13. More detailed mapping of *International Classification of Diseases, Ninth Revision (ICD-9)* and *ICD-10* codes to the GBD cancer causes LOC and OPC are summarized in eTable 1 in Supplement 1.

The present analysis uses the term *other pharyngeal cancer* (synonymous with *other pharynx cancer* in the GBD 2019 study and throughout Supplement 1) because nasopharyngeal cancer is separately estimated. Nasopharyngeal cancer is not included in this publication because it differs epidemiologically from cancers that occur in other pharyngeal sites, and we use the term OPC to be consistent with publicly available GBD results and visualizations.

Mortality Estimates

The GBD cancer estimation process begins with mortality (eFigure 1 in Supplement 1). The sources of these data were vital registration systems, cancer registries, and verbal autopsies. The data reported were mapped to a list of underlying causes (cancer types) in the GBD causes of death hierarchy (eTable 1 in Supplement 1).[1,10] Uninformative cause of death codes (the "garbage codes"[19]) were redistributed among appropriate underlying causes of death.[1,10] Mortality data were not captured by vital registries in some countries where cancer incidence data were available. To expand data availability informing mortality models, incidence data were transformed into mortality estimates using modeled mortality-to-incidence ratios (MIRs). The MIR modeling process used cancer registry data from locations where incidence and mortality of the same year were available. This model includes a linear-step mixed-effects model with logit link functions, with age, sex, and the Healthcare Access and Quality Index as covariates. The results of this step were smoothed over space and time and adjusted through a spatiotemporal Gaussian process regression.[1,10] Death data and estimates were included in cancer cause and sex-specific Cause of Death Ensemble models (eMethods and eTables 2-4 in Supplement 1).[20] Finally, cancer mortality estimates were adjusted to independently modeled all-cause mortality.[10]

Incidence and DALYs Estimates

Incidence estimates were obtained by dividing the final mortality estimates by their corresponding MIRs (eFigure 2 in Supplement 1). The 10-year prevalence estimate was derived from the estimated incidence and the survival modeled using MIRs.[10] Years lived with disability were estimated by separating 10-year cancer prevalence into 4 sequelae with associated disability weights (eTables 5 and 6 in Supplement 1). Disability weights range from 0 to 1 and represent the magnitude of health loss (0, no health loss; 1, health loss equivalent to death). Years lived with disability were obtained by multiplying each sequela duration by the corresponding disability weight. Finally, years of life lost were estimated by multiplying the difference between the standard GBD life expectancy at the age of death and the estimated number of deaths at that age. Years lived with disability and years of life lost were summed by cause, sex, age group, location, and year to result in DALYs.[10]

Socio-demographic Index

The SDI incorporates 3 aspects of development: (1) total fertility rate for female individuals younger than 25 years, (2) mean education for those 15 years and older, and (3) lag-distributed income per capita.[10] The eMethods in Supplement 1 present further SDI details as well as which countries make up each SDI quintile (eTable 7 in Supplement 1).

Risk Factors: Population Attributable Fraction Estimation

The GBD 2019 comparative risk assessment framework was used to estimate the proportion of deaths and DALYs for LOC and OPC in 2019 attributable to the risk factors estimated. The risk assessment used in the framework was the attributable burden, which means the discount in the current disease burden that would have been possible if past population risk exposure had changed to an alternative or counterfactual distribution of exposure. Theoretical minimum risk exposure level was the alternative distribution used in the model, which represents the level of risk exposure that minimizes risk at the population level or the level of risk that captures the maximum attributable burden. This study presents the proportion of mortality and DALYs due to LOC attributable to smoking, chewing tobacco, and alcohol consumption, as well as the proportion of mortality and DALYs due to OPC attributable to smoking and alcohol consumption; the estimates considered the population aged 20 years and older. These risk factors were chosen based on the risk-outcome pairs that the GBD 2019 study assessed as meeting the World Cancer Research Fund grades of convincing or probable evidence. The theoretical minimum risk exposure level for smoking and chewing tobacco was that all individuals were lifelong nonusers and for alcohol use was an estimated distribution of 0 to 10 g per day. Detailed methodology for risk factor estimation can be found in the eMethods in Supplement 1 and the GBD 2019 risk factors capstone publication.[16]

Results

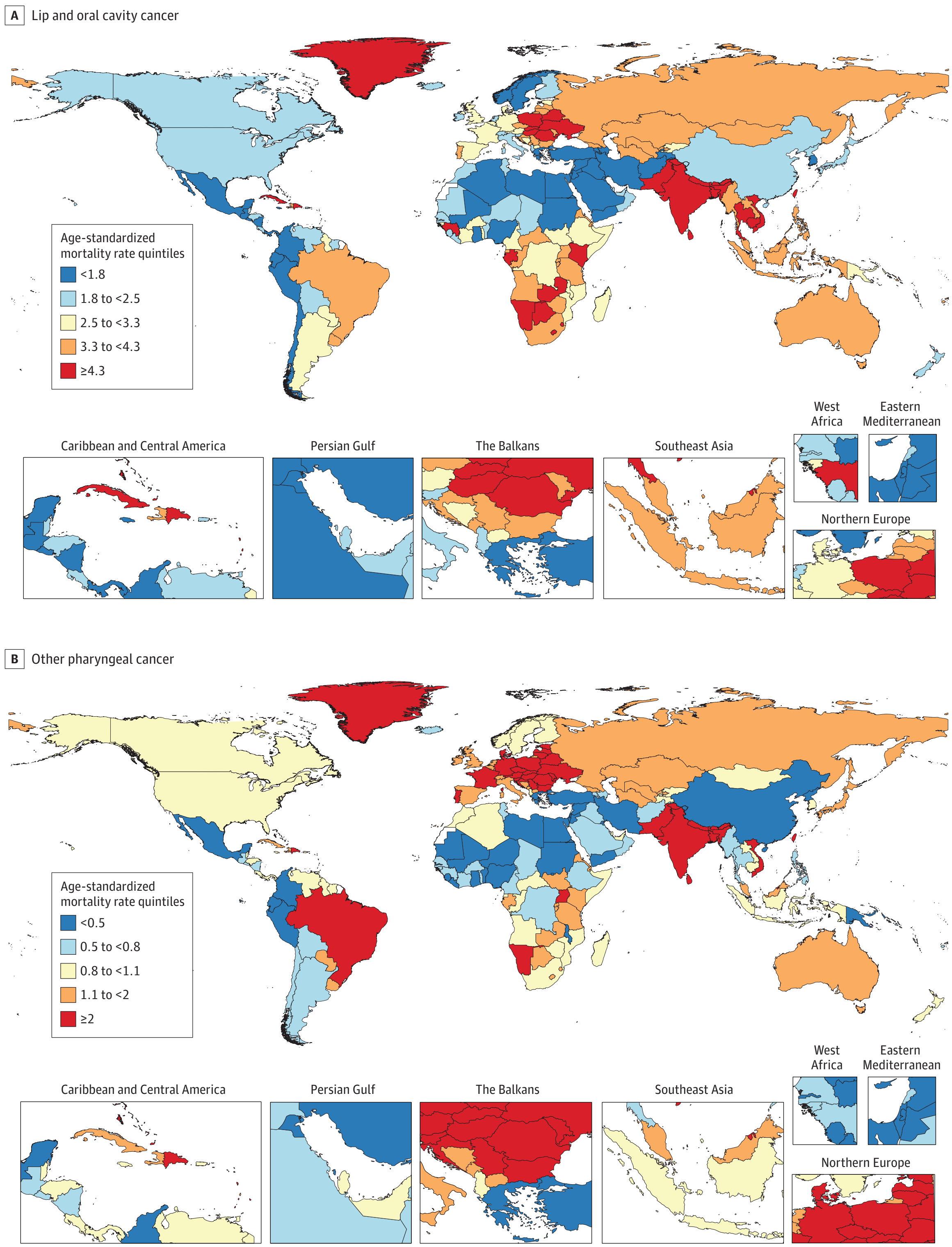
The Global Burden of LOC in 2019

In 2019, 370 000 (95% UI, 338 000-401 000) new cases of LOC occurred globally, and the global age-standardized incidence rate (ASIR) was 7.1 (95% UI, 6.5-7.7) per 100 000. Deaths from LOC were estimated to be 199 000 (95% UI, 181 000-217 000) globally, with an age-standardized mortality rate (ASMR) of 3.8 (95% UI, 3.5-4.2) deaths per 100 000. Lip and oral cavity cancer was responsible for 5.45 million (95% UI, 4.95-5.97 million) DALYs in 2019 (eTable 8 in Supplement 1).

Figure 1A shows the distribution of national-level ASMRs in 2019 due to LOC (for a map of ASIRs, see eFigure 6 in Supplement 1). Eastern Europe and South and Southeast Asia exhibited a concentration of countries with ASMRs in the highest quintile. The LOC age-specific rates for incidence, mortality, and DALYs were higher among male individuals than among female individuals in all age groups (**Figure 2** and eFigure 11 in Supplement 1).

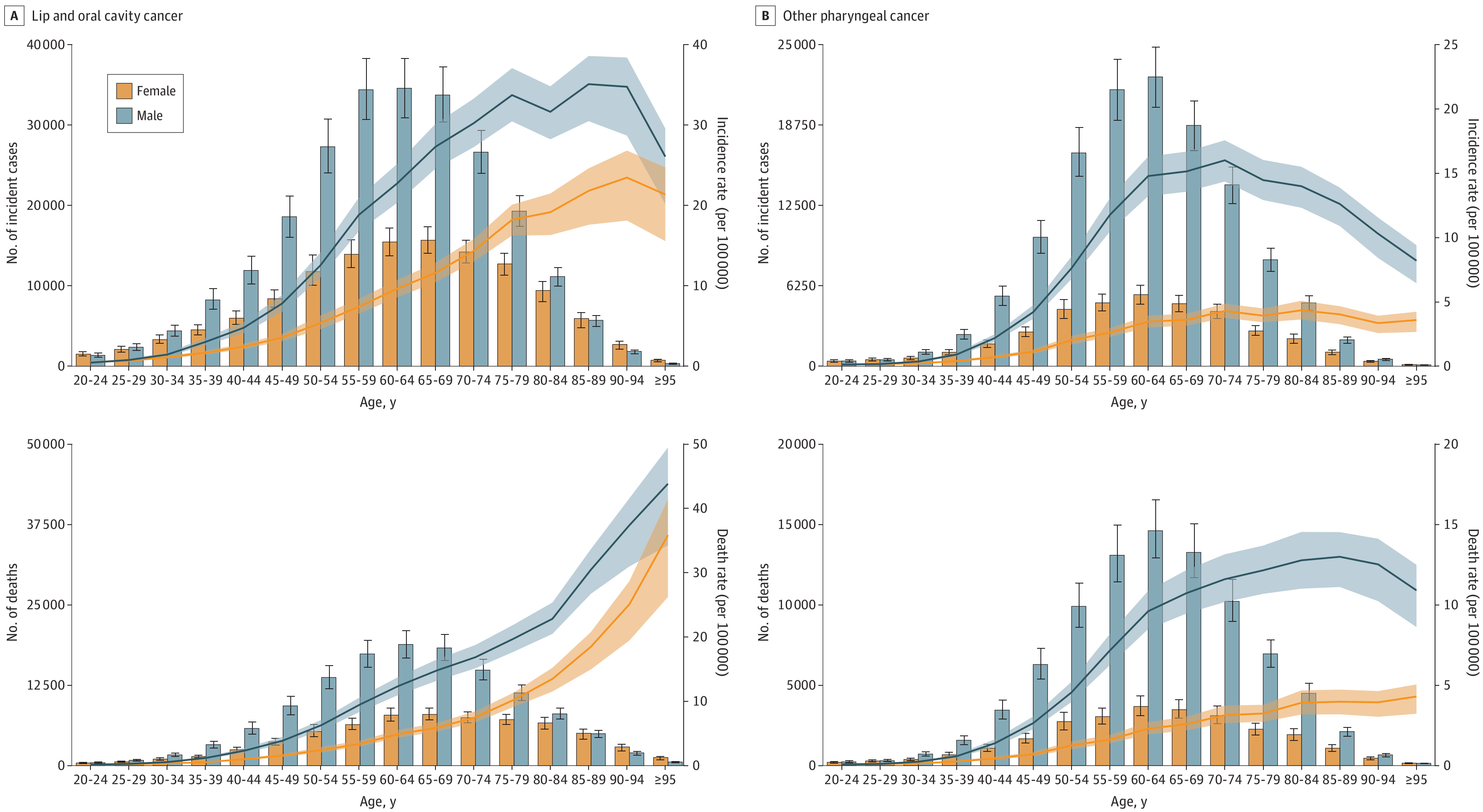
The South Asia and High-income super-regions had the highest ASIRs for LOC in 2019 (15.1 [95% UI, 12.8-17.5] and 7.2 [95% UI, 6.4-7.9] new cases per 100 000 inhabitants, respectively). South Asia also had the highest ASMR (10.0 [95% UI, 8.6-11.7] per 100 000); however, the second-largest ASMR occurred in Central Europe, Eastern Europe, and Central Asia (4.2 [95% UI, 3.8-4.6] per 100 000). The low-middle SDI regions had the highest ASIR and ASMR (10.4 [95% UI, 9.1-11.8] new cases and 7.0 [95% UI, 6.1-7.9] deaths per 100 000, respectively; eTable 8 in Supplement 1). The country with the highest ASIR

