

## ORIGINAL ARTICLE

# Physician suicide demographics and the COVID-19 pandemic

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**Objective:** To identify suicide rates and how they relate to demographic factors (sex, race and ethnicity, age, location) among physicians compared to the general population when aggravated by the coronavirus disease 2019 (COVID-19) pandemic.

**Methods:** We searched U.S. databases to report global suicide rates and proportionate mortality ratios (PMRs) among U.S. physicians (and non-physicians in health occupations) using National Occupational Mortality Surveillance (NOMS) data and using Wide-ranging Online Data for Epidemiologic Research (WONDER) in the general population. We also reviewed the effects of age, suicide methods and locations, COVID-19 considerations, and potential solutions to current challenges.

**Results:** Between NOMS1 (1985-1998) and NOMS2 (1999-2013), the PMRs for suicide increased in White male physicians (1.77 to 2.03) and Black male physicians (2.50 to 4.24) but decreased in White female physicians (2.66 to 2.42).

**Conclusions:** The interaction of non-modifiable risk factors, such as sex, race and ethnicity, age, education level/healthcare career, and location, require further investigation. Addressing systemic and organizational problems and personal resilience training are highly recommended, particularly during the additional strain from the COVID-19 pandemic.

**Keywords:** Suicide; physician suicide; mortality; psychiatric disorders; public health; sex; race; ethnicity; COVID-19

## Introduction

Suicide accounts for about 800,000 deaths per year globally. The most common methods are pesticide ingestion, hanging, and firearms.<sup>1</sup> The World Health Organization (WHO) estimated that 1.53 million people worldwide would die of suicide in 2020.<sup>1,2</sup> From 2006 to 2015, the United States recorded 1,222,419 fatal and non-fatal suicide attempts,<sup>3</sup> and fatal attempts nearly doubled between 1980 and 2016 (from 26,869 to 44,965 suicides).<sup>4,5</sup> Suicide remains one of the top 10 causes of mortality in U.S. men of every race except Black.<sup>6</sup> A recent systematic review and meta-analysis of physician suicides found that occupation and sex were major risk factors.<sup>7</sup> Similar trends were also demonstrated by Duthel et al.<sup>8</sup>

In the aforementioned meta-analysis,<sup>7</sup> we found that since 1980, male and female physician suicides have decreased, although the risk of suicide remained much

higher in female physicians than women in the general population (46% higher), while male physicians currently have a lower risk than men in the general population (34% lower). In contrast to our results,<sup>7</sup> Schernhammer & Colditz<sup>9</sup> found that before 1980, the risk of death by suicide was 41% higher for male physicians and 127% higher for female physicians than the general population.

Since physician suicides do not receive sufficient attention to mitigate the risk, we investigated how important risk factors, such as location, age, race and other demographics, interact with and influence physician death by suicide.

Sex, race and ethnicity, and age are non-modifiable suicide risk factors that influence suicide rates in physicians compared to the general population in complex ways and with multiple interactions. Due to the additional strain that coronavirus disease 2019 (COVID-19) is causing health professionals, the question remains

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whether the pandemic is changing the risk of physician or overall suicide among different populations. To address this gap, we assessed how major suicide risk factors may interact with the COVID-19 pandemic in physicians.

## Methods

To expand on the results of our recent meta-analysis on physician suicide, we retrieved comparable suicide data on physicians and the general population after conducting searches in WHO, U.S. National Occupational Mortality Surveillance (NOMS), and U.S. Centers for Disease Control and Prevention (CDC) datasets, such as the Wide-ranging Online Data for Epidemiologic Research (WONDER) and the Web-based Injury Statistics Query and Reporting System, as well as Association of American Medical Colleges publications.<sup>7</sup> We were unable to obtain data that directly compared physician suicides rates to those of the general population, so we could not reliably estimate the standardized mortality ratios (SMRs) of these populations. Physician SMR is the ratio between the suicide deaths in physicians (observed) and suicide deaths in the general population (expected);  $SMR = O/E$ , where O equals total physician suicides/total physician population and E equals total population suicides/total population using the same age groups, locations, and year ranges.<sup>10</sup>

Therefore, we adopted a different approach, analyzing proportional mortality ratio (PMR) data for both physicians and the general population using the NOMS and WONDER datasets. Physician PMR indicates the ratio of physician-suicide proportionate mortality (i.e., suicides divided by all-cause mortality in physician populations) to general population-suicide proportionate mortality (i.e., suicides divided by all-cause mortality in the general population).<sup>10</sup> We selected the age range 18-90 in the NOMS datasets (the options are 18-64, 64-90, and 18-90). We were unable to calculate general population PMRs using the NOMS query system since populations

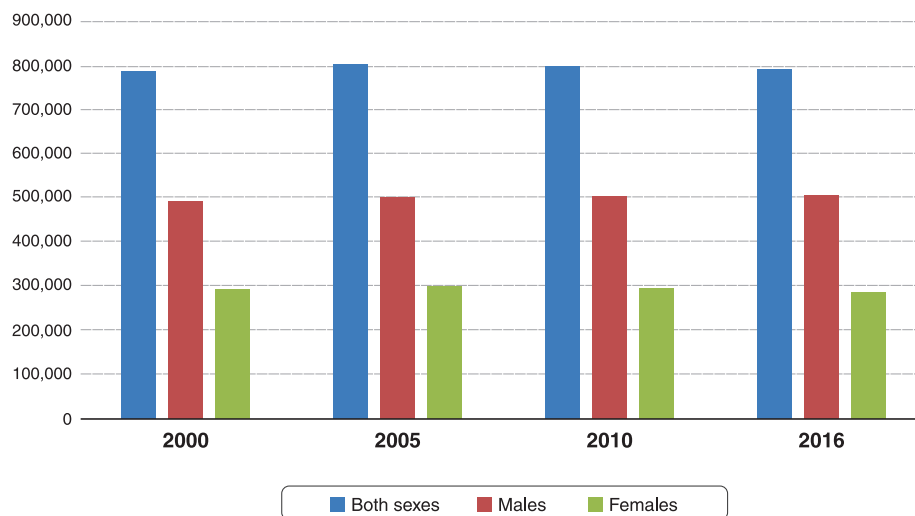
were classified by occupation, and values are suppressed when there were fewer than five suicides (for the same reason, we could not calculate all-cause mortality). We instead evaluated the WONDER1 and WONDER2 datasets for the general population (White and Black men and women aged 20 to 85+ [the closest age range we could select]) in the U.S. states and time periods corresponding to NOMS1 and NOMS2 (1985-1998, and 1999, 2003-2004, 2007-2013, respectively) and calculated the PMRs. Unlike in NOMS, the ages of the general population were subdivided into several strata in WONDER. We calculated age-specific PMRs (seven strata between ages 20 and 84 for women and eight strata between age 20 and 85+ for men), averaged the PMRs, obtained the confidence limits of the mean PMRs and obtained crude PMRs combining deaths across all age strata.

