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Alcohol restrictions and suicide rates in South Africa during the COVID-19 pandemic: results of a natural experiment

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ABSTRACT

Background Alcohol use is a well-established potentially modifiable risk factor for suicide, yet few studies have investigated the impact of alcohol restrictions on suicide rates, particularly in low- and middle-income countries.

Methods We used data from nationally representative annual surveys of postmortem investigations in 2017 (n=6117) and 2020/21 (n=6586) to estimate changes in suicide rates associated with the COVID-19 pandemic and related alcohol restrictions.

Findings Age standardised suicide mortality rates per 100 000 were 10.91 (10.64, 11.18) in 2017 and 10.82 (10.56, 11.08) in 2020/2021, with approximately 4.4 times more deaths among males than females in both periods. No significant differences were observed between overall suicide rates during the 2020/2021 pandemic period compared with 2017 (risk ratio=1.04 (1.00, 1.07)), but in the 15–24-year age group, suicide rates were 11% higher among males and 31% higher among females than in 2017. Partial alcohol restrictions during the pandemic were not associated with lower suicide risk. However, the shift from partial to full restriction on the sale of alcohol was associated with an 18% (95% CI 10% to 25%) reduction in suicides for both sexes combined and a 22% (95% CI 13% to 30%) reduction in suicides among men, but no significant reduction among women.

Interpretation Our findings offer some support for the hypothesis that restricting access to alcohol at a population level is associated with a reduction in suicide rates and suggests that restricted access to alcohol may have been one of the reasons global suicide rates did not increase during the pandemic in some countries.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Suicide rates globally did not increase during the first year of the COVID-19 pandemic, although there is little data on this from low- and middle-income countries and virtually none from Africa.

⇒ Suicidal behaviour is associated with alcohol use.

WHAT THIS STUDY ADDS

⇒ This study provides evidence from a middle-income African country that suicide rates did not increase during the first year of the COVID-19 pandemic.

⇒ Alcohol restrictions imposed during the COVID-19 pandemic in South Africa were associated with reductions in the number of suicides.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Restricting access to alcohol may be an effective public health suicide prevention strategy, but more research is needed to establish if the associations observed in this study persist when there is not a global pandemic.

RESEARCH IN CONTEXT

Evidence before this study

We used Google Scholar and PubMed to identify all systematic reviews and meta-analyses published in the last 20 years which explore association between alcohol use and suicide rates. These reviews suggest that restricting alcohol at a population level could reduce suicide rates, although some of the evidence is contradictory and most evidence comes from high income and western countries, with little research from low- and middle-income countries (LMICs) and no research from Africa. Alcohol restrictions imposed at various times during the COVID-19 pandemic in South Africa provided an opportunity for a natural experiment to explore associations between alcohol restrictions and national suicide rates in a LMIC in Africa. We also consulted three large cross-national studies which used interrupted time-series data to investigate changes in suicide rates associated with the COVID-19 pandemic. These studies showed that suicide rates did not increase during the pandemic; however, most of these studies were conducted in high-income countries, and none were conducted in Africa.

Added value of this study

Our data are the first from Africa to investigate changes in suicide rates associated with alcohol restrictions. Our findings offer some support for the hypothesis that restricting access to alcohol at a population level is associated with a reduction in suicide rates and suggests that restricted access to alcohol may have been one of the reasons global suicide rates did not increase during the pandemic in some countries. Furthermore, our findings provide robust evidence from an LMIC that suicide rates did not increase during the first year of the COVID-19 pandemic, which is consistent with findings in high-income countries. While it has been hypothesised that suicide rates globally did not increase during the pandemic because of state social and economic interventions, our study provides some empirical evidence that alcohol restrictions and reductions in availability of alcohol may also have had a protective effect on suicide rates during the first year of the pandemic.

Implications of all the available evidence

Reducing alcohol consumption at a population level could be an effective component of national suicide prevention strategies.

Alcohol consumption is an important and potentially modifiable risk factor for suicide,[1] although interventions to restrict alcohol use are often overlooked in public health suicide prevention strategies.[2] Alcohol use is associated with a significantly increased risk of non-fatal suicidal behaviour (OR=6.97 for any acute alcohol use in the period immediately preceding the suicidal behaviour and OR=37.18 for heavy alcohol use in the period immediately preceding the behaviour).[3] On average, 37% of people dying by suicide screen positive for alcohol use (range=10–69%),[4] and global estimates suggest that almost one in five suicide deaths is attributable to alcohol use.[5] There is consistent evidence from low- and middle-income countries (LMICs) of positive associations between non-fatal and fatal suicidal behaviour and both alcohol use and alcohol intoxication.[6]