Figure 1. Global Maps of Age-Standardized Mortality Rates for Lip, Oral, and Other Pharyngeal Cancer for Both Sexes Combined in 2019



Each map represents estimates at the national level and for the age range of 20 to older than 95 years. Quintiles are based on age-standardized mortality rates per 100 000 person-years. There are several geographic locations where estimates are not available (eg, Western Sahara, French Guiana) because they were not modeled locations in the Global Burden of Diseases, Injuries, and Risk Factors Study 2019; these locations are white on the maps. eFigure 6 in Supplement 1 provides global maps showing the age-standardized incidence rate quintiles for lip and oral cavity cancer and other pharyngeal cancer among both sexes in 2019. eFigures 7 through 10 in Supplement 1 provide additional global maps of age-standardized mortality and incidence rates for lip and oral cavity cancer and other pharyngeal cancer in male and female individuals separately in 2019.

Figure 2. Global Absolute Cases and Deaths and Age-Specific Incidence and Mortality Rates for Lip, Oral, and Other Pharyngeal Cancer by Age Group and Sex in 2019



Bars indicate absolute numbers, with error bars representing 95% uncertainty intervals. Lines indicate rates, with shaded areas representing respective 95% uncertainty intervals. For an additional version of this Figure showing absolute disability-adjusted life years and age-specific disability-adjusted life year rates (per 100 000), see eFigure 11 in Supplement 1.

in 2019 was Palau, with 46.6 (95% UI, 36.3-59.2) new cases per 100 000, while the highest ASMR occurred in Pakistan, with 23.2 (95% UI, 18.7-28.9) deaths per 100 000 (eTable 10 in Supplement 1).

The Burden of LOC Over Time

From 1990 to 2019, the high SDI regions showed a decreasing pattern in ASIR, ASMR, and age-standardized DALY rates (**Figure 3** and eFigure 12 in Supplement 1). The high-middle SDI quintile had decreasing ASMR and age-standardized DALY rates, while the ASIR of the middle SDI regions increased (eTable 8 in Supplement 1). Low-middle and low SDI regions consistently showed the highest ASMRs due to LOC from 1990 to 2019 (Figure 3). The LOC ASIRs, ASMRs, and age-standardized DALY rates over time by sex and super-region, as well as the age-specific rates over time and by age group, are reported in eFigures 13, 15, and 14 in Supplement 1, respectively.

The Global Burden of OPC in 2019

The estimated number of new OPC cases in 2019 was 167 000 (95% UI, 153 000-180 000), with an ASIR of 3.2 (95% UI, 2.9-3.4) per 100 000 inhabitants. It was estimated that 114 000 (95% UI, 103 000-126 000) people died of OPC, revealing a global ASMR of 2.2 (95% UI, 2.0-2.4) per 100 000. Other pharyngeal cancer caused 3.23 million (95% UI, 2.90-3.57 million) DALYs in 2019 (eTable 9 in Supplement 1).

Figure 1B presents the distribution of national-level ASMRs in 2019 due to OPC (for a map of ASIRs, see eFigure 6 in Supplement 1). Most European countries were in the highest quintile of ASMRs; there was also a concentration of South Asian countries in this quintile. The OPC age-specific rates of incidence, mortality, and DALYs among male individuals were higher than female individuals in all age groups; the difference between male and female individuals in OPC age-specific rates was greater in middle age than in the older and younger age groups (Figure 2 and eFigure 11 in Supplement 1).

In 2019, South Asia had the highest ASIR and ASMR for OPC (7.7 [95% UI, 6.5-8.9] new cases and 7.4 [95% UI, 6.3-8.5] deaths per 100 000 inhabitants, respectively). Low-middle and high SDI regions had the highest ASIRs (5.3 [95% UI, 4.6-6.1] and 4.4 [95% UI, 3.9-4.9] new cases per 100 000, respectively). The low-middle SDI quintile also had the highest ASMR (5.1 [95% UI, 4.4-5.9] per 100 000), but the low SDI quintile had the second highest ASMR (2.8 [95% UI, 2.4-3.3] per 100 000) (eTable 9 in Supplement 1). Taiwan (province of China) was the country with the highest ASIR in 2019 (9.8 [95% UI, 7.4-13.0] incident cases per 100 000), while India had the highest ASMR (7.7 [95% UI, 6.4-9.2] deaths per 100 000) (eTable 11 in Supplement 1).

The Burden of OPC Over Time

The OPC ASIRs increased from 1990 to 2019 in the high, high-middle, and middle SDI quintiles. There was a general pattern of stability across all SDI settings regarding OPC ASMRs, except for the high-middle strata, which showed a reduction (eTable 9 in Supplement 1). For age-standardized DALY rates, high and high-middle SDI settings exhibited a decreasing pattern (eTable 9 in Supplement 1). From 1990 to 2019, low-middle and low SDI regions always showed the highest ASMRs due to OPC (Figure 3). The OPC ASIRs, ASMRs, and age-standardized DALY rates over time by sex and super-region, as well as the age-specific rates over time by age group, are reported in eFigures 13, 15, and 14 in Supplement 1, respectively.

Risk Factors: Population Attributable Fraction

Figure 4 shows the proportion of LOC and OPC deaths attributable to alcohol and tobacco consumption in 2019. Among male individuals, tobacco smoking and alcohol consumption were responsible for a large proportion of LOC deaths globally (42.3% [95% UI, 35.2%-48.6%] and 40.2% [95% UI, 33.3%-46.8%], respectively). For male individuals in the younger age groups (≤54 years old) and in the oldest age group (≥95 years old), alcohol consumption was a more important risk factor than smoking (Figure 4). Among female individuals, the highest proportion of risk-attributable LOC deaths globally were due to chewing tobacco (27.6% [95% UI, 21.5%-33.8%]; Figure 4), with this burden concentrated in South and Southeast Asia (eFigure 16 in Supplement 1).

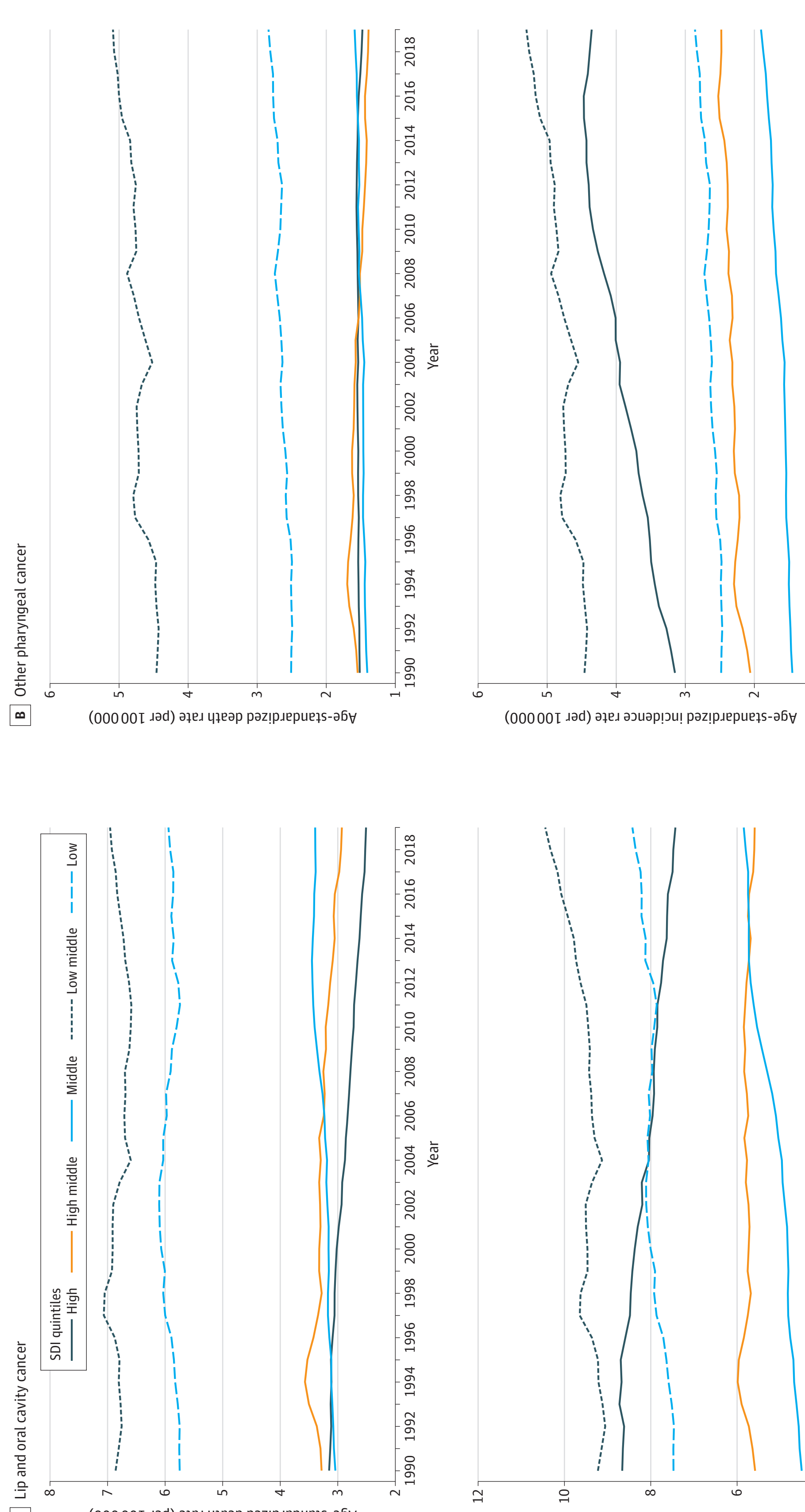
Concerning OPC, for male individuals older than 45 years and female individuals older than 50 years, the highest proportion of deaths globally was attributable to smoking tobacco; in younger age groups, however, alcohol consumption played the greater role (Figure 4). Globally, 55.8% (95% UI, 49.2%-62.0%) of OPC deaths among male individuals were attributable to tobacco smoking and 40.0% (95% UI, 31.8%-48.1%) to alcohol consumption; among female individuals, 17.4% (95% UI, 13.8%-21.2%) were due to smoking and 10.1% (95% UI, 7.1%-13.3%) to alcohol. For risk-attributable DALYs, see eFigure 17 in Supplement 1 and for results by country, eTables 12 and 13 in Supplement 1.

Discussion

This study provides an updated and comprehensive overview of lip, oral, and other pharyngeal cancer burden in the past 30 years, globally and by region using GBD 2019 estimates, including for areas where observed data are scarce. It is also, to our knowledge, the first report of the burden of LOC and OPC attributable to risk factors globally, providing important information for addressing these cancers around the world. Disparities in ASIRs and ASMRs and trends across the SDI spectrum suggested that populations from regions with a lower level of sociodemographic development have a higher chance of death when affected by LOC or OPC, with South Asia carrying substantial LOC and OPC burden. Smoking, chewing tobacco, and alcohol were substantial contributors to LOC and OPC deaths and DALYs and are crucial targets to decreasing future burden of LOC and OPC globally.

