Post-pandemic mortality patterns and COVID-19 burden considering multiple death causes

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ABSTRACT

Background: Post-pandemic mortality rates can explore the residual COVID-19 burden and changes in other causes of death. Considering weighted multiple causes of death from death certificates (underlying and others) may help compare post- versus pre-pandemic mortality patterns, while potentially reducing the impact of cause misattribution. Estimates of post-pandemic impact are critical also for proper continuing public health policies (e.g. vaccinations).

Methods: We retrospectively analyse national all-cause mortality rate ratios between 2024 and pre-pandemic years (2017-2019) for gender-stratified 10-year age groups in Austria. In weighted analyses, the underlying death cause was weighted 50% and other causes shared the remaining 50%. Sensitivity analyses explored different weightings. Death-specific causes were also compared between 2024 and 2019. Lastly, number needed to vaccinate (NNV) was estimated for 5-year age groups in hypothetical scenarios.

Results: Despite 1,212 reported COVID-19 deaths in 2024, all-cause mortality rates were equal or lower in 2024 compared to 2019 in all strata at risk from COVID-19 (i.e., aged 60 years and over). All-cause mortality rates in 2024 were higher than in 2019 in adolescent and young adult strata. The ratio of weighted over unweighted COVID-19 death rates was 0.52-0.58 for age strata 60 years and older and even lower in sensitivity analyses, indicating that COVID-19 deaths were likely overestimated. Estimated NNV exceeded 1,700 up to 80 years old, even with 100% assumed vaccine effectiveness.

Conclusions: Post-pandemic COVID-19 deaths had no visible impact on mortality patterns in Austria and were likely overcounted. Increased post-pandemic mortality patterns in the young are particularly worrisome.

Key words: COVID-19, Mortality patterns, Vaccination, Number needed to vaccinate, Multiple cause mortality analysis

INTRODUCTION

Evaluation of the continued, post-pandemic impact of COVID-19 is challenging. The effort to thoroughly document SARS-CoV-2 infections through intensive testing has been discontinued worldwide. Nevertheless, indirect ways may be used to evaluate the impact of SARS-CoV2 in the post-pandemic period. One such approach is based on all-cause mortality data. During the COVID-19 pandemic, most countries reported excess mortality compared to pre-pandemic years [1,2], with large differences across countries [3]. While excess death calculations have limitations [3,4], a comparison of mortality rates in different age and gender strata between post- and pre-pandemic years may provide some insight into the current disease burden of COVID-19 as well as any potential long-term consequences of the pandemic. If SARS-CoV-2 infections continued to have a serious health impact in 2024, strata that are disproportionately at risk of COVID-19 death (e.g., 60+ year olds) should have higher mortality rates compared to the pre-pandemic years. Conversely, other long-term consequences of the pandemic and of the pandemic response may be reflected in increased mortality rates in younger populations.

COVID-19 disease burden may also be evaluated directly by investigating reported COVID-19 deaths. However, this approach depends heavily on how deaths are reported and classified. In many cases, individuals who die with a positive SARS-CoV-2 test may be recorded as COVID-19 deaths, even when other conditions are more relevant [5–7]. Differentiating between deaths caused by COVID-19 and deaths where COVID-19 was merely yet another co-existing factor is crucial for understanding the true burden of the disease, particularly in older or chronically ill populations [8].

Accurate estimates of post-pandemic COVID-19 impact are also essential for proper formulation of COVID-19 vaccination recommendations. Current COVID-19 vaccination recommendations vary starkly across western countries (e.g. age recommendation for yearly vaccination in 2024: 12 years and older in Austria; 65 years and older in Denmark) [9,10].

The potential benefits of continued COVID-19 vaccinations have come under scrutiny in the context of widespread prior SARS-CoV-2 exposure and unclear vaccine effectiveness (VE) in previously infected individuals [11–15]. Against this background, metrics such as the number needed to vaccinate (NNV) to prevent a single COVID-19 death are useful to inform vaccination policy.

In this study, we assess whether age- and gender-adjusted mortality in Austria has returned to pre-pandemic levels (or lower) by comparing all-cause mortality rates in 2024 with the average rates from 2017 to 2019. Furthermore, we apply a weighted death count methodology to estimate a potentially more accurate contribution of COVID-19 to total mortality, accounting for co-occurring causes of death and comparing death rates from different causes from 2019 to 2024. Finally, we estimate the NNV to prevent one COVID-19 death in each age and gender group, under both ideal (100%) and modestly effective (50%) VE assumptions.