Public health interventions to reduce alcohol consumption could prevent suicides at a population level.[2 7] For example, increases in excise taxes on alcohol in USA[8] and Switzerland[9] were associated with significant reductions in male suicide rates. More recently, Scotland's minimum pricing policy on alcohol reduced alcohol-related deaths and hospitalisations.[10] Reductions in suicide rates are also associated with enforcing stringent drink driving laws[8 11] and raising the minimum legal drinking age.[12 13] Comprehensive multilevel policies to restrict alcohol consumption are particularly effective for suicide prevention. For example, suicide rates among both men and women decreased significantly in the former Union of Soviet Socialist Republics when as part of perestroika the state implemented a restrictive alcohol policy including state sponsored anti-alcohol advertising, a decrease in alcohol production and legislation to reduce the number of alcohol retail outlets and restrict their trading hours.[14–16] Likewise, in Slovenia, the introduction of the *Act Restricting the Use of Alcohol* in 2003 (which included imposing a minimum legal drinking age, a ban on alcohol advertising and restricting trading hours) was associated with an immediate and permanent reduction of approximately 10% in the average number of suicides among men.[17] However, there is also some, although limited, evidence that public health measures to restrict alcohol use do not reduce suicide rates. For example, in Sweden, no changes in suicide rates were observed when alcohol taxes were lowered.[18] And in Lithuania, male suicide rates increased by 14.3% following the introduction of a comprehensive set of legislation which included restricting alcohol advertising, raising excise tax on alcohol and harsher consequences for drink driving.[19] Furthermore, it is possible that different levels of alcohol restrictions may yield different outcomes. For example, in Native Alaskan communities, reductions in suicides were associated with partial alcohol restrictions, but complete prohibition of alcohol had no observable impact on suicides.[20]

Most studies on alcohol restrictions and suicide come from high-income countries and from Europe and the USA, with no data from sub-Saharan Africa. Both suicide and alcohol-related harms are serious public health problems in sub-Saharan Africa, and it is important to know if state policies to curb alcohol consumption could simultaneously address both concerns.[21 22] Furthermore, investigating links between alcohol restrictions and suicide rates in sub-Saharan Africa could provide empirical evidence to advocate for more state intervention and resist the powerful influences of alcohol producers in the region who have hitherto largely evaded state control of the industry.

Alcohol restrictions imposed during the COVID-19 pandemic in South Africa provided a unique opportunity to investigate changes in national suicide rates associated with various levels of alcohol restriction. During the 2020/2021 COVID-19 pandemic period, the South African government imposed various restrictions on people's movement (colloquially referred to as 'lockdowns'). These lockdowns were organised into levels ranging from 1 to 5, with level 5 being the most stringent and restrictive (see online supplemental table S1 for a detailed description of what these restrictions entailed). In addition, restrictions on the sale of alcohol were imposed during the COVID-19 pandemic as a mitigation strategy to reduce the demand for emergency medical services from alcohol-related injuries.[23] These restrictions were variously applied at different lockdown levels (see table 1) and included periods when alcohol sales were completely banned and other periods where sales were partially restricted. There is empirical evidence that restricting access to alcohol in South Africa during the COVID-19 pandemic was effective in reducing consumption of alcohol, with studies showing a corresponding reduction in alcohol-related harms during the pandemic period,[23–25] but the impact of these alcohol restrictions on suicide has not been investigated.

Table 1 Lockdown levels and alcohol restrictions in South Africa (1 April 2020–31 March 2021)

	Lockdown level	Alcohol restrictions
01 April 2020	Level 5	A full ban on the sale of alcohol as part of government's initial lockdown measures.
30 April 2020		
01 May 2020	Level 4	
31 May 2020		
01 June 2020	Level 3	Alcohol sales were permitted with restrictions on the days and hours trade as SA moved to level 3 lockdown.
11 June 2020		
12 July 2020		Full ban on alcohol sales was imposed.
17 August 2020		
18 August 2020	Level 2	Alcohol sales were permitted again as SA moved to level 2 lockdown.
20 September 2020		
21 September 2020	Level 1	
28 December 2020		
29 December 2020	Level 3	Full ban on alcohol sales in response to the second wave of COVID infections.
31 January 2021		
01 February 2021		Ban on alcohol sales was lifted, but there were restrictions on trading hours for alcohol outlets.
28 February 2021		
01 March 2021	Level 1	No restriction on alcohol sales.
31 March 2021		

SA, South Africa.

Our aim here is to estimate changes in suicide rates in South Africa associated with various alcohol restrictions implemented intermittently during the COVID-19 pandemic using nationally representative data from postmortem investigations. We begin by analysing changes in national suicide rates before and during the pandemic to establish pandemic effects on suicide in South Africa. We then investigate changes within the pandemic period to estimate the associations between various levels of alcohol restrictions and suicide rates.

METHODS

We used nationally representative mortuary data to conduct a before and after analysis of suicide deaths in 2017 and 2020/2021 (ie, April 2020 to March 2021) and explored the impact of alcohol restrictions on suicide rates in 2020/2021. Data from 2017 are used as the 'before' period because this was the most recently surveyed period prior to the pandemic. The protocol for this study is available at http://hdl.handle.net/11427/40312.

Data sources

Data were collected as part of the ongoing *Injury Mortality Survey* (IMS),[26 27] which is a national study by the South African Medical Research Council (SAMRC) to monitor injury mortality levels and causes in South Africa, due to extensive misclassification of injury deaths in vital statistics data and the inaccuracy of country level estimates from the Global Burden of Disease study.[28] Data for the IMS are collected via postmortem investigations of all suicides from a nationally representative sample of mortuaries across the country. We considered only those non-natural deaths classified in the IMS as suicides. Supplementary data were aggregated into counts based on age group (0–14, 15–24, 25–34, 35–44, 45+ years), biological sex (male, female) and year (2017, 2020/2021). Midyear population estimates from the Thembisa Model (V.4.6) were used to convert counts into rates.[29] The Thembisa Model is a mathematical model, originally designed to answer policy questions related to HIV in South Africa, which has over time become a reliable source of demographic statistics and projections in South Africa.