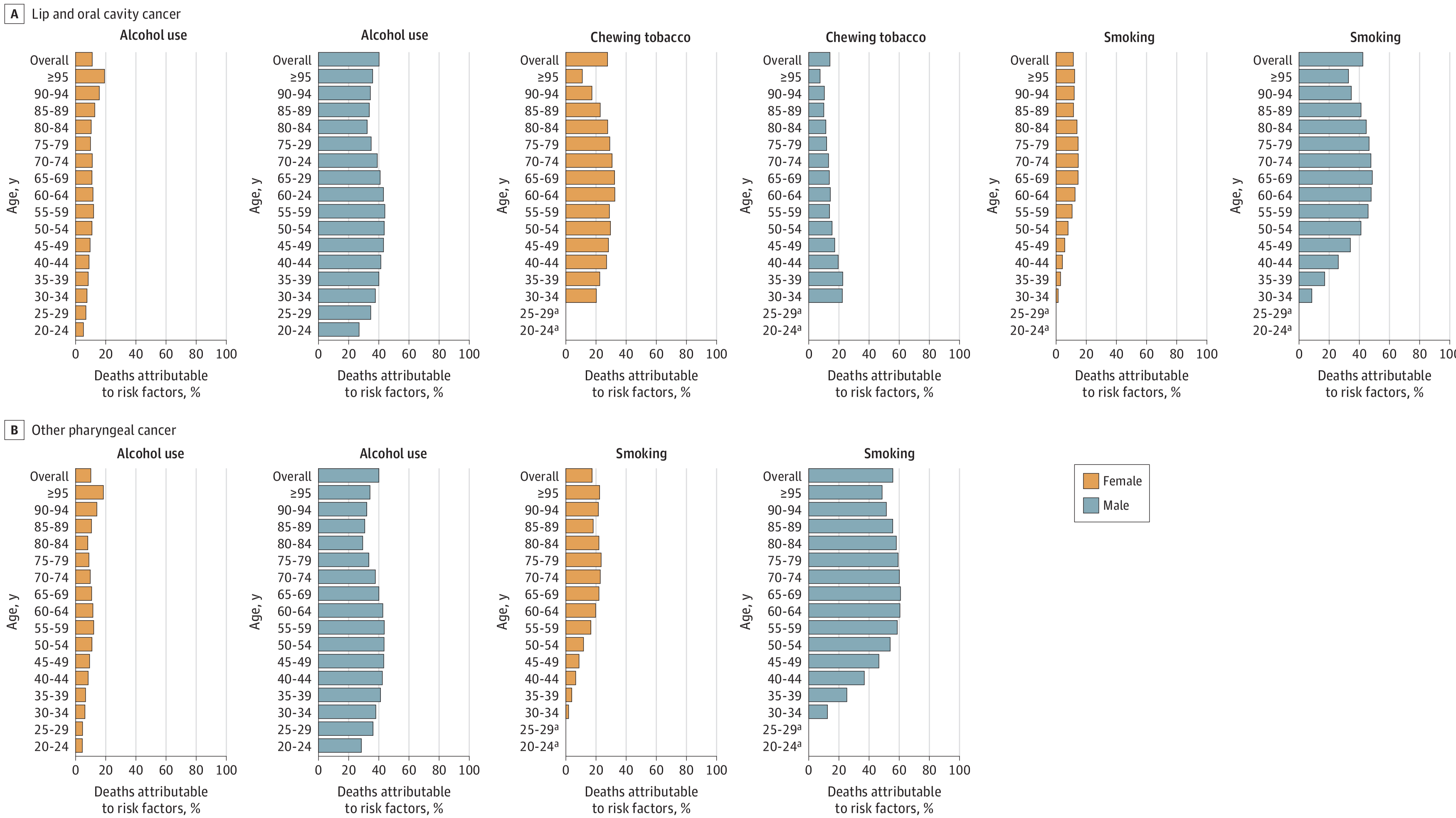
Throughout the entire study period, the low and low-middle SDI strata had the highest LOC and OPC ASMRs and age-standardized DALY rates, even though they did not always have the highest ASIRs. The differences between ASMRs and ASIRs

Figure 3. Time Trends of Age-Standardized Death and Incidence Rates for Lip, Oral, and Other Pharyngeal Cancer From 1990 to 2019 by Socio-demographic Index (SDI) Quintile



Rates represent both sexes combined and are expressed per 100 000 person-years. See eFigure 3 and eTable 7 in Supplement 1 for details and definitions of the SDI quintiles. For additional versions of this Figure, showing time trends of deaths, incidence, and disability-adjusted life years, see eFigure 12 (by SDI quintile), eFigure 13 (by sex), eFigure 14 (by 10-year age group), and eFigure 15 (by Global Burden of Diseases, Injuries, and Risk Factors Study super-region) in Supplement 1.

Figure 4. Proportion of Deaths Attributable to Risk Factors for Lip, Oral, and Other Pharyngeal Cancer by Age Group and Sex Globally in 2019



eFigure 16 in Supplement 1 provides further information on deaths attributable to risk factors for lip, oral, and other pharyngeal cancers in 2019 by Global Burden of Diseases, Injuries, and Risk Factors (GBD) Study world region. eFigure 17 in Supplement 1 provides further information on risk-attributable disability-adjusted life-years for lip, oral, and other pharyngeal cancers by 5-year age groups globally and by GBD study world region. For Tables summarizing the underlying results of risk-attributable deaths and disability-adjusted life-years by country or territory, see eTable 12 (for lip and oral cavity cancer) and eTable 13 (for other pharyngeal cancer) in Supplement 1.

An additional version of this Figure showing percentage totals for each category is provided in eFigure 18 in Supplement 1.

[a] The chewing tobacco and smoking risk factors were modeled with lower age restrictions of 30 years in the GBD 2019 study; thus, estimates were not produced for these risk factors in the age groups of 20 to 24 years and 25 to 29 years.

were smaller in the low and low-middle SDI regions, particularly for OPC. The ASMRs and age-standardized DALY rates for LOC and OPC showed a pattern of stability across time for almost all SDI groups, but the high and high-middle SDI groups exhibited a decline in these rates for LOC in the past 2 decades. These results may reflect different regional patterns of exposure to the risk factors estimated in this study (tobacco and alcohol), as well as other risk factors not estimated herein, such as oncogenic HPV infection, which is responsible for higher incidence rates of HPV-associated oropharynx cancer in wealthier countries[9] and is reported to carry lower mortality.[21,22] The latter may also be one factor contributing to the increasing trend of ASIRs in the high SDI quintile noted in this analysis.[9] Smoking may lead to poorer survival in HPV-associated oropharyngeal cancer and was found to contribute to a large proportion of OPC deaths and DALYs in High-income regions in this analysis, highlighting the critical role of this risk factor even in settings where HPV-associated oropharyngeal cancer may be more prevalent.[9,23] The differences in OPC ASMRs in the setting of similar ASIRs that were identified in some SDI strata (eg, high-middle and low SDI) could suggest that fewer patients survive their OPC diagnoses in the most impoverished parts of the world, potentially due to later-stage diagnoses and/or less access to cancer treatment.[24,25]

At the World Health Assembly in 2021, the WHO adopted a resolution on oral health—the WHA74.5 resolution[15]—which was a considerable step forward for the oral health agenda. This resolution enabled the development of a global strategy on oral health, a global action plan adopted by the member states in the 2022 World Health Assembly, which has the vision to reach universal health coverage for oral health for all individuals and communities by 2030.[26] In addition, the WHO global noncommunicable diseases action plan for 2013 to 2030 advocates for specific interventions for oral cancer, including screening in high-risk groups linked with timely diagnostic and comprehensive cancer treatment.[27] These efforts provide a collective opportunity to improve patient outcomes in a historically neglected area of health care.[28,29]

The present results suggest that inequities exist in LOC and OPC burden worldwide, which should be considered in oral health planning and implementation initiatives. Public health strategies to control exposure to major risk factors and promote access to early diagnosis and treatment in low- and low-middle–income regions are urgently needed, given the higher mortality rates in lower SDI countries. Including oral health care as part of the universal health care agenda can support early diagnosis and access to timely treatment of LOC and OPC; oral health care is unaffordable for many individuals around the world, and most health systems with universal coverage do not currently include it.[30] Delay in diagnosis and treatment of these cancers negatively affects survival, so referral pathways capable of quick diagnosis of suspected LOC and OPC cases and treatment of those confirmed are crucial.[24] Finally, monitoring actions should include creating and expanding population-based registration systems that include information on the staging of these cancers at the time of diagnosis and their subsequent outcomes.

This study showed that smoking tobacco remains an important risk factor for oral cavity and other pharyngeal cancers globally. Tobacco control efforts have been mobilized over the past several decades, including the WHO Framework Convention on Tobacco Control in 2003,[31] the first global health treaty aimed at reducing tobacco consumption in member states. Evidence indicates that tobacco control measures adopted by the countries participating in the Framework Convention on Tobacco Control effectively reduced the prevalence of smoking. However, the pace of implementation of these measures has been heterogeneous around the world, and the tobacco epidemic is still far from over.[32,33] The high percentage of LOC and OPC deaths and DALYs attributable to smoking tobacco in 2019 reinforces the need to strengthen the implementation of tobacco control measures.

The percentage of DALYs and deaths for LOC attributable to chewing tobacco is concentrated in certain world regions, mainly in South and Southeast Asia. The largest ASMRs and ASIRs for LOC and OPC in 2019 occurred in South Asia, and for LOC these rates were more than double the next highest region rates. The GBD 2019 study estimated that 83.3% (95% UI, 82.2%-84.2%) of the chewing tobacco users in 2019 lived in South Asia,[34] with the present study suggesting that chewing tobacco in South and Southeast Asia is especially relevant among female individuals. The critical contribution of chewing tobacco to oral cavity cancer burden among female individuals is concerning because the prevalence of this risk factor in female individuals has been constant in recent decades, unlike smoking tobacco, which has been decreasing.[34] These results imply that tobacco control initiatives need to be expanded, intensified, or better able to address chewing tobacco in some world regions.[35] Because chewing tobacco is a habit related to local culture and beliefs,[7] these initiatives should be planned in close collaboration with groups and institutions that are aware of the local challenges and opportunities.

The present results indicate that a large proportion of LOC and OPC deaths in 2019 were attributable to alcohol, particularly in young men. A previous GBD study indicated that the prevalence of alcohol consumption varied considerably worldwide, being higher in high SDI areas, and revealed that alcohol and its effects on health may become an increasing challenge as regions advance across the SDI spectrum.[36] This suggests that low and low-middle SDI regions could benefit from policies aimed at reducing population-level exposure to alcohol while this habit is not so widespread, in addition to addressing this risk factor in higher SDI countries. While the synergistic effect of alcohol and tobacco on the risk of developing LOC and OPC is well recognized in the literature,[37] the importance of alcohol alone is less explored; however, the present results on the critical role of alcohol as a risk factor for LOC and OPC are in line with previous studies.[6,38]

Limitations

While the GBD 2019 study provided useful estimates of global LOC and OPC burden, there are several limitations. Locations where observed data on disease burden were unavailable are reported with appropriate uncertainty, but their estimation is limited by the data available across space and time, highlighting the importance of expanding cancer and vital registration systems. The availability and quality of primary data are also a limitation in the estimation of risk-attributable cancer burden.[16] In addition, there are limitations more specific to the estimation of LOC and OPC. Currently, it is not possible in the GBD study to separately analyze cancers at a more granular level than the LOC and OPC categories reported herein, and the current GBD classification groups include some anatomical cancer sites that do not share the same pathophysiological determinants, such as lip cancer with other sites of the oral cavity. Potential improvements to the GBD categorization of these cancers would include, depending on data availability, (1) the separation of lip, salivary gland, oropharynx, and hypopharynx cancers into individual categories and (2) the inclusion of cancer of the base of the tongue in the oropharyngeal cancer category, instead of analyzing it as part of oral cavity cancers.[39,40] Finally, the current study did not estimate the burden of LOC and OPC attributable to other risk factors for these diseases, such as HPV infection, an important and growing risk factor for OPC,[22,41] and betel quid without tobacco consumption for LOC.[4]

Conclusions

In this systematic analysis, disparities in LOC and OPC incidence, mortality, and DALY rates across the SDI spectrum were evident in 2019. Actions to reduce the burden of LOC and OPC through improvements in early diagnosis, access to treatment, and reduction of exposure to risk factors should consider the inequities in the global distribution of these diseases. Including oral health into universal health coverage is one crucial strategy to reach this goal, as part of comprehensive cancer control efforts. Tobacco and alcohol use are important targets to decreasing the future burden of LOC and OPC globally.

ARTICLE INFORMATION

Accepted for Publication: May 4, 2023.