## Results

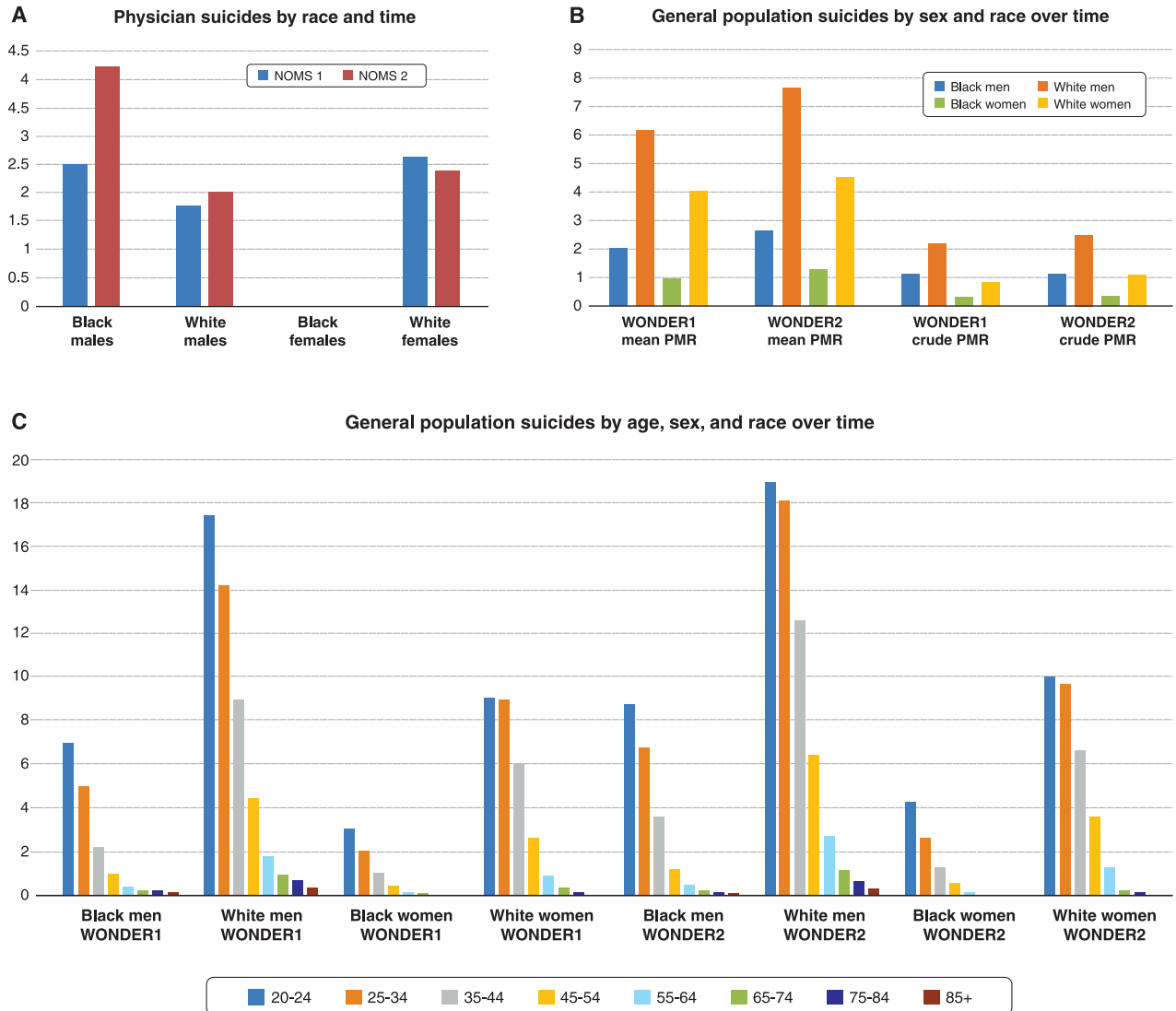
### Age, sex, and race

The WHO Global Health Estimates suicide counts (2000, 2005, 2010, 2016) were similar across time and age groups for both sexes, both combined and separately, in the general population (Figure 1).

The suicide risk in NOMS1 and especially NOMS2 appeared to be much higher for Black than White male physicians (Figure 2A).<sup>7</sup> The PMR for suicide spiked in Black male physicians and increased substantially in both time periods (from 2.50 to 4.24, with the 95% confidence interval [95%CI] shifting from 1.08-4.92 to 2.12-7.59) and was higher than the PMR of Black men in the general population. Among Black men in the general population, the mean PMRs rose somewhat (but were nonsignificant) between WONDER1 and WONDER2<sup>8</sup> (2.03 vs. 2.67; 95%CI 0.22-3.83 vs. 0.32-5.01), and the crude PMRs were much lower (1.12 vs. 1.14) than mean PMRs. Notably, ages 20 to 24 had the highest PMR (6.96 vs. 8.71) (Figure 2B and C) (supplementary material – Tables



**Figure 1** World Health Organization Global Health Estimates of suicide across all ages (5-70+) for males, females, and both sexes.