Data analysis

Only one of South Africa's nine provinces—the Western Cape—has routinely captured, fully digitised mortality data available. As such, in order to produce a nationally representative dataset, data were collected from a sample of 65 mortuaries across the other eight provinces using multistage stratified cluster sampling, to combine with data from all 16 mortuaries in the Western Cape for a total of 81 mortuaries analysed, out of a possible 121. Analysis weights were applied to account for the selection probabilities of mortuaries within survey strata (mortuary size) and the sample realisation. Weight calculations were based on the number of mortuaries randomly selected in each stratum of the total number of facilities in provinces. Further methodological details have been published elsewhere.[26 27]

For our descriptive statistics, direct standardisation using the WHO's World Standard Population was used to control for differences in age distributions across sex groups.[30 31] All rates are reported per 100 000 people and accompanied by 95% CIs. We used Poisson regression analysis to investigate associations between suicide and the first year of the pandemic, as well as suicide and various alcohol restrictions. We compared annual rates to examine the association of suicide by year for 2020/2021 versus 2017 (table 2). To assess the association between various lockdown levels and alcohol restrictions, we compared the dates of the lockdown periods in 2020/2021 with the corresponding periods in 2017 (table 3). We estimated the crude suicide rate (per 100 000) for the periods corresponding to the various alcohol restrictions (table 4). In all models, the outcome variable is the total suicide count for the relevant period, with

Table 2 Relative risk of suicide in South Africa in 2020/2021 versus 2017 by sex and age group (n=12 415)

	Male	Female
	RR (95% CI)	RR (95% CI)
0–14	1.07 (0.85, 1.36)	1.45 (1.02, 2.07)
15–24	1.11 (1.01, 1.21)	1.31 (1.13, 1.52)
25–34	0.98 (0.91, 1.04)	1.01 (0.86, 1.19)
35–44	1.08 (0.99, 1.18)	0.92 (0.76, 1.13)
45+	1.00 (0.92, 1.08)	0.87 (0.75, 1.02)
Crude suicide rate	1.03 (0.99, 1.07)	1.05 (0.97, 1.13)

RR, risk ratio.

logs of the population/duration parameters included as offsets to model rates as opposed to counts and thus implicitly control for changes in population size and alcohol/lockdown status durations respectively. All models were stratified by sex and age group.

Ethical considerations

Ethical approval for the study was obtained from the SAMRC Health Research Ethics Committee (EC 008-5-2018). Further approval and permission to access data were obtained from the National and Provincial Departments of Health and Forensic Pathology Service. It was not possible to obtain informed consent from individuals whose data are included in the analysis because all individuals were deceased.

Patient and public involvement

Members of the public and patients were not involved the formulation of research questions or the design of the study. The findings of this study will be disseminated to the public through open access publication of the manuscript and media reports.

RESULTS

Our initial dataset included 7530 suicides recorded across the 2 years, of which 74 observations were removed because they had missing data for age (n=69), or date of death (n=3), or sex was recorded as undetermined (n=2). Analysis weights were calculated to adjust sampled data to be nationally representative (using the same weighting methods that are used for all deaths), yielding weighted sample sizes of 6117 and 6586 for 2017 and 2020/2021, respectively. Online supplemental table S1 contains a full breakdown of unweighted and weighted suicide numbers by province for each year.

Age standardised and age-specific suicide mortality rates in 2017 and 2020/2021

Details of the unweighted and weighted numbers of suicide deaths for each year, for each of South Africa's nine provinces, are provided as supplementary materials (online supplemental table S2). No significant variations in age-standardised suicide rates per 100 000 were observed between 2017 and 2020/2021 for males (18.29 (17.78, 18.80) vs 18.04 (17.56, 18.53)), females (4.12 (3.89, 4.36) vs 4.16 (3.93, 4.39)) or for both sexes combined (10.91 (10.64, 11.18) vs 10.82 (10.56, 11.08)) (see online supplemental table S3). The age-specific and age-standardised estimated suicide mortality rates per 100 000 population (with 95% CIs) for 2017 and 2020/2021 by year and sex are illustrated in figure 1. The highest age-specific suicide rates were observed in the age group 25–34 years old with a mortality rate of 19.23 (18.39, 20.07) per 100 000 in 2017 and 18.83 (17.99, 19.66) per 100 000 in 2020/2021. In both years, age-specific suicide rates among men peaked in the age group 25–34 years, with estimates of 32.72 (31.18, 34.27) and 31.95 (30.42, 33.48) per 100 000 in 2017 and 2020/2021, respectively. For females, age-specific suicide rates peaked among 15–24-year olds, with estimates of 6.56 (5.83, 7.29) and 8.58 (7.75, 9.42) per 100 000 for 2017 and 2020/2021, respectively. The ratio of male to female age-standardised suicide rates were 4.44:1 in 2017 and 4.33:1 in 2020/2021, being highest among 25–34 and 35–44-year olds (>5.0:1) and lowest in the age groups 0–14 and 15–24 years old (<3.3:1) in both observation periods.