Published Online: September 7, 2023. doi:10.1001/jamaoncol.2023.2960

The GBD 2019 Lip, Oral, and Pharyngeal Cancer Collaborators: The following investigators take authorship responsibility for the study results: Amanda Ramos da Cunha, PhD; Kelly Compton, BS; Rixing Xu, BSc; Rashmi Mishra, BDS; Mark Thomas Drangsholt, PhD; Jose Leopoldo Ferreira Antunes, PhD; Alexander R. Kerr, MS; Alistair R. Acheson, BA; Dan Lu, MA; Lindsey E. Wallace, MPA; Jonathan M. Kocarnik, PhD; Weijia Fu, MSc; Frances E. Dean, BA; Alyssa Pennini, MSc; Hannah Jacqueline Henrikson, MPH; Tahiya Alam, MPH; Emad Ababneh, MD; Sherief Abd-Elsalam, PhD; Meriem Abdoun, BMedSc; Hassan Abidi, PhD; Hiwa Abubaker Ali, PhD; Eman Abu-Gharbieh, PhD; Tigist Demssew Adane, MSc; Isaac Yeboah Addo, PhD; Aqeel Ahmad, PhD; Sajjad Ahmad, PhD; Tarik Ahmed Rashid, PhD; Maxwell Akonde, MLS; Hanadi Al Hamad, MD; Fares Alahdab, MSc; Yousef Alimohamadi, PhD; Vahid Alipour, PhD; Sadeq Ali Al-Maweri, PhD; Ubai Alsharif, MD; Alireza Ansari-Moghaddam, PhD; Sumadi Lukman Anwar, PhD; Anayochukwu Edward Anyasodor, PhD; Jalal Arabloo, PhD; Aleksandr Y. Aravkin, PhD; Raphael Taiwo Aruleba, MSc; Malke Asaad, MD; Tahira Ashraf, MS; Seyyed Shamsadin Athari, PhD; Sameh Attia, MSc; Sina Azadnajafabad, MD; Mohammadreza Azangou-Khyavy, MD; Muhammad Badar, PhD; Nayereh Baghcheghi, PhD; Maciej Banach, PhD; Mainak Bardhan, MD; Hiba Jawdat Barqawi, MPhil; Nasir Z. Bashir, BDS; Azadeh Bashiri, PhD; Habib Benzian, PhD; Eduardo Bernabe, PhD; Devidas S. Bhagat, PhD; Vijayalakshmi S. Bhojaraja, MD; Tone Bjørge, PhD; Souad Bouaoud, MD; Dejana Braithwaite, PhD; Nikolay Ivanovich Briko, DSc; Daniela Calina, PhD; Giulia Carreras, PhD; Promit Ananyo Chakraborty, MPH; Vijay Kumar Chattu, MD; Akhilanand Chaurasia, MD; Meng Xuan Chen, BDS; William C. S. Cho, PhD; Dinh-Toi Chu, PhD; Isaac Sunday Chukwu, BMedSc; Eunice Chung, MSc; Natália Cruz-Martins, PhD; Omid Dadras, DrPH; Xiaochen Dai, PhD; Lalit Dandona, MD; Rakhi Dandona, PhD; Parnaz Daneshpajouhnejad, MD; Reza Darvishi Cheshmeh Soltani, PhD; Aso Mohammad Darwesh, PhD; Sisay Abebe Debela, MPH; Meseret Derbew Molla, MSc; Fikadu Nugusu Dessalegn, MPH; Mostafa Dianati-Nasab, MSc; Lankamo Ena Digesa, MSc; Shilpi Gupta Dixit, MD; Abhinav Dixit, MD; Shirin Djalalinia, PhD; Iman El Sayed, PhD; Maha El Tantawi, PhD; Daniel Berhanie Enyew, MSc; Daniel Asfaw Erku, PhD; Rana Ezzeddini, PhD; Adeniyi Francis Fagbamigbe, PhD; Luca Falzone, PhD; Getahun Fetensa, MSc; Takeshi Fukumoto, PhD; Piyada Gaewkhiew, PhD; Silvano Gallus, DSc; Mesfin Gebrehiwot, DSc; Ahmad Ghashghaee, BSc; Paramjit Singh Gill, DM; Mahaveer Golechha, PhD; Pouya Goleij, MSc; Ricardo Santiago Gomez, PhD; Giuseppe Gorini, MD; Andre Luiz Sena Guimaraes, PhD; Bhawna Gupta, PhD; Sapna Gupta, MSc; Veer Bala Gupta, PhD; Vivek Kumar Gupta, PhD; Arvin Haj-Mirzaian, MD; Esam S. Halboub, PhD; Rabih Halwani, PhD; Asif Hanif, PhD; Ninuk Hariyani, PhD; Mehdi Harorani, MSc; Hamidreza Hasani, MD; Abbas M. Hassan, MD; Soheil Hassanipour, PhD; Mohammed Bheser Hassen, BSc; Simon I. Hay, DSc; Khezar Hayat, MS; Brenda Yuliana Herrera-Serna, PhD; Ramesh Holla, MD; Nobuyuki Horita, PhD; Mehdi Hosseinzadeh, PhD; Salman Hussain, PhD; Olayinka Stephen Ilesanmi, PhD; Irena M. Ilic, PhD; Milena D. Ilic, PhD; Gaetano Isola, PhD; Abhishek Jaiswal, MD; Chinmay T. Jani, MD; Tahereh Javaheri, PhD; Umesh Jayarajah, MBBS; Shubha Jayaram, MD; Nitin Joseph, MD; Vidya Kadashetti, MDS; Eswar Kandaswamy, MS; Shama D. Karanth, PhD; Ibraheem M. Karaye, MD; Joonas H. Kauppila, MD; Harkiran Kaur, MPH; Mohammad Keykhaei, MD; Yousef Saleh Khader, PhD; Himanshu Khajuria, PhD; Javad Khanali, MD; Mahalaqua Nazli Khatib, PhD; Hamid Reza Khayat Kashani, MD; Mohammad Amin Khazeei Tabari, MD; Min Seo Kim, MD; Farzad Kompani, MD; Hamid Reza Koohestani, PhD; G. Anil Kumar, PhD; Om P. Kurmi, PhD; Carlo La Vecchia, MD; Dharmesh Kumar Lal, MD; Iván Landires, MD; Savita Lasrado, MS; Caterina Ledda, PhD; Yo Han Lee, PhD; Massimo Libra, PhD; Stephen S. Lim, PhD; Stefan Listl, PhD; Platon D. Lopukhov, CandMed; Ahmad R. Mafi, MD; Rashidul Alam Mahumud, PhD; Ahmad Azam Malik, PhD; Manu Raj Mathur, PhD; Sazan Qadir Maulud, PhD; Jitendra Kumar Meena, MD; Entezar Mehrabi Nasab, MD; Tomislav Mestrovic, PhD; Reza Mirfakhraie, PhD; Awoke Misganaw, PhD; Sanjeev Misra, MCh; Prasanna Mithra, MD; Yousef Mohammad, MD; Mokhtar Mohammadi, PhD; Esmaeil Mohammadi, MD; Ali H. Mokdad, PhD; Mohammad Ali Moni, PhD; Paula Moraga, PhD; Shane Douglas Morrison, MD; Hamid Reza Mozaffari, PhD; Sumaira Mubarik, MS; Christopher J. L. Murray, DPhil; Tapas Sadasivan Nair, MD; Sreenivas Narasimha Swamy, MD; Aparna Ichalangod Narayana, PhD; Hasan Nassereldine, MD; Zuhair S. Natto, DrPH; Biswa Prakash Nayak, PhD; Serban Mircea Negru, MD; Haruna Asura Nggada, MD; Hasti Nouraei, MSc; Virginia Nuñez-Samudio, PhD; Bogdan Oancea, PhD; Andrew T. Olagunju, MD; Ahmed Omar Bali, PhD; Alicia Padron-Monedero, PhD; Jagadish Rao Padubidri, MD; Anamika Pandey, PhD; Shahina Pardhan, PhD; Jay Patel, MChD; Raffaele Pezzani, PhD; Zahra Zahid Piracha, PhD; Navid Rabiee, PhD; Venkatraman Radhakrishnan, MD; Raghu Anekal Radhakrishnan, PhD; Amir Masoud Rahmani, PhD; Vahid Rahmanian, PhD; Chythra R. Rao, MD; Sowmya J. Rao, MDS; Goura Kishor Rath, MD; David Laith Rawaf, MBBS; Salman Rawaf, MD; Reza Rawassizadeh, PhD; Mohammad Sadegh Razeghinia, MSc; Nazila Rezaei, MD; Negar Rezaei, PhD; Nima Rezaei, PhD; Aziz Rezapour, PhD; Abanoub Riad, DDS; Thomas J. Roberts, MD; Esperanza Romero-Rodríguez, PhD; Gholamreza Roshandel, PhD; Manjula S., MDS; Chandan S. N., PhD; Basema Saddik, PhD; Mohammad Reza Saeb, PhD; Umar Saeed, PhD; Mohsen Safaei, PhD; Maryam Sahebazzamani, MSc; Amirhossein Sahebkar, PhD; Amir Salek Farrokhi, PhD; Abdallah M. Samy, PhD; Milena M. Santric-Milicevic, PhD; Brijesh Sathian, PhD; Maheswar Satpathy, PhD; Mario Šekerija, PhD; Subramanian Senthilkumaran, MD; Allen Seylani, BS; Omid Shafaat, MD; Hamid R. Shahsavari, PhD; Erfan Shamsoddin, DDS; Mequannent Melaku Sharew, MPH; Javad Sharifi-Rad, PhD; Jeevan K. Shetty, MD; K. M. Shivakumar, PhD; Parnian Shobeiri, MD; Seyed Afshin Shorofi, PhD; Sunil Shrestha, PharmD; Sudeep K. Siddappa Malleshappa, MD; Paramdeep Singh, MD; Jasvinder A. Singh, MD; Garima Singh, MD; Dhirendra Narain Sinha, PhD; Yonatan Solomon, MSc; Muhammad Suleman, PhD; Rizwan

Suliankatchi Abdulkader, MD; Yasaman Taheri Abkenar, PharmD; Iman M. Talaat, PhD; Ker-Kan Tan, PhD; Abdelghani Tbakhi, MD; Arulmani Thiyagarajan, MPH; Amir Tiyuri, MSc; Marcos Roberto Tovani-Palone, PhD; Bhaskaran Unnikrishnan, MD; Bay Vo, PhD; Simona Ruxandra Volovat, PhD; Cong Wang, MPH; Ronny Westerman, DSc; Nuwan Darshana Wickramasinghe, MD; Hong Xiao, PhD; Chuanhua Yu, PhD; Deniz Yuce, MD; Ismaeel Yunusa, PhD; Vesna Zadnik, PhD; Iman Zare, BSc; Zhi-Jiang Zhang, PhD; Mohammad Zoladl, PhD; Lisa M. Force, MD; Fernando N. Hugo, PhD.