**Figure 2** PMRs for suicide among Black/White male/female physicians (A) in NOMS in contrast with WONDER mean and crude PMRs for suicide among Black/White men and women in the general population (B and C); PMRs by age strata (C) including ages up to 84 years for women and 85+ years for men. The NOMS1 and WONDER1 datasets reflect 1985-1998 data; NOMS2 and WONDER2 datasets reflect 1999, 2003-2004, 2007-2013 data. The physician PMRs are significant in (A) but were unmeasured for (B) and (C), apart from the mean PMRs, which were significant for White men and women. NOMS = U.S. National Occupational Mortality Surveillance; PMR = proportionate mortality ratio; WONDER = U.S. Wide-ranging Online Data for Epidemiologic Research.

S1 and S2). Although the PMRs for Black men increased in almost all age strata over time, the PMRs for Black male physicians appeared to be even higher, rising more sharply and having a different age distribution (since U.S. physicians under 24 years of age are rare).

Meanwhile, the mean PMRs for suicide among White male physicians also increased (and were significant) from NOMS1 to NOMS2 (1.77 to 2.03, with the 95%CI shifting from 1.60-1.96 to 1.81-2.27). However, White male physicians appeared to have lower PMRs overall than White men in the general population, for whom the mean PMRs in WONDER1 and WONDER2<sup>8</sup> increased and were significant (6.14 vs. 7.62; 95%CI 1.50-10.78 vs. 2.17-13.07, respectively), including much lower crude

PMRs (2.18 vs. 2.49). Again, individuals aged 20 to 24 had the highest PMRs (17.51 vs. 18.94) (Figure 2B and C, Tables S1 and S2).

The PMRs for suicide among White female physicians dropped slightly from 2.66 to 2.42 (higher than those of White male physicians in both cases), with the 95%CI also dropping from 1.92-3.60 to 1.80-3.18 (Figure 2A).<sup>7</sup> In White women in the general population, the mean PMRs increased somewhat (and were significant) between WONDER1 and WONDER2<sup>8</sup> (4.02 vs. 4.55; 95%CI 1.08-6.97 vs. 1.37-7.74), including much lower crude PMRs (0.86 vs. 1.08). Again, individuals aged 20 to 24 had the highest PMRs (9.10 vs. 10.04) (Figure 2B and C, Tables S1 and S2). The PMRs for White women