Comparison of suicide rates in 2017 and 2020/2021

We fitted Poisson regression models to estimate associations between crude suicide rates and year (ie, 2020/2021 vs 2017), stratified by sex. No significant associations were observed between crude suicide rates and year for both sexes combined (risk ratio (RR)=1.04 (1.00, 1.07)), males (RR=1.03 (0.99, 1.07)) or females (RR=1.05 (0.97, 1.13)).

To investigate whether there were significant variations in age-distribution of suicide rates between 2017 and 2020/2021, we fitted Poisson regression models, stratified by sex and age group (see table 2). A significant association was observed in the age group 15–24 years among males (RR=1.11 (1.01, 1.21)) and females (RR=1.31 (1.13, 1.52)) indicating an increase in suicide rates in this age group during the COVID-19 pandemic. No significant associations were observed in any of the other age groups.

Associations between suicide and alcohol restrictions in 2020/2021

Table 3 shows the results of a Poisson regression analysis of associations between crude suicide rates and the various combinations of alcohol restrictions and lockdown levels, stratified by sex. At lockdown level 1, the risk of suicide was no different during periods of partial restrictions on alcohol sales, compared with periods with no alcohol restrictions for both sexes combined (RR=1.09 (1.00, 1.19)), males (RR=1.08 (0.98, 1.19)) or females (RR=1.15 (0.92, 1.44)). Within the periods of partial alcohol restrictions, the risk of suicide at all lockdown levels was no different from periods with no restrictions, except at lockdown level 2 where the suicide risk was 14% higher for both sexes combined (RR=1.14 (1.02; 1.27)) and 45% higher for females (RR=1.45 (1.13, 1.87)).

Table 3 Relative risk of suicide by lockdown stage and alcohol restrictions, stratified by sex

Lockdown level	Alcohol restriction	Lockdown level X alcohol restriction	Crude suicide rate for both sexes combined				Crude suicide rate for males				Crude suicide rate for females			
			RR	95% CI		P	RR	95% CI		P	RR	95% CI		P
Lockdown level 1	No alcohol restriction	No alcohol restriction (lockdown level 1)	• .	• .	• .	• .	• .	• .	• .	• .	• .	• .	• .	• .
	Partial alcohol restriction	Partial alcohol restriction (lockdown level 1)	1.09	1.00	1.19	0.066	1.08	0.98	1.19	0.14	1.15	0.92	1.44	0.20
Lockdown level 2		Partial alcohol restriction (lockdown level 2)	1.14	1.02	1.27	0.017	1.08	0.96	1.22	0.20	1.45	1.13	1.87	0.004
Lockdown level 3		Partial alcohol restriction (lockdown level 3)	1.00	0.90	1.11	>0.9	0.96	0.85	1.08	0.50	1.19	0.93	1.53	0.20
	Full alcohol restriction	Full alcohol restriction (lockdown level 3)	0.82	0.75	0.90	<0.001	0.78	0.70	0.87	<0.001	1.02	0.82	1.29	0.80
Lockdown level 4		Full alcohol restriction (lockdown level 4)	0.72	0.64	0.82	<0.001	0.66	0.57	0.76	<0.001	1.05	0.80	1.38	0.70
Lockdown level 5		Full alcohol restriction (lockdown level 5)	0.63	0.56	0.72	<0.001	0.63	0.55	0.73	<0.001	0.64	0.46	0.88	0.006

Table 4 Crude suicide rate (per 100 000) for various lockdown levels and alcohol restrictions

Lockdown level	Alcohol restriction	Lockdown level X alcohol restriction	Crude suicide rate per 100 000 (95% CI)
Lockdown level 1	No alcohol restriction	No alcohol restriction (lockdown level 1)	12.03 (11.07, 13.00)
	Partial alcohol restriction	Partial alcohol restriction (lockdown level 1)	13.12 (12.56, 13.69)
Lockdown level 2		Partial alcohol restriction (lockdown level 2)	13.75 (12.76, 14.73)
Lockdown level 3		Partial alcohol restriction (lockdown level 3)	12.00 (11.18, 12.83)
	Full alcohol restriction	Full alcohol restriction (lockdown level 3)	9.90 (9.41, 10.39)
Lockdown level 4		Full alcohol restriction (lockdown level 4)	8.70 (7.88, 9.52)
Lockdown level 5		Full alcohol restriction (lockdown level 5)	7.64 (6.86, 8.42)

However, within lockdown level 3, risk of suicide (relative to periods of no restrictions) was significantly lower during periods of full alcohol restrictions compared with periods with partial restrictions for both sexes combined (RR=0.82 (0.75, 0.90) vs 1.00 (0.90, 1.11)) and for men (RR=0.78 (0.70, 0.87) vs 0.96 (0.85, 1.08)) but not for females. These data suggest that the move from partial alcohol restrictions to full alcohol restrictions at level 3 resulted in an 18% (95% CI 10% to 25%) reduction in risk of suicide for both sexes combined and a 22% (95% CI 13% to 30%) reduction in suicides among men, but no significant reduction among women.