METHODS

Study design and data description

This is a retrospective study using national data from Austria. We compared mortality rates between pre- and post- COVID-19 pandemic time periods, analysed 2024 death certificates to estimate the potential contribution of COVID-19 deaths to total mortality when both underlying and other contributing causes are considered, and estimated the NNV to prevent one COVID-19 death. Population, mortality and vaccination data were publicly available [16–19]. Data on death certificates was acquired from Statistics Austria [20]. COVID-19 vaccinations were redistributed to age groups of interest by weighting them based on population size (see supplements for details).

We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist (Table S1). The study was approved by the ethics

committee at the Medical University of Graz (no. 33-144 ex 20/21). The statistical analyses were conducted using R (version 4.4.2) [21].

Analyses

Pre- and post-pandemic mortality

We compared mortality rates in 2024 with the average rates observed in the three years preceding the pandemic (2017–2019). Specifically, we calculated age- and sex-stratified mortality rates in each 10-year age and gender (binary) stratum (up to 90+ year olds) [16–18]. For each stratum, we then computed the ratio of the 2024 mortality rate to the average mortality rate across 2017–2019. Ratios above 1.00 in age groups that exhibit deaths due to COVID-19 (practically those 60+ year old) suggest higher mortality in 2024 relative to the pre-pandemic years and may indicate a persistent COVID-19 disease burden, whereas ratios below 1.00 would argue against this.

Weighted death counts

To address possible misattribution of death causes, we used death certificate data to calculate the weighted death count, which encompasses both the prevalence of a cause mentioned as the underlying cause of death (UC) as well other mentioned causes (OC) on the death certificate [8,22]. This is based on a previously published methodology which used contributing causes (CC) instead of all other mentions [8,22]. However, Austrian death certificate data states the UC and all other causes mentioned on the death certificates, but not whether causes are immediate, intermediate, or contributing causes [8]. We tried to address this issue in the sensitivity analyses. To calculate weighted estimates, we weighed both the UC and all OC mentions equally (50% UC; 50% all OCs). When no OC was reported, UC was weighted with 100%. Duplicates and ill-defined causes in OC were excluded. The data

may present an external and internal UC. When an external UC was present, it was used as the UC.

We calculated both age standardised UC (ASRuc), i.e. unweighted death counts, and age standardised weighted counts (ASRw) for COVID-19 in 2020 to 2024, for age groups 0-19, 20-39, 40-59, 60-74, 75-84 and 85+ years. Lower ASRw than ASRuc (i.e., a ratio of ASRw/ASRuc below 1.00) suggests that COVID-19 was more commonly chosen to be placed as UC rather than OC, compared to other causes. Very low values may indicate overcounting of COVID-19 deaths. Additionally, we compared the 10 major causes of death across all years from 2019 to 2024 using ASRw and ASRuc. The main comparison was for 2024 (post-pandemic) versus 2019 (pre-pandemic, death certificates causes other than UC were not available before 2019). Similarly, we ran the same comparison for the 19 high-level groupings of death causes (such as all infectious diseases, all neoplasms, all external etc – see supplement for full list). For 2020 to 2024, we also reported the ten most frequent causes on death certificates co-occurring with COVID-19, and the percentage of those in which COVID-19 was the UC.

We performed sensitivity analyses by applying two different weighting schemes. (1) all causes are weighted the same (including UC) and (2) the UC was weighted double the weight of a single OC in the respective death certificate [22].

Additionally, we reran the analyses using more stringent exclusion criteria to address noisy data [23]. See Supplements for full list of exclusions.

Number needed to vaccinate

We estimated the NNV to prevent one COVID-19-related death across 5-year age and gender stratified groups (up to 95+ year olds). As existing literature on VE regarding COVID-19 deaths is inconsistent, we assumed a hypothetical best-case ideal scenario in which all recorded COVID-19 deaths occurred among unvaccinated individuals (i.e., those who

received no COVID-19 vaccination in 2024 regardless of what vaccinations they had received in previous years), and that vaccination would have prevented 100% of these deaths [13]. For each stratum, we estimated the number of unvaccinated individuals by subtracting the number of vaccine doses administered in 2024 from the population size. The NNV was calculated as the number of unvaccinated individuals divided by the number of recorded COVID-19 deaths. We repeated this calculation assuming a more realistic 50% VE [13,24] and with raw death counts replaced by death counts weighted for multiple causes. These calculations provide upper-bound estimates of the potential benefit of SARS-CoV-2 vaccinations in 2024 in Austria regarding death outcomes.