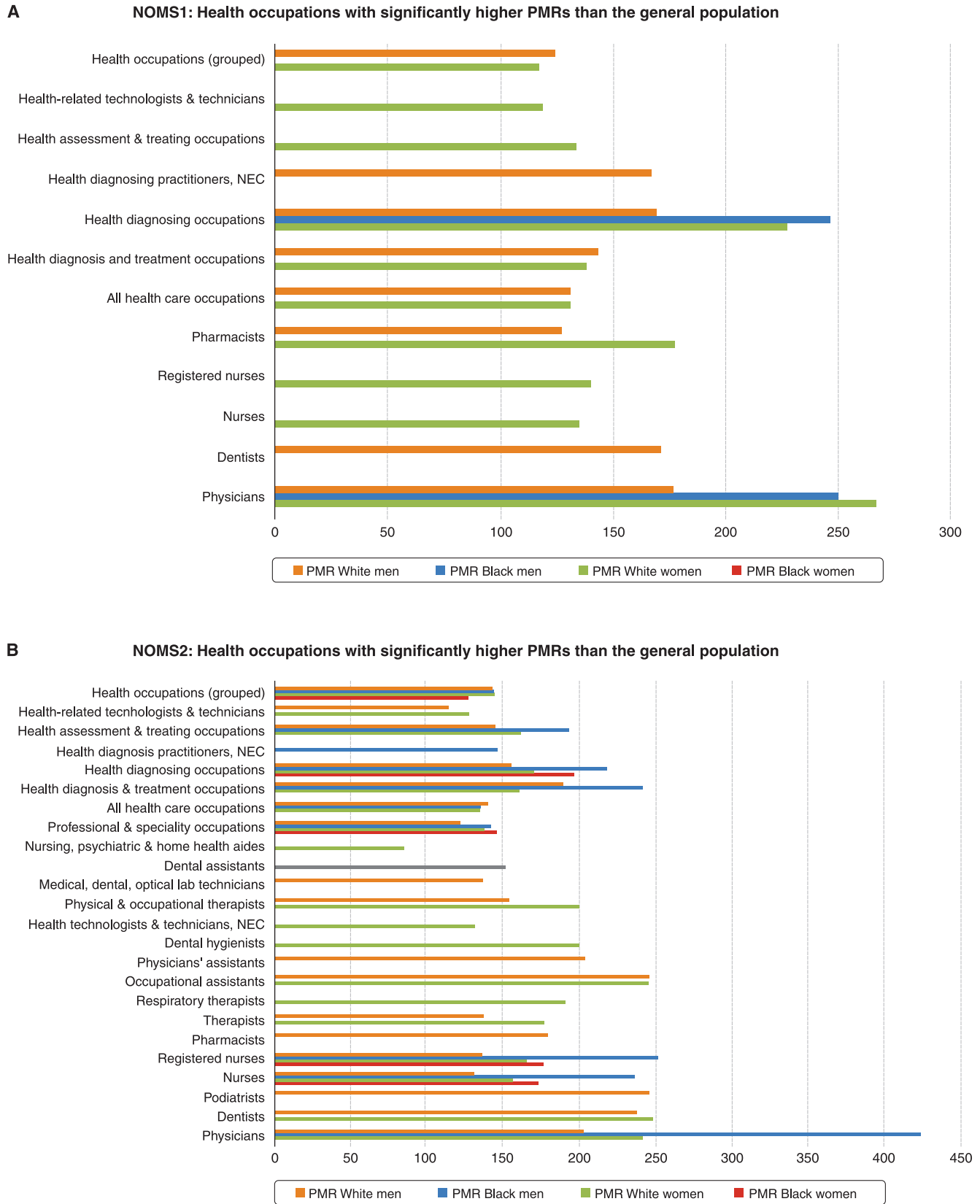


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**Figure 3** (continued) PMRs for suicide among White and Black men and women in different health occupations, including physicians in the U.S. NOMS1 and NOMS2 datasets. The Y axis shows health occupations (individual and grouped) whose suicide PMRs are significant (compared to all-cause mortality) for either race or sex. The X axis shows PMRs (all significant at  $p < 0.01$ , except for the following, which are significant at  $p < 0.05$ ; NOMS1: Black male physicians, and White male and female pharmacists; NOMS2: White female dentists, White male podiatrists, physical and occupational therapists, medical, dental and optical lab technicians, and health-related technologists and technicians, and Black female health occupations grouped). Note that the PMR scale of NOMS2 is greater than NOMS1 due to the much higher Black male physician PMRs. NOMS2 has a larger list of occupations, more of which had significantly elevated PMRs. NEC = not elsewhere classified; NOMS = U.S. National Occupational Mortality Surveillance; PMR = proportionate mortality ratio.

increased over time in all age strata under 65 years and decreased somewhat over time for age 65 and older. Thus, the PMRs for suicide among female physicians decreased somewhat over time but remained higher than those of male physicians, and likely lower than the PMRs of White women in the general population (crude rates are less reliable), although, again, the age distribution was probably different.

Meanwhile, the PMRs for suicide among Black female physicians were unavailable in NOMS1 and NOMS2 ( $< 5$  deaths). In Black women in the general population, the mean PMRs were nonsignificant but rose somewhat between WONDER1 and WONDER2<sup>B</sup> (0.97 vs. 1.28; 95%CI 0.12-1.82 vs. 0.08-2.47), and crude PMRs were much lower (0.33 vs. 0.34). Individuals aged 20 to 24 had the highest PMRs (3.01 vs. 4.27) (Figure 2B and C, Tables S1 and S2). The PMRs for Black women increased over time in all age strata until 64 years, even when the PMRs were less than 1.

#### Sex and education level

We also investigated the suicide rates among health care professionals with high vs. low educational levels. We performed an additional search regarding the PMRs for suicide among different health occupations in the United States (including race and sex) (Figure 3, Tables S3 and S4). We found no specific occupations with significant suicide PMRs among Black women (i.e., significant suicides per occupation compared to suicides in the general population), except for nurses and registered nurses in NOMS2, whose PMRs were somewhat higher in Black women than in White women, yet much lower than those of Black men – all those PMRs were significant (note, Black male nurses and registered nurses did not have significant suicide PMRs in NOMS1). In NOMS2, Black male physicians again had by far the highest PMRs for suicide of any group or time period, suggesting that the PMRs for Black male physicians and nurses increased in the second time period. However, White men and/or women had the highest PMRs for suicide in most health occupations in both time periods (Figure 3A and B, Tables S3 and S4).

#### Suicide location

In Global Health Estimates 2016: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2016 (WHO<sup>11</sup>), suicide rates in the general population vary by location (Figure 4). In the 2008 Global Burden of Disease Death

Estimates for WHO Member States, suicide death estimates (age 15-60+) were much higher in the United States for both males and females (27.6 and 7.6 respectively) than in the United Kingdom (3.6 and 1.1 respectively).<sup>11</sup> However, the highest suicide rates were in India, followed by China, the Russian Federation, and the United States, with the effects of age varying by country (e.g., the suicide rates in India were highest between 15-59 years of age and dropped sharply in older adults, but age discrepancies were not large in China – Figure 4D).<sup>11</sup> Meanwhile, over 5% of U.S. physicians are international medical graduates from India.<sup>12</sup> However, no data were available on Asian-American physician suicide rates, making it difficult to determine cultural effects. Considering the ethnic variation in different countries and the varying accuracy of suicide reports, the relationship between location and ethnicity is not entirely clear. Other factors may be contributing to the rise in suicides in the United States and other places, even while they dropped in Europe,<sup>11</sup> such as suicide prevention programs (further discussed below). Finally, U.S. suicide rates in urban and rural areas were 11.1 and 20 per 100,000, respectively, in 2017 (increasing by 16 and 53%, respectively, since 1999), i.e., rural suicide rates increased 1.8 times more than urban rates.<sup>13</sup>

We are not aware of global databases that compare suicide among physicians in different countries. The International Labor Organization reports on overall fatal occupational injuries by sex, migrant status, and economic activity, which includes the label “human health and social work activities” but does not classify by specific occupation or cause of death, and the countries included vary by year.<sup>14</sup> Therefore, we addressed mainly general populations, although we highlighted certain details about physicians.

## Discussion

### Age, sex, and race

Global suicide rates were higher among individuals aged 15 to 59 than among those aged 60 years or older (Figure 4), while the suicide risk among physicians was higher in those aged 55 or older.<sup>7</sup> Due to the broad time span involved in the global suicide data, as well as the fact that physicians tend to be older, we cannot rule out peaks comparable to those of the population. However, of the 31,636 U.S. adult suicides reported between 2003 and 2008, the physicians were older than the non-physicians (mean ages 59 and 47 years, respectively), although it is unclear how physician age compares to that