Finally, within the periods of full alcohol restriction, the risk of suicide relative to periods of no restrictions was significantly lower at all lockdown levels for both sexes combined and for men. For both sexes combined, the relative RRs were 0.82 (0.75, 0.90), 0.72 (0.64, 0.82) and 0.63 (0.56, 0.72) at levels 3, 4 and 5, respectively. For males, the corresponding relative RRs were 0.78 (0.70. 0.87), 0.66 (0.57, 0.76) and 0.63 (0.55, 0.73). A different pattern was, however, observed for females, with lockdown level 5 being the only period associated with a decreased risk of suicide (RR=0.64 (0.46, 0.88)).

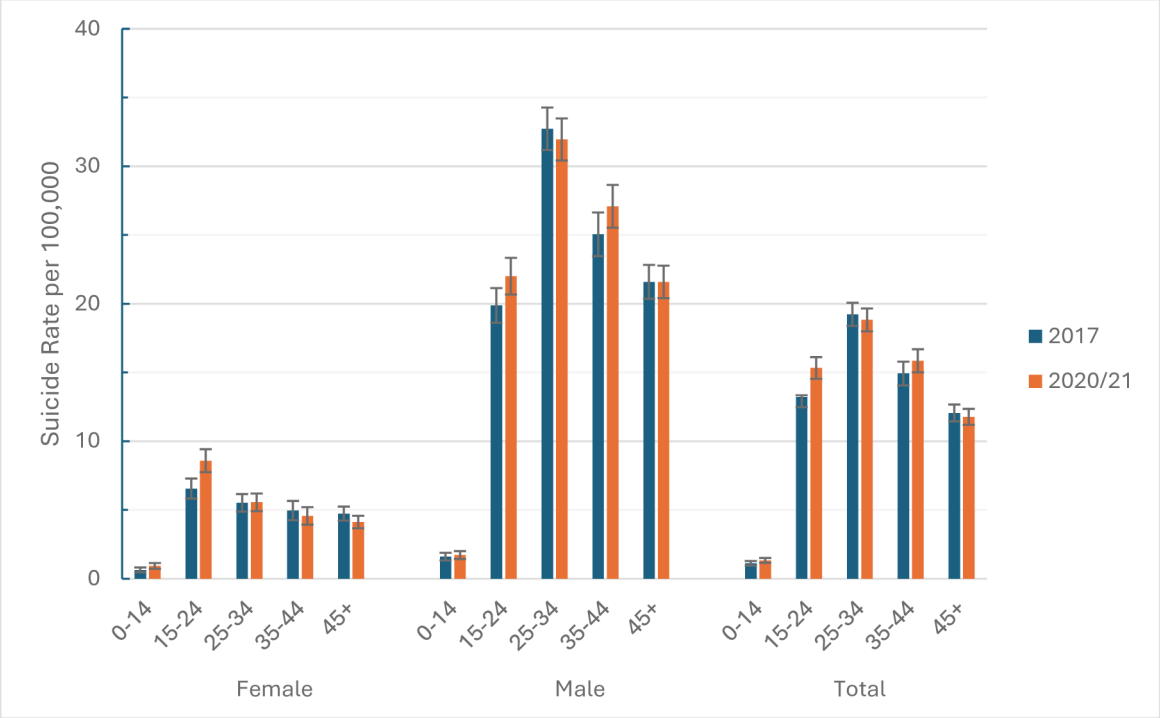

Figure 1 Age-stratified and age-standardised suicide mortality rates in South Africa by year and sex (N = 12703).

Table 4 shows the estimates of crude suicide rates per 100 000 of the population during the various lockdown levels and alcohol restrictions. Consistent with the results of our regression analysis, these data show that suicide rates during the period of no alcohol restrictions (12.03 (11.07, 13.00) per 100 000) were not significantly different from the suicide rates observed when partial alcohol restrictions were imposed at lockdown level 1 (13.12 (12.56, 13.69) per 100 000). However, the shift from partial to complete restrictions at lockdown level 3 was associated with a significant reduction in crude suicide rates from 12.00 (11.18, 12.83) to 9.90 (9.41, 10.39) per 100 000.

DISCUSSION

We used data from nationally representative postmortem surveys to investigate whether changes in suicide deaths were associated with various alcohol restrictions implemented intermittently during the COVID-19 pandemic in South Africa. Although suicide rates did not change significantly between 2017 and the first year of the pandemic, we found that during the pandemic, complete restrictions on the sale of alcohol were associated with a significant reduction in suicide rates. Although partial alcohol restrictions were not associated with any significant reductions in suicide rates, the shift from partial to full restrictions coincided with an 18% reduction in risk of suicide, equivalent to a change in crude suicide mortality rates from 12·0 per 100 000 to 9.90 per 100 000.