Affiliations of The GBD 2019 Lip, Oral, and Pharyngeal Cancer Collaborators: School of Public Health, University of São Paulo, São Paulo, Brazil (Cunha, Antunes); Institute for Health Metrics and Evaluation, University of Washington, Seattle (Compton, Xu, Acheson, Lu, Wallace, Kocarnik, Fu, Dean, Pennini, Henrikson, Alam, Aravkin, Chung, Dai, L. Dandona, R. Dandona, Hassen, Hay, Lim, Mestrovic, Mokdad, Murray, Nassereldine, Force); Department of Data and Tooling, Sage Bionetworks, Seattle, Washington (Xu); Department of Oral Medicine, School of Dentistry, University of Washington, Seattle (Mishra, Drangsholt); Oral Medicine Clinic, School of Dentistry, University of Washington, Seattle (Drangsholt); Department of Oral and Maxillofacial Pathology, Radiology, and Medicine, College of Dentistry, New York University, New York, New York (Kerr); Department of Mathematics, University of California, Berkeley (Dean); Department of Global Health, School of Public Health, Boston University, Boston, Massachusetts (Henrikson); Pathology and Laboratory Medicine Institute, Cleveland Clinic, Cleveland, Ohio (Ababneh); Tropical Medicine Department, Faculty of Medicine, Tanta University, Tanta, Egypt (Abd-Elsalam); Department of Medicine, University of Setif Algeria, Setif, Algeria (Abdoun); Laboratory Technology Sciences Department, Yasuj University of Medical Sciences, Yasuj, Iran (Abidi); Department of Banking and Finance, University of Human Development, Sulaymaniyah, Iraq (Abubaker Ali); Clinical Sciences Department, University of Sharjah, Sharjah, United Arab Emirates (Abu-Gharbieh, Barqawi, Halwani, Talaat); Department of Clinical and Psychosocial Epidemiology, University of Groningen, Groningen, the Netherlands (Adane); Centre for Social Research in Health, University of New South Wales, Sydney, New South Wales, Australia (Addo); Quality and Systems Performance Unit, Cancer Institute NSW, Sydney, New South Wales, Australia (Addo); Department of Medical Biochemistry, Shaqra University, Shaqra, Saudi Arabia (A. Ahmad); Department of Health and Biological Sciences, Abasyn University, Peshawar, Pakistan (S. Ahmad); Department of Computer Science and Engineering, University of Kurdistan Hewler, Erbil, Iraq (Ahmed Rashid); Department of Epidemiology and Biostatistics, Arnold School of Public Health, University of South Carolina, Columbia (Akonde); Geriatric and Long Term Care Department, Hamad Medical Corporation, Doha, Qatar (Al Hamad, Sathian); Rumailah Hospital, Hamad Medical Corporation, Doha, Qatar (Al Hamad); Evidence-Based Practice Center Program, Mayo Clinic Foundation for Medical Education and Research, Rochester, Minnesota (Alahdab); Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran (Alimohamadi); Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran (Alipour, Arabloo, Rezapour); Department of Health Economics, Iran University of Medical Sciences, Tehran, Iran (Alipour); College of Dental Medicine, Qatar University, Doha, Qatar (Al-Maweri); Dortmund Clinic, Dortmund, Germany (Alsharif); Department of Epidemiology and Biostatistics, Zahedan University of Medical Sciences, Zahedan, Iran (Ansari-Moghaddam); Department of Surgery, Faculty of Medicine, Gadjah Mada University, Yogyakarta, Indonesia (Anwar); School of Dentistry and Medical Sciences, Charles Sturt University, Orange, New South Wales, Australia (Anyasodor); Department of Applied Mathematics, College of Arts & Sciences, University of Washington, Seattle (Aravkin); Department of Health Metrics Sciences, School of Medicine, University of Washington, Seattle (Aravkin, Dai, R. Dandona, Hay, Lim, Misganaw, Mokdad, Murray, Force); Department of Molecular and Cell Biology, University of Cape Town, Cape Town, South Africa (Aruleba); Department of Plastic Surgery, University of Texas, Houston (Asaad, Hassan); University Institute of Radiological Sciences and Medical Imaging Technology, The University of Lahore, Lahore, Pakistan (Ashraf); Department of Immunology, Zanjan University of Medical Sciences, Zanjan, Iran (Athari); Department of Oral and Maxillofacial Surgery, Justus Liebig University of Giessen, Giessen, Germany (Attia); Non-Communicable Diseases Research Center, Tehran University of Medical Sciences, Tehran, Iran (Azadnajafabad, Azangou-Khyavy, Keykhaei, Khanali, Nazila Rezaei, Negar Rezaei); Social Determinants of Health Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Azangou-Khyavy, Khanali); Gomal Center of Biochemistry and Biotechnology, Gomal University, Dera Ismail Khan, Pakistan (Badar); Department of Nursing, Saveh University of Medical Sciences, Saveh, Iran (Baghcheghi); Department of Hypertension, Medical University of Lodz, Lodz, Poland (Banach); Polish Mothers' Memorial Hospital Research Institute, Lodz, Poland (Banach); Department of Molecular Microbiology and Bacteriology, National Institute of Cholera and Enteric Diseases, Kolkata, India (Bardhan); Department of Molecular Microbiology, Indian Council of Medical Research, New Delhi, India (Bardhan); School of Oral and Dental Sciences, University of Bristol, Bristol, England, United Kingdom (Bashir); Health Information Management, Shiraz University of Medical Sciences, Shiraz, Iran (Bashiri); Department of Epidemiology and Health Promotion, College of Dentistry, New York University, New York, New York (Benzian); Faculty of Dentistry, Oral & Craniofacial Sciences, King's College London, London, England, United Kingdom (Bernabe); Department of Forensic Chemistry, Government Institute of Forensic Science, Aurangabad, India (Bhagat); Department of Anatomy, Royal College of Surgeons in Ireland Medical, University of Bahrain, Busaiteen, Bahrain (Bhojaraja); Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway (Bjørge, Dadras); Cancer Registry of Norway, Oslo, Norway (Bjørge); Department of Medicine, University Ferhat Abbas of Setif, Setif, Algeria (Bouaoud); Department of Epidemiology and Preventive Medicine, University Hospital Saadna Abdenour, Setif, Algeria (Bouaoud); Department of Epidemiology, College of Public Health and Health Professions and College of Medicine, University of Florida, Gainesville (Braithwaite); Cancer Control and Population Sciences Program, University of Florida Health Cancer Center, Gainesville (Braithwaite); Department of Epidemiology and Evidence-Based Medicine, I.M. Sechenov First Moscow State Medical University, Moscow, Russia (Briko, Lopukhov); Department of Clinical Pharmacy, Faculty of Pharmacy, University of Medicine and Pharmacy of Craiova, Craiova, Romania (Calina); Institute for Cancer Research, Prevention and Clinical Network, Florence, Italy (Carreras); School of Population and Public Health, Faculty of Medicine, The University of British Columbia, Vancouver, British Columbia, Canada (Chakraborty); Department of Community Medicine, Datta Meghe Institute of Medical Sciences, Sawangi, India (Chattu); Saveetha Medical College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai, India (Chattu); Department of Oral Medicine and Radiology, King George's Medical University, Lucknow, India (Chaurasia); Department of Oral Biological and Medical Sciences, The University of British Columbia, Vancouver, British Columbia, Canada (Chen); Department of Clinical Oncology, Queen Elizabeth Hospital, Hong Kong, China (Cho); Center for Biomedicine and Community Health, International School, Vietnam National University, Hanoi, Vietnam (Chu); Department of Paediatric Surgery, Federal Medical Centre, Umuahia, Nigeria (Chukwu); Department of Therapeutic and Diagnostic Technologies, Polytechnic and University Higher Education Cooperative, Gandra, Portugal (Cruz-Martins); Institute for Research and Innovation in Health, University of Porto, Porto, Portugal (Cruz-Martins); Section Global Health and Rehabilitation, Western Norway University of Applied Sciences, Bergen, Norway (Dadras); Public Health Foundation of India, Gurugram, India (L. Dandona, R. Dandona, Kaur, Kumar, Lal, Pandey); Indian Council of Medical Research, New Delhi, India (L. Dandona); Department of Pathology, Johns Hopkins Medicine, Baltimore, Maryland (Daneshpajouhnejad); Department of Pathology, Isfahan University of Medical Sciences, Isfahan, Iran (Daneshpajouhnejad); Environmental Health, Arak University of Medical Sciences, Arak, Iran (Darvishi Cheshmeh Soltani); Department of Information Technology, University of Human Development, Sulaymaniyah, Iraq (Darwesh); School of Public Health, Salale University, Fiche, Ethiopia (Debela); Department of Biochemistry, University of Gondar, Gondar, Ethiopia (Derbew Molla); Department of Public Health, College of Medicine, Madda Walabu University, Bale Goba, Ethiopia (Dessalegn); Department of Epidemiology, Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, the Netherlands (Dianati-Nasab); Department of Epidemiology, Shiraz University of Medical Sciences, Shiraz, Iran (Dianati-Nasab); Department of Comprehensive Nursing, Arba Minch University, Arba Minch, Ethiopia (Digesa); Department of Anatomy, All India Institute of Medical Sciences, Jodhpur, India (S. G. Dixit); Department of Physiology, All India Institute of Medical Sciences, Jodhpur, India (A. Dixit); Development of Research and Technology Center, Ministry of Health and Medical Education, Tehran, Iran (Djalalinia); Department of Biomedical Informatics and Medical Statistics, Medical Research Institute, Alexandria University, Alexandria, Egypt (El Sayed); Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Alexandria University, Alexandria, Egypt (El Tantawi); Department of Health Informatics, Haramaya University, Harar, Ethiopia (Enyew); Centre for Applied Health Economics, Griffith University, Gold Coast, Queensland, Australia (Erku); Department of Clinical Biochemistry, Tarbiat Modares University, Tehran, Iran (Ezzeddini); Department of Epidemiology and Medical Statistics, College of Medicine, University of Ibadan, Ibadan, Nigeria (Fagbamigbe); The Institute of Applied Health Sciences, University of Aberdeen, Aberdeen, Scotland, United Kingdom (Fagbamigbe); Epidemiology and Biostatistics Unit, National Cancer Institute IRCCS Fondazione G. Pascale, Naples, Italy (Falzone); Department of Biomedical and Biotechnological Sciences, University of Catania, Catania, Italy (Falzone, Libra); Department of Nursing, College of Medical and Health Sciences, Wollega University, Nekemte, Ethiopia (Fetensa); Department of Dermatology, Kobe University, Kobe, Japan (Fukumoto); Department of Community Dentistry, Faculty of Dentistry, Mahidol University, Ratchathewi, Thailand (Gaewkhiew); Population and Patient Health Group, King's College London, London, England, United Kingdom (Gaewkhiew); Department of Environmental Health Sciences, Mario Negri Institute for Pharmacological Research, Milan, Italy (Gallus); Department of Environmental Health, College of Medicine and Health Sciences, Wollo University, Dessie, Ethiopia (Gebrehiwot); School of Public Health, Qazvin University of Medical Sciences, Qazvin, Iran (Ghashghaee); Warwick Medical School, University of Warwick, Coventry, England, United Kingdom (Gill); Department of Health Systems and Policy Research, Indian Institute of Public Health, Gandhinagar, India (Golechha); Department of Genetics, Sana Institute of Higher Education, Sari, Iran (Goleij); Department of Oral Surgery and Pathology, School of Dentistry, Federal University of Minas Gerais, Belo Horizonte, Brazil (Gomez); Oncological Network, Institute for Cancer Research, Prevention and Clinical Network, Florence, Italy (Gorini); School of Dentistry, State University of Montes Claros, Montes Claros, Brazil (Guimaraes); Department of Public Health, Torrens University Australia, Melbourne, Victoria, Australia (B. Gupta); Toxicology Department, Shriram Institute for Industrial Research, Delhi, India (S. Gupta); School of Medicine, Deakin University, Geelong, Victoria, Australia (V. B. Gupta); Faculty of Medicine, Health and Human Sciences, Macquarie University, Sydney, New South Wales, Australia (V. K. Gupta); Department of Pharmacology, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Haj-Mirzaian); Obesity Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Haj-Mirzaian); College of Dentistry, Jazan University, Jazan, Saudi Arabia (Halboub); School of Dentistry, Sana'a University, Sana'a, Yemen (Halboub); College of Medicine, University of Sharjah, Sharjah, United Arab Emirates (Halwani); University Institute of Public Health, The University of Lahore, Lahore, Pakistan (Hanif, Malik); Department of Dental Public Health, Airlangga University, Surabaya, Indonesia (Hariyani); Australian Research Centre for Population Oral Health, University of Adelaide, Adelaide, South Australia, Australia (Hariyani); Department of Nursing, School of Nursing, Arak University of Medical Sciences, Arak, Iran (Harorani); Department of Ophthalmology, Iran University of Medical Sciences, Karaj, Iran (Hasani); Gastrointestinal and Liver Diseases Research Center, Guilan University of Medical Sciences, Rasht, Iran (Hassanipour); Caspian Digestive Disease Research Center, Guilan University of Medical Sciences, Rasht, Iran (Hassanipour); National Data Management Center for Health (NDMC), Ethiopian Public Health Institute, Addis Ababa, Ethiopia (Hassen); Institute of Pharmaceutical Sciences, University of Veterinary and Animal Sciences, Lahore, Pakistan (Hayat); Department of Pharmacy Administration and Clinical Pharmacy, Xi'an Jiaotong University, Xi'an, China (Hayat); Department of Oral Health, Faculty of Health, Autonomous University of Manizales, Manizales, Colombia (Herrera-Serna); Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, India (Holla); Department of Pulmonology, Yokohama City University, Yokohama, Japan (Horita); National Human Genome Research Institute (NHGRI), National Institutes of Health, Bethesda, Maryland (Horita); Institute of Research and Development, Duy Tan University, Da Nang, Vietnam (Hosseinzadeh); Department of Computer Science, University of Human Development, Sulaymaniyah, Iraq (Hosseinzadeh); Czech National Centre for Evidence-Based Healthcare and Knowledge Translation, Masaryk University, Brno, Czech Republic (Hussain); Institute of Biostatistics and Analyses, Faculty of Medicine, Masaryk University, Brno, Czech Republic (Hussain); Department of Community Medicine, College of Medicine, University of Ibadan, Ibadan, Nigeria (Ilesanmi); Department of Community Medicine, University College Hospital, Ibadan, Ibadan, Nigeria (Ilesanmi); Faculty of Medicine, University of Belgrade, Belgrade, Serbia (I. M. Ilic, Santric-Milicevic); Department of Epidemiology, Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia (M. D. Ilic); Department of General Surgery and Surgical-Medical Specialties, University of Catania, Catania, Italy (Isola); Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi, India (Jaiswal); Department of Internal Medicine, Mount Auburn Hospital, Harvard University, Cambridge, Massachusetts (Jani); Health Informatics Lab, Boston University, Boston, Massachusetts (Javaheri); Postgraduate Institute of Medicine, University of Colombo, Colombo, Sri Lanka (Jayarajah); Department of Surgery, National Hospital of Sri Lanka, Colombo, Sri Lanka (Jayarajah); Department of Biochemistry, Government Medical College, Mysuru, India (Jayaram); Department of Community Medicine, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Mangalore, India (Joseph, Mithra); Department of Oral and Maxillofacial Pathology, Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, India (Kadashetti); Department of Periodontics, School of Dentistry, Louisiana State University Health Sciences Center, New Orleans (Kandaswamy); University of Florida Health Cancer Center, Gainesville (Karanth); School of Health Professions and Human Services, Hofstra University, Hempstead, New York (Karaye); Surgery Research Unit, University of Oulu, Oulu, Finland (Kauppila); Department of Molecular Medicine and Surgery, Karolinska Institute, Stockholm, Sweden (Kauppila); Students' Scientific Research Center (SSRC), Tehran University of Medical Sciences, Tehran, Iran (Keykhaei); Department of Public Health and Community Medicine, Jordan University of Science and Technology, Irbid, Jordan (Khader); Amity Institute of Forensic Sciences, Amity University, Noida, India (Khajuria, Nayak); Global Consortium for Public Health Research, Jawaharlal Nehru Medical College, Datta Meghe Institute of Higher Education and Research, Wardha, India (Khatib); Department of Neurosurgery, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Khayat Kashani); Department of Medicine, Mazandaran University of Medical Sciences, Sari, Iran (Khazeei Tabari); MAZUMS Office, Universal Scientific Education and Research Network, Tehran, Iran (Khazeei Tabari); Department of Genomics and Digital Health, Samsung Advanced Institute for Health Sciences & Technology (SAIHST), Seoul, South Korea (Kim); Public Health Center, Ministry of Health and Welfare, Wando, South Korea (Kim); Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran (Kompani); Social Determinants of Health Research Center, Saveh University of Medical Sciences, Saveh, Iran (Koohestani); Faculty of Health and Life Sciences, Coventry University, Coventry, England, United Kingdom (Kurmi); Department of Medicine, Faculty of Health Sciences, McMaster University, Hamilton, Ontario, Canada (Kurmi); Department of Clinical Sciences and Community Health, University of Milan, Milan, Italy (La Vecchia); Unit of Genetics and Public Health, Institute of Medical Sciences, Las Tablas, Panama (Landires); Ministry of Health, Herrera, Panama (Landires); Department of Otorhinolaryngology, Father Muller Medical College, Mangalore, India (Lasrado); Department of Clinical and Experimental Medicine, University of Catania, Catania, Italy (Ledda); Department of Preventive Medicine, College of Medicine, Korea University, Seoul, South Korea (Lee); Department of Dentistry, Radboud University, Nijmegen, the Netherlands (Listl); Department of Translational Health Economics, Heidelberg University Hospital, Heidelberg, Germany (Listl); Department of Clinical Oncology, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Mafi); NHMRC Clinical Trials Centre, University of Sydney, Sydney, New South Wales, Australia (Mahumud); Rabigh Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia (Malik); Department of Health Policy Research, Public Health Foundation of India, Gurugram, India (Mathur); Institute of Population Health Sciences, University of Liverpool, Liverpool, England, United Kingdom (Mathur); Department of Biology, College of Science, Salahaddin University, Erbil, Iraq (Maulud); Department of Preventive Oncology, All India Institute of Medical Sciences, New Delhi, India (Meena); Tehran Heart Center, Tehran University of Medical Sciences, Tehran, Iran (Mehrabi Nasab); University Centre Varazdin, University North, Varazdin, Croatia (Mestrovic); Department of Genetics, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Mirfakhraie); National Data Management Center for Health, Ethiopian Public Health Institute, Addis Ababa, Ethiopia (Misganaw); Department of Surgical Oncology, All India Institute of Medical Sciences, Jodhpur, India (Misra); Internal Medicine Department, King Saud University, Riyadh, Saudi Arabia (Mohammad); Department of Information Technology, Lebanese French University, Erbil, Iraq (M. Mohammadi); Tehran University of Medical Sciences, Tehran, Iran (E. Mohammadi); Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran (E. Mohammadi, Shobeiri); School of