RESULTS

Pre- and post-pandemic mortality

Mortality rate ratios show that in all strata aged 40 years or older, the post pandemic mortality rate was either equal or lower than before the pandemic (Figure 1 and Table S2). In half of these gender and age strata, the mortality rate was 0.93 or lower, i.e. reflecting 7% or higher improvement.

Conversely, some mortality rate ratios were elevated in younger groups (i.e. 10-19, 20-29 (male only) and 30-39 years old). In these groups only one individual was categorized to have died due to COVID-19 in 2024 (Table S3). To explore potential reasons for the increased youth mortality, we additionally investigated the mortality rate ratios of these age groups in the high-level causes previously described (see list of causes in supplements), based on the unfiltered death certificate data. Higher mortality rates in 2024 as compared to pre-pandemic in the 10-39 year olds were due to moderate increases in multiple high level causes (Figure S1, Table S4). There were consistent increases in particular in mental & behavioural diseases, external causes and nervous system causes.

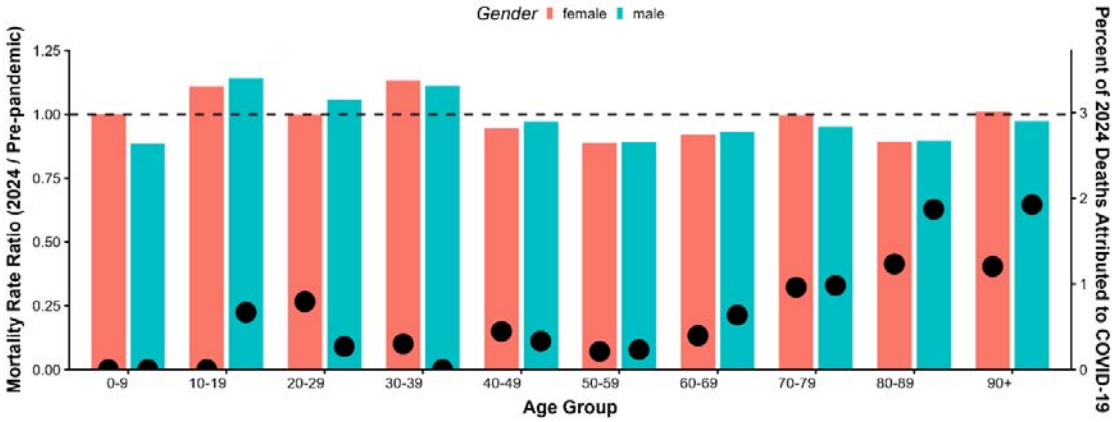

Fig. 1: Mortality rate ratios between 2024 and pre-pandemic by age-group and gender. Pre-pandemic is based on years 2017-2019. Rates under 1.00 indicate fewer relative deaths in 2024 than in the pre-pandemic period. Right axis shows percentage of all-cause deaths attributed to COVID-19 in 2024 (black dots). Note that COVID-19 death percentages in age groups under 40 years are based on one (or zero) COVID-19 death within the respective groups (Table S3). See exact values in Table S2.

Weighted death counts

There was a total of 538,525 death certificates in Austria for the years 2019 to 2024 (2019: 83,386; 2024: 88,486), the years with full information on specific death causes. This included 2,502,281 non-duplicate ICDs code mentions (2019: 369,844; 2024: 424,707). We excluded 259,041 (2019: 37,927; 2024: 44,968) ill-defined causes in OC (see lists below for definitions of intermediate, immediate and ill-defined causes). We also removed all duplicate causes that were created when mapping ICD codes to the causes list. The final dataset for this sensitivity analysis had 1,888,980 mentions of causes (2019: 281,185; 2024: 316,291). The allocation to high-level causes led to further exclusion of OCs due to multiple causes being allocated to the same high-level cause. After excluding duplicates, the final higher-level analysis had a total of 1,340,943 mentions of causes (2019: 199,781; 2024: 224,967).