Our data indicate that the age standardised suicide mortality rate in South Africa (per 100 000 of the population) was 10.91 (10.64, 11.18) in 2017 and 10.82 (10.56, 11.08) in 2020/2021, with suicide rates being approximately 4.4 times higher among males in both periods. These prevalence estimates of suicide are aligned with the WHO estimate of the global age standardised suicide mortality rate for 2019 of 9.2 per 100 000 (9.7–12.6).[32] Importantly, our estimate of age standardised suicide rates for South Africa are substantially lower than the WHO estimate for South Africa of 23.5 per 100 000 (16.0–32.2) for 2019,[32] which raises important questions about the accuracy of the WHO models. Our estimates of suicide mortality in South Africa are, however, likely to be under-estimates because of undercounting and misallocation of suicide deaths due to social, cultural and religious taboos associated with suicide.[33 34] although this is unlikely to have changed systematically between 2017 and 2020, thus not affecting the outcome of our analysis.

We found no evidence that the suicide rate in South Africa in the first year of the COVID pandemic was significantly different from the suicide rate in 2017. Similarly, no differences were observed in the age or gender distribution of suicides between these two periods, except for an increase in suicides among 15–24 year-olds during the COVID period among both males and females. Our findings are congruent with global data showing that the COVID pandemic did not precipitate a marked rise in suicides despite expectations that it might.[35 36] However, much of the global data on suicide and COVID comes from high income countries, with very little data from Africa,[37] as is also the case with suicide data more generally.[38] Our findings make an important contribution to the literature on suicide during the global pandemic in 2020/2021 by being one of the first studies from Africa on this topic and one of the few studies from LMICs which use nationally representative reliable data from before and during COVID and robust statistical methods. Pirkis *et al*[35] have argued that one possible reason that suicide rates globally did not increase during the COVID pandemic was because governments were quick to implement mitigation strategies, which included social and financial support. Our data suggest that changes in alcohol policy during the pandemic may also have been one of the strategies that curbed increases in suicide rates. This hypothesis is supported by evidence of decreased consumption of alcohol at a population level during the pandemic[39 40] and studies which have previously demonstrated reductions in suicidal behaviour when access to alcohol is restricted.[2 7]

Our data provide some support for the hypothesis that restricting alcohol consumption at a population level could be an effective component of national suicide prevention strategies, as has also been proposed by other scholars globally.[5] The most cost-effective approaches to achieve this include legislation to increase alcohol prices (eg, through minimum pricing laws and/or taxes), restricting the number of alcohol outlets, limiting trading hours for alcohol sales, raising the minimum legal drinking age, and prohibiting marketing and advertising of alcohol.[2 41 42] Such public health measures are, however, likely to be thwarted by powerful industry and commercial interests which continue to influence alcohol policy and legislation,[43] particularly in Africa and other LMICs.[44] Multinational alcohol producers have actively sought to expand market share and influence legislation in African countries where there is political instability and/or weak state mechanisms for regulating the marketing, pricing, distribution, and sale of alcohol.[45] There is, for example, clear evidence that national alcohol policy documents in Lesotho, Malawi, Uganda and Botswana reflect industry interests, by focusing attention on individual behaviour and ignoring more effective population-level interventions to curb harmful effects of alcohol.[21 46]

While our findings suggest that restricting access to alcohol at a population level could help reduce suicide rates, we have no evidence to show that this strategy would be effective outside of a global pandemic or that the impact would be sustained over a protracted period. It is likely that longer term complete bans on alcohol would have other social consequences, such as precipitating illicit manufacture and trade of alcohol or shifts to consumption of other drugs, which would dampen any protective effects of alcohol restrictions. Importantly, our findings show that partial restrictions on the sale of alcohol were not associated with reductions in suicide

rates and that alcohol restrictions are more likely to have an impact on male suicide rates. It will be important for future studies to establish if this pattern is also observed in South Africa in the absence of social distancing and outside of a global pandemic.

Key limitations of our study include the fact that we do not have data for the period immediately before the pandemic and we relied on data from 2017 to assess the potential impact of COVID. Other variables could play a role in some of our observed effects, with the most obvious consideration here being curfews of various durations which were instituted alongside alcohol restrictions as part of a wider set of lockdown restrictions. However, recent studies report no significant impact of curfews on mortality rates[24 47] and injury presentations[23] during this period

Additionally, we have only analysed data collected during the first year of the pandemic, and it is unknown whether COVID may have precipitated an increase in suicide rates after March 2021. It is possible that suicide rates increased post-COVID, given the long-term deleterious economic consequences of the pandemic[48] and the consistent evidence of associations between poverty and suicides in LMICs.[49] Importantly, our analysis of associations between suicide and alcohol restrictions are all based on data collected during the first year of the COVID pandemic, making it difficult to generalise our findings to non-pandemic periods. Nonetheless, these are some of the first data from sub-Saharan Africa which report on suicide rates using nationally representative data collected before and during the pandemic. Crucially, this is one of the few studies from an LMIC, and, as far as we are aware, the only study from Africa reporting on associations between alcohol restrictions and suicide.

CONCLUSION

Our findings provide robust evidence from an LMIC that suicide rates did not increase during the first year of the COVID-19 pandemic, which is consistent with findings in high income countries. While it has been hypothesised that suicide rates globally did not increase during the pandemic because of state social and economic interventions, our study provides some empirical evidence that alcohol restrictions and reductions in availability of alcohol may also have had a protective effect on suicide rates during the first year of the pandemic. Crucially, our findings suggest that reducing alcohol consumption at a population level could be an effective component of national suicide prevention strategies, particularly in LMICs where the alcohol industry continues to resist state efforts to reduce the harmful effects of alcohol use through measures such as minimum pricing laws, restrictions on trading hours, and bans on alcohol marketing and advertising.