Health and Rehabilitation Sciences, The University of Queensland, Brisbane, Queensland, Australia (Moni); Computer, Electrical and Mathematical Sciences and Engineering Division, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (Moraga); Division of Facial Plastic and Reconstructive Surgery, Department of Otolaryngology–Head and Neck Surgery, University of Washington, Seattle (Morrison); Department of Oral and Maxillofacial Medicine, Kermanshah University of Medical Sciences, Kermanshah, Iran (Mozaffari); Department of Epidemiology and Biostatistics, School of Medicine, Wuhan University, Wuhan, China (Mubarik, Yu); Health Workforce Department, World Health Organization, Geneva, Switzerland (Nair); Mysore Medical College and Research Institute, Government Medical College, Mysore, India (Narasimha Swamy); Manipal College of Dental Sciences, Manipal, Manipal Academy of Higher Education, Manipal, India (Narayana, R. A. Radhakrishnan); Department of Dental Public Health, Faculty of Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia (Natto); Department of Oral Health Policy and Epidemiology, School of Dental Medicine, Harvard University, Boston, Massachusetts (Natto); Department of Oncology, Victor Babes University of Medicine and Pharmacy, Timisoara, Romania (Negru); Department of Histopathology, University of Maiduguri Teaching Hospital, Maiduguri, Nigeria (Nggada); Department of Human Pathology, University of Maiduguri, Maiduguri, Nigeria (Nggada); Department of Medical Mycology and Parasitology, Shiraz University of Medical Sciences, Shiraz, Iran (Nouraei); Unit of Microbiology and Public Health, Institute of Medical Sciences, Las Tablas, Panama (Nuñez-Samudio); Department of Public Health, Ministry of Health, Herrera, Panama (Nuñez-Samudio); Department of Applied Economics and Quantitative Analysis, University of Bucharest, Bucharest, Romania (Oancea); Department of Psychiatry and Behavioural Neurosciences, Faculty of Health Sciences, McMaster University, Hamilton, Ontario, Canada (Olagunju); Department of Psychiatry, Faculty of Clinical Science, University of Lagos, Lagos, Nigeria (Olagunju); Diplomacy and Public Relations Department, University of Human Development, Sulaymaniyah, Iraq (Omar Bali); National School of Public Health, Institute of Health Carlos III, Madrid, Spain (Padron-Monedero); Department of Forensic Medicine and Toxicology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Mangalore, India (Padubidri); Vision and Eye Research Institute, Anglia Ruskin University, Cambridge, England, United Kingdom (Pardhan); Global Health Governance Programme, University of Edinburgh, Edinburgh, Scotland, United Kingdom (Patel); School of Dentistry, University of Leeds, Leeds, England, United Kingdom (Patel); Endocrinology Unit, Department of Medicine, University of Padova, Padova, Italy (Pezzani); Associazione Italiana Ricerca Oncologica di Base (AIROB), Padova, Italy (Pezzani); International Center of Medical Sciences Research, Islamabad, Pakistan (Piracha, Saeed); School of Engineering, Macquarie University, Sydney, New South Wales, Australia (Rabiee); Pohang University of Science and Technology, Pohang, South Korea (Rabiee); Department of Medical Oncology, Cancer Institute (WIA), Chennai, India (V. Radhakrishnan); Future Technology Research Center, National Yunlin University of Science and Technology, Yunlin, Taiwan (Rahmani); Department of Public Health, Torbat Jam Faculty of Medical Sciences, Torbat Jam, Iran (Rahmanian); Department of Community Medicine, Kasturba Medical College, Manipal, Manipal Academy of Higher Education, Manipal, India (C. R. Rao); Department of Oral Pathology and Microbiology, Sharavathi Dental College and Hospital, Shimogga, India (S. J. Rao); Department of Radiation Oncology, All India Institute of Medical Sciences, New Delhi, India (Rath); WHO Collaborating Centre for Public Health Education and Training, Imperial College London, London, England, United Kingdom (D. L. Rawaf); Inovus Medical, St Helens, England, United Kingdom (D. L. Rawaf); Department of Primary Care and Public Health, Faculty of Medicine, Imperial College London, London, England, United Kingdom (S. Rawaf); Academic Public Health England, Public Health England, London, England, United Kingdom (S. Rawaf); Department of Computer Science, College of Arts & Sciences, Boston University, Boston, Massachusetts (Rawassizadeh); Department of Immunology and Laboratory Sciences, Sirjan School of Medical Sciences, Sirjan, Iran (Razeghinia); Department of Immunology, Kerman University of Medical Sciences, Kerman, Iran (Razeghinia); Endocrinology and Metabolism Research Institute, Tehran University of Medical Sciences, Tehran, Iran (Negar Rezaei); Research Center for Immunodeficiencies, Tehran University of Medical Sciences, Tehran, Iran (Nima Rezaei); Network of Immunity in Infection, Malignancy and Autoimmunity (NIIMA), Universal Scientific Education and Research Network (USERN), Tehran, Iran (Nima Rezaei); Department of Public Health, Masaryk University, Brno, Czech Republic (Riad); Czech National Centre for Evidence-based Healthcare and Knowledge Translation, Masaryk University, Brno, Czech Republic (Riad); Department of Medicine, Massachusetts General Hospital, Boston (Roberts); Harvard Medical School, Harvard University, Boston, Massachusetts (Roberts); Clinical and Epidemiological Research in Primary Care (GICEAP), Maimonides Biomedical Research Institute of Cordoba (IMIBIC), Cordoba, Spain (Romero-Rodríguez); Golestan Research Center of Gastroenterology and Hepatology, Golestan University of Medical Sciences, Gorgan, Iran (Roshandel); Department of Oral and Maxillofacial Surgery, JSS Academy of Higher Education and Research, Mysore, India (S., S. N.); Sharjah Institute for Medical Research, University of Sharjah, Sharjah, United Arab Emirates (Saddik); Department of Polymer Technology, Faculty of Chemistry, Gdańsk University of Technology, Gdańsk, Poland (Saeb); Multidisciplinary Laboratory Foundation University School of Health Sciences (FUSH), Foundation University, Islamabad, Pakistan (Saeed); Advanced Dental Sciences Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran (Safaei); Department of Medical Biochemistry, Rafsanjan University of Medical Sciences, Rafsanjan, Iran (Sahebazzamani); Medical Laboratory Sciences, Sirjan School of Medical Sciences, Sirjan, Iran (Sahebazzamani); Applied Biomedical Research Center, Mashhad University of Medical Sciences, Mashhad, Iran (Sahebkar); Biotechnology Research Center, Mashhad University of Medical Sciences, Mashhad, Iran (Sahebkar); Department of Immunology, Pasteur Institute of Iran, Tehran, Iran (Salek Farrokhi); Department of Entomology, Faculty of Science, Ain Shams University, Cairo, Egypt (Samy); Medical Ain Shams Research Institute (MARSI), Ain Shams University, Cairo, Egypt (Samy); School of Public Health and Health Management, University of Belgrade, Belgrade, Serbia (Santric-Milicevic); Faculty of Health and Social Sciences, Bournemouth University, Bournemouth, England, United Kingdom (Sathian); UGC Centre of Advanced Study in Psychology, Utkal University, Bhubaneswar, India (Satpathy); Udyam-Global Association for Sustainable Development, Bhubaneswar, India (Satpathy); Department of Medical Statistics, University of Zagreb, Zagreb, Croatia (Šekerija); Department of Epidemiology and Prevention of Chronic Noncommunicable Diseases, Croatian Institute of Public Health, Zagreb, Croatia (Šekerija); Emergency Department, Manian Medical Centre, Erode, India (Senthilkumaran); National Heart, Lung, and Blood Institute, National Institutes of Health, Rockville, Maryland (Seylani); Department of Radiology and Radiological Science, Johns Hopkins Medicine, Baltimore, Maryland (Shafaat); Department of Radiology and Interventional Neuroradiology, Isfahan University of Medical Sciences, Isfahan, Iran (Shafaat); Department of Chemistry, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran (Shahsavari); Department of Oral Health, Non-Communicable Diseases Research Center (NCDRC), Tehran, Iran (Shamsoddin); Non-Communicable Diseases Committee, National Institute for Medical Research Development (NIMAD), Tehran, Iran (Shamsoddin); Institute of Public Health, University of Gondar, Gondar, Ethiopia (Sharew); Faculty of Medicine, University of Azuay, Cuenca, Ecuador (Sharifi-Rad); Department of Biochemistry, Royal College of Surgeons in Ireland Medical University of Bahrain, Busaiteen, Bahrain (Shetty); Department of Public Health Dentistry, Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, India (Shivakumar); Department of International Studies, Non-Communicable Diseases Research Center (NCDRC), Tehran, Iran (Shobeiri); Department of Medical-Surgical Nursing, Nasibeh School of Nursing and Midwifery, Mazandaran University of Medical Sciences, Sari, Iran (Shorofi); College of Nursing and Health Sciences, Flinders University, Adelaide, South Australia, Australia (Shorofi); School of Pharmacy, Monash University, Selangor Darul Ehsan, Malaysia (Shrestha); Department of Hematology-Oncology, Baystate Medical Center, Springfield, Massachusetts (Siddappa Malleshappa); Department of Radiodiagnosis, All India Institute of Medical Sciences, Bathinda, India (P. Singh); Heersink School of Medicine, University of Alabama at Birmingham, Birmingham (J. A. Singh); Department of Medicine Service, US Department of Veterans Affairs, Birmingham, Alabama (J. A. Singh); Department of Community Medicine, Lady Hardinge Medical College, New Delhi, India (G. Singh); Department of Community Medicine, All India Institute of Medical Sciences, Jodhpur, India (G. Singh); Department of Epidemiology, School of Preventive Oncology, Patna, India (Sinha); Department of Epidemiology, Healis Sekhsaria Institute for Public Health, Mumbai, India (Sinha); Department of Nursing, Dire Dawa University, Dire Dawa, Ethiopia (Solomon); Center for Biotechnology and Microbiology, University of Swat, Mingora, Pakistan (Suleman); School of Life Sciences, Xiamen University, Xiamen, China (Suleman); National Institute of Epidemiology, Indian Council of Medical