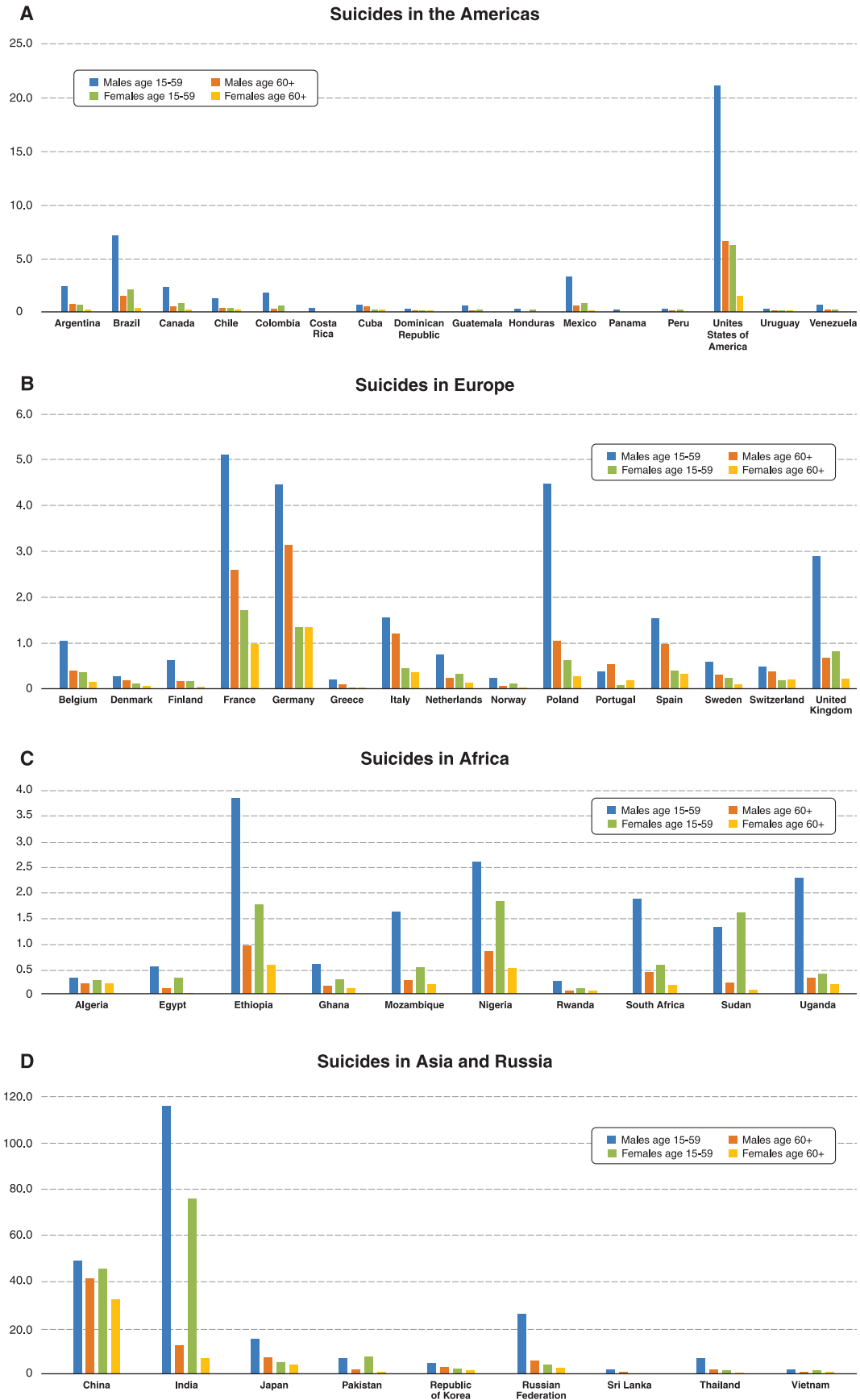


Figure 4 Continued on next page

**Figure 4** (continued) Suicide death estimates for males and females aged 15 to 59 and 60+ in the Americas (A), Europe (B), Africa (C), and Asia/Russian Federation (D) according to the 2008 Global Burden of Disease Death Estimates for World Health Organization Member States. The Y axis includes suicide estimates, i.e., death by self-inflicted injury (Global Burden of Disease code 157), with each member state's age-specific death rate applied to the WHO global standard population. The X axis includes member states selected for high suicide rates or to demonstrate variability within regions.

of the general population overall.<sup>15</sup> Moreover, the age-risk effect seems influenced by sex and race.

The suicide risk appeared to be much higher for Black than White male physicians, although the suicide risk for White male physicians was also significant and increased over time. The suicide PMRs for White men increased in almost every age stratum over time and were higher than those of Black men. In addition, crude suicide rates (per 100,000) increased between WONDER1 and WONDER2 in White men aged 24 to 64 (i.e., mostly working age) and decreased in the other age groups; conversely, crude rates of all-cause mortality decreased across all age strata over time (Tables S5 and S6). This suggests that despite improved overall health in White men, those of working age tended to be more suicidal than in the previous time period. The crude suicide rates were much higher in White than Black men in both time periods. Conversely, all-cause mortality was much higher in Black than White men in all age strata except for those aged 85 years or older (Tables S5 and S6). Crude rates of suicide and all-cause mortality decreased across all age strata in Black men (Tables S5 and S6), suggesting that suicides did not improve to the same degree as all-cause mortality over time. It is unclear whether this effect was even more pronounced in Black male physicians, leading to higher PMRs.

The reason for the discrepancy between White and Black male physicians is unclear. One possibility is that being a physician mitigates the elevated risk of all-cause mortality in Black men (e.g., due to higher education and socioeconomic status) and this mitigation increased over time. Another possibility is that Black male physicians in the United States are more suicidal, but why would that be the case? We considered the possibility of additional stress due to racial discrimination and underrepresentation among physicians. Between 1978 and 2008, the annual number of Black male medical school graduates in the U.S. dropped somewhat (from 474 to 429). Conversely, White male medical school graduates peaked in 1982 (over 10,000) and have since gradually dropped to 5,346 in 2008. Therefore, Black men are somewhat less likely to graduate from medical school, and Black men remain underrepresented in the field compared to White men. This disparity could reflect systemic factors that increase the stress of being a Black male physician in the United States.<sup>16</sup>

Meanwhile, it is possible that for White men, extreme social and financial stressors have a greater impact on suicidality than all-cause mortality. However, White male physicians may be relatively protected during economic downturns, reducing the high suicide risk seen in White men in the general population.