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Data availability statement Data are available upon reasonable request. Availability of data used in the study would be subject to permission by the Health Research Ethics Committee and provincial authorities that approved the original study. This is a recently completed study, and the data set will initially be used for capacity development among the emerging researchers on study team. Thereafter access to a de-identified data set is available upon reasonable request. Requests should be sent to the convenor of the South African Medical Research Council's Research Ethics Office, Ms Adri Labuschagne (Adri.Labuschagne@mrc.ac.za), for consideration. Guidelines for applications and related materials are available at: https://www.samrc.ac.za/research/rio-research-ethics-office. A period of 24 months after publication of the main study results should elapse before requests are made, to allow the authors to publish substudies and further analyses.

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REFERENCES

1 Amiri S, Behnezhad S. Alcohol use and risk of suicide: a systematic review and Meta-analysis. *J Addict Dis* 2020;38:200–13.

2 Giesbrecht N, Farkouh EK, Pavalaghanthan H, *et al*. Prevention of alcohol-related suicide: a rapid review. *Drugs: Education, Prevention and Policy* 2024;31:1–26.
3 Borges G, Bagge CL, Cherpitel CJ, *et al*. A meta-analysis of acute use of alcohol and the risk of suicide attempt. *Psychol Med* 2017;47:949–57.
4 Cherpitel CJ, Borges GLG, Wilcox HC. Acute alcohol use and suicidal behavior: a review of the literature. *Alcohol Clin Exp Res* 2004;28:18S–28S.
5 Kõlves K, Crossin R, Witt K. Alcohol consumption and suicidal behavior: current research evidence and potential for prevention. In: *Handbook of Substance Misuse and Addictions*. 2022: 1–26.
6 Breet E, Goldstone D, Bantjes J. Substance use and suicidal ideation and behaviour in low- and middle-income countries: a systematic review. *BMC Public Health* 2018;18:549.
7 Xuan Z, Naimi TS, Kaplan MS, *et al*. Alcohol Policies and Suicide: A Review of the Literature. *Alcohol Clin Exp Res* 2016;40:2043–55.
8 Markowitz S, Chatterji P, Kaestner R. Estimating the impact of alcohol policies on youth suicides. *J Ment Health Policy Econ* 2003;6:37–46.
9 Yamasaki A, Chinami M, Suzuki M, *et al*. Tobacco and alcohol tax relationships with suicide in Switzerland. *Psychol Rep* 2005;97:213–6.
10 Wyper GMA, Mackay DF, Fraser C, *et al*. Evaluating the impact of alcohol minimum unit pricing on deaths and hospitalisations in Scotland: a controlled interrupted time series study. *The Lancet* 2023;401:1361–70.
11 Sloan FA, Reilly BA, Schenzler C. Effects of Prices, Civil and Criminal Sanctions, and Law Enforcement on Alcohol-Related Mortality Abbreviated Form: Effects of Prices, Civil and Criminal Sanctions, and Law Enforcement on Alcohol-Related Mortality. 2015;55:454–65.
12 DeJong W, Blanchette J. *Case Closed: Res Evid on the Pos Pub Health Impact of the Age 21 Min Leg Drink Age in the US* 2015;108–15.
13 Birckmayer J, Hemenway D. Minimum-age drinking laws and youth suicide, 1970-1990. *Am J Public Health* 1999;89:1365–8.
14 Wasserman D, Värnik A, Eklund G. Female suicides and alcohol consumption during *perestroika* in the former USSR. *Acta Psychiatr Scand* 1998;98:26–33.
15 Wasserman D, Värnik A, Eklund G. Male suicides and alcohol consumption in the former USSR. *Acta Psychiatr Scand* 1994;89:306–13.
16 Nemtsov A. Suicides and alcohol consumption in Russia, 1965-1999. *Drug Alcohol Depend* 2003;71:161–8.
17 Pridemore WA, Snowden AJ. Reduction in suicide mortality following a new national alcohol policy in Slovenia: an interrupted time-series analysis. *Am J Public Health* 2009;99:915–20.
18 Andreasson S, Holder HD, Norström T, *et al*. Estimates of harm associated with changes in Swedish alcohol policy: results from past and present estimates. *Addiction* 2006;101:1096–105.
19 Sauliune S, Petrauskiene J, Kalediene R. Alcohol-related injuries and alcohol control policy in Lithuania: effect of the year of sobriety, 2008. *Alcohol Alcohol* 2012;47:458–63.
20 Berman M, Hull T, May P. Alcohol control and injury death in Alaska native communities: wet, damp and dry under Alaska's local option law. 2015.
21 Morojele NK, Dumbili EW, Obot IS, *et al*. Alcohol consumption, harms and policy developments in sub-Saharan Africa: The case for stronger national and regional responses. *Drug Alcohol Rev* 2021;40:402–19.