Research, Chennai, India (Suliankatchi Abdulkader); Living Systems Institute, University of Exeter, Exeter, England, United Kingdom (Taheri Abkenar); Pathology Department, Alexandria University, Alexandria, Egypt (Talaat); Department of Surgery, National University of Singapore, Singapore, Singapore (Tan); Department of Cell Therapy and Applied Genomics, King Hussein Cancer Center, Amman, Jordan (Tbakhi); Department of Clinical Epidemiology, Leibniz Institute for Prevention Research and Epidemiology, Bremen, Germany (Thiyagarajan); Department of Epidemiology and Biostatistics, Birjand University of Medical Sciences, Birjand, Iran (Tiyuri); Department of Epidemiology and Biostatistics, Iran University of Medical Sciences, Tehran, Iran (Tiyuri); Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai, India (Tovani-Palone); Modestum LTD, Eastbourne, England, United Kingdom (Tovani-Palone); Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Mangalore, India (Unnikrishnan); Faculty of Information Technology, Ho Chi Minh City University of Technology (HUTECH), Ho Chi Minh City, Vietnam (Vo); Department of Medical Oncology, University of Medicine and Pharmacy "Grigore T Popa" Iaşi, Iaşi, Romania (Volovat); Department of Medical Oncology, Regional Institute of Oncology, Iaşi, Romania (Volovat); Department of Medicine, Vanderbilt University, Nashville, Tennessee (Wang); Competence Center of Mortality-Follow-Up of the German National Cohort, Federal Institute for Population Research, Wiesbaden, Germany (Westerman); Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka (Wickramasinghe); School of Public Health, Zhejiang University, Zhejiang, China (Xiao); Public Health Sciences Division, Fred Hutchinson Cancer Research Center, Seattle, Washington (Xiao); Hacettepe University Cancer Institute, Ankara, Turkey (Yuce); Department of Clinical Pharmacy and Outcomes Sciences, College of Pharmacy, University of South Carolina, Columbia (Yunusa); Epidemiology and Cancer Registry Sector, Institute of Oncology Ljubljana, Ljubljana, Slovenia (Zadnik); Research and Development Department, Sina Medical Biochemistry Technologies, Shiraz, Iran (Zare); School of Medicine, Faculty of Medical Sciences, Wuhan University, Wuhan, China (Zhang); Department of Nursing, Yasuj University of Medical Sciences, Yasuj, Iran (Zoladl); Division of Hematology-Oncology, Department of Pediatrics, University of Washington, Seattle (Force); Department of Preventive and Social Dentistry, Federal University of Rio Grande do Sul, Porto Alegre, Brazil (Hugo).

Author Contributions: Dr Force had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Drs Force and Hugo contributed equally to this work and are considered co–senior authors.

Concept and design: Cunha, Compton, Mishra, Drangsholt, Antunes, Ababneh, Abubaker Ali, Ahmed Rashid, Anyasodor, Arabloo, Athari, Attia, Azadnajafabad, Bashiri, Bouaoud, Braithwaite, Chen, Chung, Darwesh, Dessalegn, Dianati-Nasab, Djalalinia, El Sayed, Enyew, Fetensa, Fukumoto, Ghashghaee, Golechha, B. Gupta, V. Gupta, Hassan, Hassanipour, Hay, Hosseinzadeh, Isola, Javaheri, Kadashetti, Keykhaei, Khatib, Kompani, Lasrado, Lim, Mahumud, Meena, M. Mohammadi, Mokdad, Natto, Olagunju, Patel, Rahmani, Rath, Rawassizadeh, Nazila Rezaei, Nima Rezaei, Roberts, Samy, Satpathy, Senthilkumaran, Shahsavari, Shamsoddin, Sharew, Shivakumar, Thiyagarajan, Vo, Wickramasinghe, Zare, Force, Hugo.

Acquisition, analysis, or interpretation of data: Cunha, Xu, Drangsholt, Kerr, Acheson, Lu, Wallace, Kocarnik, Fu, Dean, Pennini, Henrikson, Alam, Abd-Elsalam, Abdoun, Abidi, Abu-Gharbieh, Adane, Addo, A. Ahmad, S. Ahmad, Akonde, Al Hamad, Alahdab, Alimohamadi, Alipour, Al-Maweri, Alsharif, Ansari-Moghaddam, Anwar, Arabloo, Aravkin, Aruleba, Asaad, Ashraf, Azadnajafabad, Azangou-Khyavy, Badar, Baghcheghi, Banach, Bardhan, Barqawi, Bashir, Benzian, Bernabe, Bhagat, Bhojaraja, Bjørge, Bouaoud, Briko, Calina, Carreras, Chakraborty, Chattu, Chaurasia, Chen, Cho, Chu, Chukwu, Chung, Cruz-Martins, Dadras, Dai, L. Dandona, R. Dandona, Daneshpajouhnejad, Darvishi Cheshmeh Soltani, Debela, Derbew Molla, Dessalegn, Dianati-Nasab, Digesa, S. Dixit, A. Dixit, El Sayed, El Tantawi, Erku, Ezzeddini, Fagbamigbe, Falzone, Fukumoto, Gaewkhiew, Gallus, Gebrehiwot, Gill, Goleij, Gomez, Gorini, Guimaraes, S. Gupta, V. K. Gupta, Haj-Mirzaian, Halboub, Halwani, Hanif, Hariyani, Harorani, Hasani, Hassan, Hassen, Hay, Hayat, Herrera-Serna, Holla, Horita, Hussain, Ilesanmi, I. Ilic, M. Ilic, Isola, Jaiswal, Jani, Jayarajah, Jayaram, Joseph, Kadashetti, Kandaswamy, Karanth, Karaye, Kauppila, Kaur, Khader, Khajuria, Khanali, Khatib, Khayat Kashani, Khazeei Tabari, Kim, Koohestani, Kumar, Kurmi, La Vecchia, Lal, Landires, Lasrado, Ledda, Lee, Libra, Lim, Listl, Lopukhov, Mafi, Mahumud, Malik, Mathur, Maulud, Meena, Mehrabi Nasab, Mestrovic, Mirfakhraie, Misganaw, Misra, Mithra, Mohammad, E. Mohammadi, Mokdad, Moni, Moraga, Morrison, Mozaffari, Mubarik, Murray, Nair, Narasimha Swamy, Narayana, Nassereldine, Natto, Nayak, Negru, Nggada, Nouraei, Nuñez-Samudio, Oancea, Olagunju, Omar Bali, Padron-Monedero, Padubidri, Pandey, Pardhan, Patel, Pezzani, Piracha, Rabiee, V. Radhakrishnan, R. Radhakrishnan, Rahmanian, C. Rao, S. Rao, Rath, D. Rawaf, S. Rawaf, Razeghinia, Negar Rezaei, Rezapour, Riad, Romero-Rodríguez, Roshandel, S., S. N., Saddik, Saeb, Saeed, Safaei, Sahebazzamani, Sahebkar, Salek Farrokhi, Samy, Santric-Milicevic, Sathian, Satpathy, Šekerija, Seylani, Shafaat, Sharew, Sharifi-Rad, Shetty, Shivakumar, Shobeiri, Shorofi, Shrestha, Siddappa Malleshappa, P. Singh, J. Singh, G. Singh, Sinha, Solomon, Suleman, Suliankatchi Abdulkader, Taheri Abkenar, Talaat, Tan, Tbakhi, Thiyagarajan, Tiyuri, Tovani-Palone, Unnikrishnan, Volovat, Wang, Westerman, Xiao, Yu, Yuce, Yunusa, Zadnik, Zhang, Zoladl, Force, Hugo.

Drafting of the manuscript: Cunha, Compton, Xu, Mishra, Drangsholt, Antunes, Lu, Wallace, Pennini, Abubaker Ali, A. Ahmad, Ahmed Rashid, Arabloo, Bardhan, Bashiri, Darwesh, Dessalegn, Dianati-Nasab, El Sayed, Fagbamigbe, Fukumoto, V. Gupta, V. K. Gupta, Haj-Mirzaian, Hassan, Horita, Hosseinzadeh, Isola, Javaheri, Kadashetti, Khatib, Meena, Mozaffari, Murray, Padubidri, Patel, Rahmani, D. Rawaf, Rawassizadeh, Riad, Saddik, Saeb, Saeed, Safaei, Samy, Satpathy, Seylani, Shahsavari, Sharew, Thiyagarajan, Force, Hugo.