Regarding women, although crude PMRs are less reliable due to the effects of age, it is notable that crude suicide rates increased and then decreased among White

women in all age strata under 65. Crude all-cause mortality rates decreased across all age strata, although the effect was more pronounced beginning at age 55 (Tables S5 and S6). Conversely, the crude suicide rates of Black women only increased between the ages of 20 and 24 years and decreased thereafter, while crude all-cause mortality rates increased across all age strata.

In the WONDER datasets, the highest crude rates of all-cause mortality were in Black men, followed by White men and Black women, and the lowest rates were in White women (Table S5). Conversely, the highest crude suicide rates were consistently in White men, followed by Black men and White women (who overtook the rate of Black men between age 45 and 64 in WONDER2); the lowest rates were in Black women (Table S6). Thus, it seems that in the United States, despite elevated PMRs for suicide in younger age groups, Black women, and perhaps especially Black female physicians, may be more resilient against suicide, unlike Black male physicians. Conversely, these groups are probably exposed to and impacted differently by a distinct pattern of risk and protective factors. For example, Black male physicians could be exposed to a myriad of risk factors and may be resilient enough to avoid higher suicide rates. Thus, Black male physicians could be more resilient than Black women/Black female physicians, despite their higher rates of suicide.

Additionally, common suicide methods used by women and men (with the latter usually being more lethal) can also influence the outcome. It is important to note, however, that since we were unable to estimate the confidence limits for most of the PMRs, we calculated those for the general population and their PMRs had a decreasing age gradient (Figure 2C). The different measures and calculation methods require careful assessment to uncover underlying issues that affect Black/White, male/female, and physician/non-physician suicides.

Unfortunately, there is no suicide data on the large number of physicians of Asian or Hispanic/Latino origin (both U.S. and international graduates), and there is also no suicide data on American Indians and Alaska Natives (who may be at higher risk, but represent a small fraction of physicians).<sup>16</sup> Between 1997 and 2008, 75% of the U.S. medical school graduates practicing medicine were White, 6.3% were Black, 12.8% were Asian, 5.5% were Hispanic/Latino, and only 0.5% were American Indian/Alaska Native.<sup>17</sup> Finally, considering the ethnic makeup of different countries and the varying accuracy of suicide reports, the contribution of ethnic background vs. location is not entirely clear.

#### Sex and educational level

The PMRs for suicide in White and Black men and women were significantly higher than all-cause mortality in

different health occupations (including physicians) in the NOMS1 and NOMS2 datasets. However, PMR differences according to educational level varied by sex, race, occupation, and dataset. For instance, in NOMS1 the PMRs for health diagnosis occupations and physicians had similar trends among men, while in NOMS2 the PMRs for physicians were clearly higher. White female physicians had much higher PMRs than White female nurses in NOMS1 and NOMS2. No PMRs for male nurses (or Black female nurses) were significantly higher in NOMS1, although in NOMS2 the PMRs for White and especially Black male physicians were higher than their White and Black male nurse counterparts (Figure 3). The PMRs for Black female nurses were higher than those of White female nurses – there were no PMRs for Black female physicians. However, in NOMS1 (not available in NOMS2) the PMRs for White female pharmacists fell in between those of White female nurses and physicians. In NOMS2 the PMRs for occupational therapists were comparable among White men and women, and both were higher than their White male and female physician counterparts. Therefore, we are unable to give a definitive statement on whether higher/lower education or sex/race could be associated with higher/lower PMRs for suicide.

### *Suicide location*

Location can affect death by suicide in three ways: 1) the geographic location and its features (e.g., country, state/province, urban vs. rural); 2) the acceptability of and access to lethal means (e.g., firearms, suffocation, poisoning, overdose on self-prescribed medications); 3) occurrence at or near the workplace.

Across the six WHO regions, the incidence of suicide differed by a factor of four between the region with the highest rate (Europe) and the region with the lowest rate (the Eastern Mediterranean, including the Middle East).<sup>1,18,19</sup>

Suicide rates in the general population are higher in rural than urban regions in the United States and many other countries.<sup>20</sup> The higher suicide risk in rural areas may be due to factors such as increased isolation, access to lethal means (e.g., firearms, pesticides), and social beliefs, stigmatization, or lack of access to mental health treatment.<sup>21</sup> A study on rural female physicians found that their work and personal demands were balanced and that they achieved long-term career satisfaction by adopting flexible work hours, setting clear boundaries between their professional and private lives, and by establishing supportive relationships.<sup>22</sup> These results could guide strategies aimed at reducing physician burnout and death by suicide in rural areas.

An Australian study found that individuals in occupations that provide access to lethal means die of suicide using those means at significantly higher rates (3.02 vs. 1.24 respectively for women and men) than those without access to such means, although the risk by specific occupation can vary.<sup>23,24</sup> It appears that countries, states, and cities with more firearms have a higher prevalence of suicide by firearm than other methods. The United States has nearly twice as many civilian-held firearms per capita (estimate: 120.5 firearms/100 civilians) as any other

country,<sup>11</sup> and 52% of completed U.S. suicides were by firearm (343,389 deaths aged 20-85+ from 1999-2017). The second and third most common suicide methods in the United States were suffocation (22.62%) and poisoning (17.28%), although together they led to fewer suicide deaths than firearms.<sup>25</sup> Likewise, physician suicides by firearm are more common in states with more firearms than in those with fewer firearms (e.g., California).<sup>7</sup> Our systematic review showed that countries with fewer firearms (e.g., in Western Europe) had fewer firearm-related suicides.<sup>7</sup>

Furthermore, suicide methods vary within countries. For example, in the general population of France, suicide by hanging is prevalent in Northwestern regions (~ 60%), while suicide by firearms is more common in Southern France (e.g., Corsica, which has the highest rate of firearms per capita in France). However, relatively uncommon methods of suicide, such as by drowning or jumping from a height, may be related to regional geography (e.g., drowning in Pays de la Loire is more than double the national average). The suicide rate for French physicians was 14% in 1999, compared to 5.6% in the general population,<sup>26</sup> but whether the methods differed is unclear.<sup>11,27</sup> Meanwhile, restricting access to lethal means is known to reduce suicides<sup>28</sup> and may be particularly helpful to reduce impulsive suicides.<sup>29</sup>