22 Osafo J, Asante KO, Akotia CS. Suicide Prevention in the African Region. *Crisis* 2020;41:S53–71.
23 Chu KM, Marco J-L, Owolabi EO, *et al*. Trauma trends during COVID-19 alcohol prohibition at a South African regional hospital. *Drug Alcohol Rev* 2022;41:13–9.
24 Moultrie TA, Dorrington RE, Laubscher R, *et al*. Unnatural deaths, alcohol bans and curfews: Evidence from a quasi-natural experiment during COVID-19. *S Afr Med J* 2021;111:834–7.
25 Barron K, Bradshaw D, Parry CDH, *et al*. Alcohol and Short-Run Mortality: Evidence from a Modern-Day Prohibition. *SSRN Journal* 2020.
26 Prinsloo M, Mhlongo S, Dekel B, *et al*. The 2nd Injury Mortality Survey: A national study of injury mortality levels and causes in South Africa in 2017. 2021.
27 Abeeda Roomaney R, Mhlongo S, Dekel B, *et al*. THE 3 RD INJURY MORTALITY SURVEY: A national study of injury mortality levels and causes in South Africa in 2020/21. 2023.
28 Prinsloo M, Mhlongo S, Roomaney RA, *et al*. Injury mortality in South Africa: a 2009 and 2017 comparison to track progress to meeting sustainable development goal targets. *Glob Health Action* 2024;17:2377828.
29 Johnson LF, May MT, Dorrington RE, *et al*. Estimating the impact of antiretroviral treatment on adult mortality trends in South Africa: A mathematical modelling study. *PLoS Med* 2017;14:e1002468.
30 Naing NN. Easy way to learn standardization : direct and indirect methods. *Malays J Med Sci* 2000;7:10–5.
31 Ben AO, Pinto CB, Lozano R. Age standardization of rates: a new who standard. Available: https://www.researchgate.net/publication/238744905 [Accessed 18 Apr 2024].
32 Tedros Adhanom Ghebreyesus. Monitoring health for the sdgs sustainable development goals 2023. World Health Statistics; 2023.119.
33 Tøllefsen IM, Hem E, Ekeberg Ø. The reliability of suicide statistics: a systematic review. *BMC Psychiatry* 2012;12:1–11.
34 Rockett IR, Kapusta ND, Bhandari R, *et al*. Suicide Misclassification in an International Context: Revisitation and Update. *Speechley & Stavraky* 2011;2:48–61.
35 Pirkis J, John A, Shin S, *et al*. Suicide trends in the early months of the COVID-19 pandemic: an interrupted time-series analysis of preliminary data from 21 countries. *Lancet Psychiatry* 2021;8:579–88.
36 Pirkis J, Gunnell D, Shin S, *et al*. Suicide numbers during the first 9-15 months of the COVID-19 pandemic compared with pre-existing trends: An interrupted time series analysis in 33 countries. *EClinMed* 2022;51:101573.
37 Knipe D, John A, Padmanathan P, *et al*. Suicide and self-harm in low- and middle- income countries during the COVID-19 pandemic: A systematic review. *PLOS Glob Public Health* 2022;2:e0000282.
38 Cai Z, Chang Q, Yip PSF. A scientometric analysis of suicide research: 1990-2018. *J Affect Disord* 2020;266:356–65.
39 Sohi I, Chrystoja BR, Rehm J, *et al*. Changes in alcohol use during the COVID-19 pandemic and previous pandemics: A systematic review. *Alcohol Clin Exp Res* 2022;46:498–513.
40 Kilian C, O'Donnell A, Potapova N, *et al*. Changes in alcohol use during the COVID-19 pandemic in Europe: A meta-analysis of observational studies. *Drug Alcohol Rev* 2022;41:918–31.
41 The technical package a world free from alcohol related harms. 2019. Available: http://apps.who.int/ [Accessed 18 Apr 2024].
42 Chisholm D, Moro D, Bertram M, *et al*. Are the "Best Buys" for Alcohol Control Still Valid? An Update on the Comparative Cost-Effectiveness of Alcohol Control Strategies at the Global Level. *J Stud Alcohol Drugs* 2018;79:514–22.
43 Ghandour L. Subtle industry interference in public health: the case of the alcohol industry. *Eur J Public Health* 2023;33:33.
44 Babor, Ph.D. T. Alcohol policy in the low- and middle-income countries. *IJADR* 2024;12:xx.
45 Delobelle P. Big Tobacco, Alcohol, and Food and NCDs in LMICs: An Inconvenient Truth and Call to Action Comment on "Addressing NCDs: Challenges From Industry Market Promotion and Interferences". *Int J Health Policy Manag* 2019;8:727–31.
46 Babor TF, Robaina K, Jernigan D. The influence of industry actions on the availability of alcoholic beverages in the African region. *Addiction* 2015;110:561–71.
47 Barron K, Parry CD, Bradshaw D, *et al*. Alcohol, Violence and Injury-Induced Mortality: Evidence from a Modern-Day Prohibition. *SSRN J* 2022.
48 Sinyor M, Hawton K, Appleby L, *et al*. The coming global economic downturn and suicide: a call to action. *Nat Mental Health* 2023;1:233–5.
49 Iemmi V, Bantjes J, Coast E, *et al*. Suicide and poverty in low-income and middle-income countries: a systematic review. *Lancet Psychiatry* 2016;3:774–83.