Critical review of the manuscript for important intellectual content: Cunha, Compton, Mishra, Drangsholt, Antunes, Kerr, Acheson, Kocarnik, Fu, Dean, Henrikson, Alam, Ababneh, Abd-Elsalam, Abdoun, Abidi, Abubaker Ali, Abu-Gharbieh, Adane, Addo, S. Ahmad, Akonde, Al Hamad, Alahdab, Alimohamadi, Alipour, Al-Maweri, Alsharif, Ansari-Moghaddam, Anwar, Anyasodor, Arabloo, Aravkin, Aruleba, Asaad, Ashraf, Athari, Attia, Azadnajafabad, Azangou-Khyavy, Badar, Baghcheghi, Banach, Bardhan, Barqawi, Bashir, Benzian, Bernabe, Bhagat, Bhojaraja, Bjørge, Bouaoud, Braithwaite, Briko, Calina, Carreras, Chakraborty, Chattu, Chaurasia, Chen, Cho, Chu, Chukwu, Chung, Cruz-Martins, Dadras, Dai, L. Dandona, R. Dandona, Daneshpajouhnejad, Darvishi Cheshmeh Soltani, Debela, Derbew Molla, Dessalegn, Dianati-Nasab, Digesa, S. Dixit, A. Dixit, Djalalinia, El Sayed, El Tantawi, Enyew, Erku, Ezzeddini, Fagbamigbe, Falzone, Fetensa, Fukumoto, Gaewkhiew, Gallus, Gebrehiwot, Ghashghaee, Gill, Golechha, Goleij, Gomez, Gorini, Guimaraes, B. Gupta, S. Gupta, V. Gupta, Haj-Mirzaian, Halboub, Halwani, Hanif, Hariyani, Harorani, Hasani, Hassan, Hassanipour, Hassen, Hay, Hayat, Herrera-Serna, Holla, Hussain, Ilesanmi, I. Ilic, M. Ilic, Isola, Jaiswal, Jani, Jayarajah, Jayaram, Joseph, Kadashetti, Kandaswamy, Karanth, Karaye, Kauppila, Kaur, Keykhaei, Khader, Khajuria, Khanali, Khatib, Khayat Kashani, Khazeei Tabari, Kim, Kompani, Koohestani, Kumar, Kurmi, La Vecchia, Lal, Landires, Lasrado, Ledda, Lee, Libra, Lim, Listl, Lopukhov, Mafi, Mahumud, Malik, Mathur, Maulud, Meena, Mehrabi Nasab, Mestrovic, Mirfakhraie, Misganaw, Misra, Mithra, Mohammad, M. Mohammadi, E. Mohammadi, Mokdad, Moni, Moraga, Morrison, Mozaffari, Mubarik, Murray, Nair, Narasimha Swamy, Narayana, Nassereldine, Natto, Nayak, Negru, Nggada, Nouraei, Nuñez-Samudio, Oancea, Olagunju, Omar Bali, Padron-Monedero, Padubidri, Pandey, Pardhan, Patel, Pezzani, Piracha, Rabiee, V. Radhakrishnan, R. Radhakrishnan, Rahmanian, C. Rao, S. Rao, Rath, D. Rawaf, S. Rawaf, Razeghinia, Nazila Rezaei, Negar Rezaei, Nima Rezaei, Rezapour, Riad, Roberts, Romero-Rodríguez, Roshandel, S., S. N., Saddik, Saeed, Safaei, Sahebazzamani, Sahebkar, Salek Farrokhi, Samy, Santric-Milicevic, Sathian, Satpathy, Šekerija, Senthilkumaran, Seylani, Shafaat, Shamsoddin, Sharew, Sharifi-Rad, Shetty, Shivakumar, Shobeiri, Shorofi, Shrestha, Siddappa Malleshappa, P. Singh, J. Singh, G. Singh, Sinha, Solomon, Suleman, Suliankatchi Abdulkader, Taheri Abkenar, Talaat, Tan, Tbakhi, Thiyagarajan, Tiyuri, Tovani-Palone, Unnikrishnan, Vo, Volovat, Wang, Westerman, Wickramasinghe, Xiao, Yu, Yuce, Yunusa, Zadnik, Zare, Zhang, Zoladl, Force, Hugo.

Statistical analysis: Xu, Mishra, Drangsholt, Antunes, Acheson, Wallace, Kocarnik, Fu, Dean, Pennini, Abdoun, Abubaker Ali, Abu-Gharbieh, Adane, Ahmed Rashid, Al Hamad, Aravkin, Baghcheghi, Bhagat, Bouaoud, Chung, Dai, Darwesh, Derbew Molla, Dessalegn, Dianati-Nasab, Digesa, Ezzeddini, Fagbamigbe, Gaewkhiew, Gebrehiwot, B. Gupta, S. Gupta, Haj-Mirzaian, Hassen, Hayat, Hosseinzadeh, Javaheri, Joseph, Karaye, Khatib, Koohestani, La Vecchia, Lasrado, Meena, Misganaw, E. Mohammadi, Mokdad, Mubarik, Natto, Oancea, Olagunju, Patel, Rahmani, S. Rawaf, Rawassizadeh, Saddik, Salek Farrokhi, Samy, Sathian, Satpathy, Sharew, Sinha, Solomon, Vo, Westerman, Wickramasinghe, Xiao.

Obtained funding: Antunes, Ahmed Rashid, Darwesh, M. Mohammadi, Mokdad, Patel, Samy, Hugo.

Administrative, technical, or material support: Compton, Xu, Mishra, Lu, Kocarnik, Pennini, Alam, Addo, S. Ahmad, Alipour, Ansari-Moghaddam,

Anwar, Arabloo, Ashraf, Athari, Bardhan, Barqawi, Benzian, Briko, Chattu, Cho, Chukwu, Dadras, Dai, L. Dandona, R. Dandona, Dianati-Nasab, S. Dixit, A. Dixit, Fukumoto, Golechha, Guimaraes, Hariyani, Hasani, Hassan, Hay, Ilesanmi, Kadashetti, Kaur, Khader, Khajuria, Khatib, Landires, Lopukhov, Mafi, Mahumud, Malik, Mathur, Mehrabi Nasab, Mithra, M. Mohammadi, Mokdad, Mubarik, Natto, Nggada, Nuñez-Samudio, Pandey, Piracha, Rabiee, S. Rawaf, Nima Rezaei, Negar Rezaei, S. N., Saddik, Saeed, Safaei, Samy, Satpathy, Sharifi-Rad, Shivakumar, Shrestha, Sinha, Solomon, Suleman, Taheri Abkenar, Talaat, Tan, Tiyuri, Zhang, Force, Hugo.
Supervision: Compton, Antunes, Alam, Abd-Elsalam, Asaad, Attia, Banach, Bardhan, Briko, Calina, Chaurasia, Dessalegn, Dianati-Nasab, El Sayed, Fetensa, Fukumoto, Hay, Horita, Isola, Jaiswal, Keykhaei, Khatib, Khayat Kashani, Kompani, Lim, Lopukhov, Meena, Mokdad, Murray, Natto, Nayak, Padron-Monedero, Pezzani, Rath, D. Rawaf, Razeghinia, Nazila Rezaei, Nima Rezaei, Romero-Rodríguez, Saeed, Sahebzazmani, Samy, Senthilkumaran, G. Singh, Tan, Unnikrishnan, Vo, Volovat, Force, Hugo.

Conflict of Interest Disclosures: Dr Cunha reported grants from the São Paulo Research Foundation during the conduct of the study. Ms Compton reported grants from the Bill & Melinda Gates Foundation and St. Jude Children's Research Hospital, which partially funded their employment at the Institute for Health Metrics and Evaluation at University of Washington during the conduct of the study. Ms Xu reported grants from the Bill & Melinda Gates Foundation and St. Jude Children's Research Hospital during the conduct of the study. Prof Antunes reported support from the University of São Paulo School of Public Health during the conduct of the study and payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing, or educational events from the Ministry of Health (Brazil's official government agency). Dr Kerr reported grants or contracts from the National Institute of Dental and Craniofacial Research; payment for expert testimony; leadership or fiduciary roles in board, society, committee, or advocacy groups; paid or unpaid support from the American Board of Oral Medicine as a director; and other support from a Subaward budget. Ms Lu reported grants from the Bill & Melinda Gates Foundation and St. Jude Children's Research Hospital, which partially funded her employment at the Institute for Health Metrics and Evaluation at University of Washington during the conduct of the study. Dr Kocarnik reported grants from the Bill & Melinda Gates Foundation during the conduct of the study. Ms Dean reported grants from the Institute for Health Metrics and Evaluation during the conduct of the study. Dr A. Ahmad reported support from Shaqra University. Dr Anwar reported support from the NUS-UGM Seed Grant from the Tahir Foundation. Prof Benzian reported institutional support as a fellow at the Stellenbosch Institute of Advanced Study. Dr Dai reported grants from the Bill & Melinda Gates Foundation during the conduct of the study and grants from Bloomberg Philanthropies outside the submitted work. Prof Gill reported support from the National Institute for Health and Care Research as a senior investigator. The views expressed in this article are those of the authors and not necessarily those of the National Institute for Health and Care Research or the UK Department of Health and Social Care. Prof V. Gupta reported grant support from the National Health and Medical Research Council of Australia. Prof V. K. Gupta reported funding support from the National Health and Medical Research Council. Dr Hussain reported support from Operational Programme Research, Development and Education. Dr Joseph reported support from the Department of Community Medicine at Kasturba Medical College, Mangalore of the Manipal Academy of Higher Education. Prof Kauppila reported support from the Sigrid Jusélius Foundation and the Finnish Cancer Foundation. Prof Khatib reported support from the Global Evidence Synthesis Initiative (GESI) and the School of Epidemiology and Public Health at Datta Meghe Institute of Higher Education and Research (DMIHER). Prof Landires reported support as a member of the Sistema Nacional de Investigación (SNI), which is supported by Panama's Secretaria Nacional de Ciencia y Tecnologia (SENACYT). Dr Morrison reported grants from The Plastic Surgery Foundation outside the submitted work. Prof Nuñez-Samudio reported support as a member of the Sistema Nacional de Investigación (SNI), which is supported by Panama's Secretaria Nacional de Ciencia y Tecnologia (SENACYT). Dr Piracha reported support from the International Center of Medical Sciences Research (ICMSR). Prof R. Radhakrishnan reported support from Wellcome Trust/DBT India Alliance. Prof Riad reported support from the NPO Systemic Risk Institute (LX22NPO5101), funded by the European Union's NextGenerationEU. Dr Roberts reported personal fees from Biocon Biologics Ltd and grants from the National Cancer Institute outside the submitted work. Prof Saeed reported support from the International Center of Medical Sciences Research (ICMSR). Dr Samy reported support from Ain Shams University and the Egyptian Fulbright Mission Program. Dr Šekerija reported personal fees from Roche and Johnson & Johnson outside the submitted work. Dr Shahsavari reported support from the Institute for Advanced Studies in Basic Sciences (IASBS) Research Council. Mr Shrestha reported being a Doctor of Philosophy (PhD) student from the School of Pharmacy at Monash University Malaysia and received the Graduate Research Merit Scholarship to pursue his PhD. Prof J. Singh reported consultant fees from Scipher, Crealta/Horizon, MediSys, Fidia, PK Med, Two Labs, Adept Field Solutions, Clinical Care Options, ClearView Healthcare Partners, Putnam Associates, Focus Forward, Navigant Consulting, Spherix, Mediq, Jupiter Life Science, UBM LLC, Trio Health, Medscape, WebMD, Practice Point Communications, the National Institutes of Health, and the American College of Rheumatology; institutional research support from Zimmer Biomet Holdings; food and beverage payments from Intuitive Surgical/Philips Electronics North America; stock options in atai Life Sciences, Kintara Therapeutics, Intelligent Bio Solutions, Acumen Pharmaceuticals, TPT Global Tech, Vaxart, Aytu BioPharma, Adaptimmune Therapeutics, GeoVax, Pieris Pharmaceuticals, Enzolytics, Seres Therapeutics, Tonix Pharmaceuticals Holding Corp, and Charlotte's Web Holdings; previous stock options in Amarin, Viking, and Moderna; serving on the speaker's bureau of Simply Speaking; and serving as a member of Outcome Measures in Rheumatology (OMERACT), an organization that develops outcome measures in rheumatology and receives arms-length funding from 8 companies. Dr Suliankatchi Abdulkader reported support from Indian Council of Medical Research National Institute of Epidemiology. Mr Tovani-Palone reported support from the Saveetha Institute of Medical and Technical Sciences. Prof Unnikrishnan reported support from Kasturba Medical College, Mangalore of the Manipal Academy of Higher Education. Prof Yu reported support from the National Natural Science Foundation of China (No. 82173626). Dr Force reported grants from the Bill & Melinda Gates Foundation during the conduct of the study, as well as grants from St. Baldrick's Foundation and the American Society of Clinical Oncology, subcontracting for St. Jude Children's Research Hospital, and loan repayment from the National Institutes of Health Loan Repayment Program outside the submitted work. No other disclosures were reported.

Funding/Support: Financial support for Global Burden of Disease research was provided by the Bill & Melinda Gates Foundation.

Role of the Funder/Sponsor: The Bill & Melinda Gates Foundation had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Data Sharing Statement: See Supplement 2.

Additional Contributions: We thank the many cancer registries around the world that worked to generate data on cancer burden.

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