While scientific studies have not addressed this issue, anecdotal evidence indicates that physicians often die of suicide in hospitals,<sup>30</sup> which may be consistent with workplace suicides in the general population. For example, between 2008 and 2013, workplace suicide was the second leading cause of workplace fatalities (15.2%) in Massachusetts, and a job-related issue contributed to 8% of workplace suicides.<sup>31</sup> By comparison, suicide accounted for 5.6% of workplace fatalities nationally, though suicide rates in Massachusetts were lower than the national average during those years. One explanation for this could be that Massachusetts had a more accurate reporting system than other states.<sup>32</sup>

### *COVID-19 considerations*

As of mid-June 2020, 24% of the deaths in which the race is known occurred in Black people, despite their being only 13% of the U.S. population.<sup>33</sup> Racial inequalities in the United States have also led to increased COVID-19 risk among vulnerable groups.<sup>34</sup> The effects of crowding, unsafe living conditions, air pollution, poor nutrition, chronic disease, violence, lack of financial resources, and health insurance have contributed to disproportionate suffering among the Black community and other minority communities. In addition, racial discrimination may lead to inadequate health care.<sup>35</sup> Notably, as of June 11th, 2021, the CDC COVID Data Tracker showed non-Hispanic Black people had the lowest single or full-dose vaccination rates of any group.<sup>36</sup>

It is unclear how the moral injury related to such factors affects suicide rates among Black people in the general population and Black physicians compared to all-cause mortality (which would include complications from COVID-19 infections).<sup>33,37</sup> A U.S. study may have begun



to answer this intricate puzzle, since it showed changing suicide trends during the pandemic: opposite effects observed between Black and White residents of Maryland.<sup>38</sup> Among Black residents, suicide mortality appeared to double during the period of progressive closings and reopenings after the first COVID-19 case in Maryland, while suicide mortality appeared to have nearly halved among White residents during the same period.<sup>38</sup> Nevertheless, more studies addressing race are needed to understand the real influence of the COVID-19 pandemic on suicide trends.

Although the Italian experience alerted many countries to take COVID-19 seriously, the response varied widely. We would expect a lower additional suicide risk in physicians and populations who reside in areas that responded early and vigorously to the pandemic, such as South Korea, Hong Kong, New Zealand, and Australia, although the baseline risk may have been relatively high. Meanwhile, the United States has the highest number of confirmed cases (over 33 million) and deaths (over 596,000), and Brazil has the third and the second highest numbers, respectively, with nearly 17 million cases and nearly 471,000 deaths.<sup>39</sup> The United States has the highest suicide rate in the Americas, followed by Brazil (Figure 4A), and with PMRs for suicide being high among U.S. physicians, the effects on physician mental health are a serious concern. Moreover, while African countries tend to have lower suicide rates, COVID-19 cases are accelerating; in June 2021, there was an increase in the weekly case incidence by over 20% for a second consecutive week, while deaths increased for a third week consecutively, although at a lower rate.<sup>39</sup> More than 75% of African COVID-19 deaths have occurred in four countries: Nigeria, South Africa, Ethiopia, and Algeria. These are some of the most populous countries on the continent and Nigeria, South Africa, Ethiopia also had relatively high pre-pandemic suicide rates, although Algeria had a low suicide rate in 2008 (Figure 4C).<sup>40</sup> Due to overcrowding and poor sanitary conditions in many places, including healthcare facilities, limited response capacity, stigma, and other factors, many physicians are not only under tremendous stress at work, but may also fear spreading the infection to patients, families, and neighbors.<sup>41</sup> Additionally, stay-at-home orders, if enforced, may affect workers in African countries to a much greater extent than in the United States or in high-income countries with better social safety nets.

In Japan, a January 2021 study found that the suicide rate in the general population had declined substantially during the first wave of the COVID-19 pandemic (by 14% from February to June 2020), but increased rapidly during the second outbreak (by 16% from July to October 2020), with an even greater percentage (38%) in the final month of the study period (October 2020).<sup>42</sup> Moreover, the increase in suicide fatalities in the second wave was driven primarily by women, children, and adolescents (individuals under 20 years of age). Suicide mortality increased by 37% among females, about five times more than the effect in males.<sup>42</sup> Nevertheless, an April 2021 study showed an opposite trend.<sup>43</sup> It used observed vs. expected numbers of suicides to calculate suicide rate

ratios and 95%CI from 21 countries (16 high-income and five upper-middle-income countries, including whole-country data from 10 countries and data from various areas in 11 countries). It showed no evidence of a significant increase in suicide risk in any country or area since the pandemic began. On the contrary, there was statistical evidence of a decrease in suicide compared with the expected rate in 12 countries or areas. In high-income and upper-middle-income countries, the suicide rate remained largely unchanged or declined in the early months of the pandemic compared with the expected levels based on pre-pandemic data.<sup>43</sup>

U.S. firearm sales skyrocketed in March 2020 amid the COVID-19 pandemic, and rates have remained 80% higher than the same months in 2019.<sup>44</sup> An increase in firearm-related suicide may be occurring due to a confluence of risk factors, including increased access to guns, substantial economic loss, disrupted social networks, and increasing stress levels.<sup>45</sup>

The COVID-19 pandemic has had detrimental effects on the workplaces of physicians. Full hospitals, shortages of personal protective equipment, inadequate testing for severe acute respiratory syndrome coronavirus 2, redeployment/volunteering to work in areas with low expertise, financial problems (furloughs, pay cutbacks, cancellation of nonessential visits, and elective procedures) have intensified stress during long working hours amidst the uncertainty of the pandemic.<sup>46</sup> Additionally, moral injury from anti-lockdown protesters, negligent community members, and dismissive governmental authorities in certain regions has led to unprecedented spikes in physician distress and may have increased the suicide risk.<sup>47</sup> Rapid vaccine development and distribution may have helped alleviate some stress, at least in high-income countries such as the United States, where most adults have received at least one vaccine dose, and health care workers, including physicians, were the first in line.<sup>36</sup> Meanwhile, vaccine supplies in lower-income countries are quite limited and the COVAX distribution initiative began only recently.<sup>48</sup> To date, no country has reached the vaccination levels required for herd immunity, although the actual percentages required to reach herd immunity and the duration of vaccine effectiveness remain unclear.<sup>49</sup>

Finally, in a six-month retrospective cohort of 36,379 patients diagnosed with COVID-19, the estimated incidence of a neurological or psychiatric diagnosis was 33.62% (95%CI 33.17-34.07), with 12.84% (12.36-13.33) receiving their first such diagnosis.<sup>50</sup> For patients who had been admitted to an intensive treatment unit, the estimated incidence of a diagnosis was 46.42% (44.78-48.09), while the estimated incidence of a first diagnosis was 25.79% (23.50-28.25).<sup>50</sup> Since a previous history of psychiatric disorders is a suicide risk factor in the general population and among physicians, COVID-19 could have a multivariate influence on suicide outcomes.<sup>7</sup>

#### *Addressing physicians' challenges*

Certainly, developing a "culture of health" that addresses "health and well-being across all social domains" will be critical.<sup>33,51</sup> On a general level, we should address social

inequalities affecting vulnerable populations, such as older adults, minorities, and women. Regarding physicians, further investigation is needed into the factors that influence suicide rates by age, sex, and race. In the United States and globally, a better understanding of physician workforce challenges could be obtained by expanding existing investigations on physician diversity, such as the Minority Physician Database of the U.S. Association of American Medical Colleges Data Warehouse.<sup>17</sup> It is also advisable to survey physicians of different demographic backgrounds about relevant challenges in work and life. One possibility is active mentorship programs for all physicians as they go through training and join the independent workforce, focusing on the challenges they may face as individuals with interacting demographic and career factors, including mentors who actively follow them throughout their careers.<sup>52</sup>

Regarding the lack of global data on physician suicides, it may be particularly helpful to expand existing databases, such as the International Labor Organization's Global Database on Occupational Safety and Health Legislation, collecting more detailed data on cause of death, demographics and occupation, including physicians.<sup>53</sup>

Some solutions to physician suicide may involve enhancing social networks, workplace support, expanding telehealth and mental health support, as well as educational campaigns to reduce stigma (e.g., only 71.4% of psychiatrists followed the prescribed treatment if diagnosed with schizophrenia, even though all of them reported that pharmacotherapy was important).<sup>54,55</sup> The pandemic, while increasing social distancing, has expanded professional and even personal connections online (e.g., family video meetings) and has led members of some health care communities to regularly check on each other online to see how they are doing. Such measures can benefit physicians beyond the pandemic and ease feelings of social isolation, whether they are surrounded by other people or not.

One possible "silver lining" of the pandemic is the acceleration and expansion of telehealth services in both rural and urban areas in the United States and elsewhere, partly due to better reimbursement. This may help reduce stressors related to contagion, financial loss, commuting, and other issues.<sup>56,57</sup> However, additional measures are needed to improve funding, solidify post-pandemic reimbursement, provide appropriate training, and reorganize health systems to better manage telehealth and in-person services on a routine basis.<sup>58</sup> Local and international measures are needed (telemedicine can be useful even in low-income countries, where cell phones are common), and consistency is important. For instance, the Centers for Medicaid and Medicare Services issued new guidelines about the delivery of health care services during the COVID-19 public health emergency, expanding the list of telehealth services eligible for reimbursement.<sup>59</sup> However, although the Centers for Medicaid and Medicare Services eased restrictions across U.S. state lines, state medical boards may have conflicting rules. Such issues should be addressed, and a carefully managed expansion of licensing may be very helpful. Indeed, expanding

compact (multistate) licensure may reduce U.S. physician work/financial stress, since it would then be possible to moonlight across state lines at a time when some state boards have a backlog of license applications. This may be particularly important for trainees and physicians seeking new jobs.<sup>60</sup>

Several suicide and self-harm registries are now collecting data on COVID-19-related stressors; summaries of this data will facilitate timely public health responses. Repeated longitudinal population surveys can help identify increases in population-level risk, as can anonymized real-time data on caller concerns from helplines. Monitoring the demands and capacity of mental health care providers over the coming months will be essential to ensure that resources are directed to the parts of the system under the greatest pressure. These efforts must be appropriately resourced and coordinated, with a particular focus on the needs of physicians and health care workers.<sup>29</sup>

A 2016 meta-analysis found that approximately half of all suicides are likely to occur in low-risk groups and that 95% of high-risk patients do not die by suicide.<sup>61,62</sup> Therefore, individual risk factors may lack statistical power, and cohort studies should be conducted using multivariate methodology to determine independent variables associated with physician suicide.<sup>18,61</sup> Finally, suicide screening, evaluation, and intervention are more effective if performed together through universal screening plus intervention or a safety plan at regular intervals, which could take a different form for physicians than general population, since the risks and protective factors might vary.<sup>62</sup>

In conclusion, physician suicide can be mitigated only through a multimodal approach that optimizes recognition of suicides and their risk factors and then addresses systematic problems. The interaction of non-modifiable risk factors, such as sex, race and age, in addition to educational attainment, health occupation and location, require further investigation.

## Resources

- The Physician Support Line (888-409-0141) provides anonymous and free psychiatric counseling.
- The American Foundation for Suicide Prevention: "If you are in crisis, please call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255) or contact the Crisis Text Line by texting TALK to 741741."
- The CDC link on fast facts and resources for suicide (see How We Can Prevent Suicide infographic): <https://www.cdc.gov/violenceprevention/suicide/fastfact.html>
- APA: American Psychiatric Association.
- Pamela Wible, MD, blog: <https://www.idealmedicalcare.org/ive-learned-547-doctor-suicides/>

## Disclosure

The authors report no conflicts of interest.

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