The ASRw of COVID-19 was much lower than ASRuc (Figure 2 and Table S5). While mentions of COVID-19 in death certificates decreased drastically from 2020 to 2024, the ratio between ASRw and ASRuc in age groups older than 60 barely changed (0.52 in 2020 versus 0.54-0.58 in 2024). In those 40-59 years old, the ratio increased from 0.53 in 2020 to 0.75 in 2024.

When comparing the 10 most frequent causes of death between 2024 and 2019, age standardized estimates indicated a relative decrease in reported “Ischaemic heart disease” and a relative increase in “Alzheimer’s disease and dementia” as causes of death (Figure 3 and Table S6). While many of the top 10 causes had a ratio of ASRw/ASRuc lower than 1.00, COVID-19 had an extremely low ratio comparable only to “Colorectal cancer”, “Lung cancer” and “Residual - external causes” (Table S6).

High-level causes indicated an increase in “Respiratory diseases” between 2020 and 2023 as compared to 2024 and 2019, when COVID-19 was included in this group (Figure 4 & Table S7). Conversely, when COVID-19 was not included, “Respiratory diseases” showed a marked decrease in 2020-2023 (ASRuc 52.86 versus 59.64 in 2019 and 59.93 in 2024); moreover, the ASRw/ASRuc ratio was highest in 2020-2023 (1.65 versus 1.47 in 2019 and 1.40 in 2024).

Causes most mentioned together with COVID-19 in 2024 were: “Pneumonia", “Residual – infections”, “Hypertensive Disease”, “Ischaemic heart disease”, and “Renal failure” (Table 1). Previous pandemic years mostly showed the same causes, though in a slightly different order (Table S8). When co-mentioned with these causes, COVID-19 was listed as the UC in 88-98% of these deaths in 2020. While this gradually decreased over time, in 2024 COVID-19 was still listed as the UC in 68-85% of these deaths.

Sensitivity analyses showed that alternative weighing methods did not change the findings on COVID-19 (Table S9). ASRw for the alternative weighting methods was even lower than for the weighting used in the main analysis (Table S9; e.g. 2020: main 37.59,

equally weighted causes 22.14, UC double the weight of OC 31.28; 2024: main 7.43 equally weighted causes 4.35, UC double the weight of OC 5.90).

Using more stringent exclusion criteria did not change the findings concerning COVID-19 either (Table S10, Figure S2 & S3). However, it did affect ASRw/ASRuc ratios of some other prevalent causes such as “Hypertensive diseases” and changed the overall prevalence of multiple top-10 causes (Figure S4). It also led to changes in co-occurrences, in particular for “Pneumonia” (Table S8, S11, & S12).

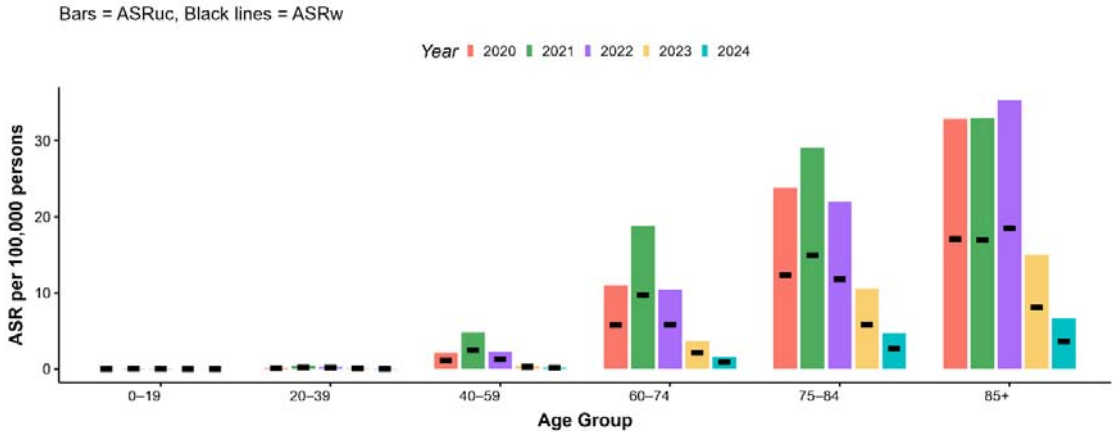

Fig. 2: Age stratified unweighted (ASRuc) and weighted COVID-19 death counts (ASRw) from 2020 to 2024. ASRuc = age standardised underlying causes; ASRw = age standardised weighted counts

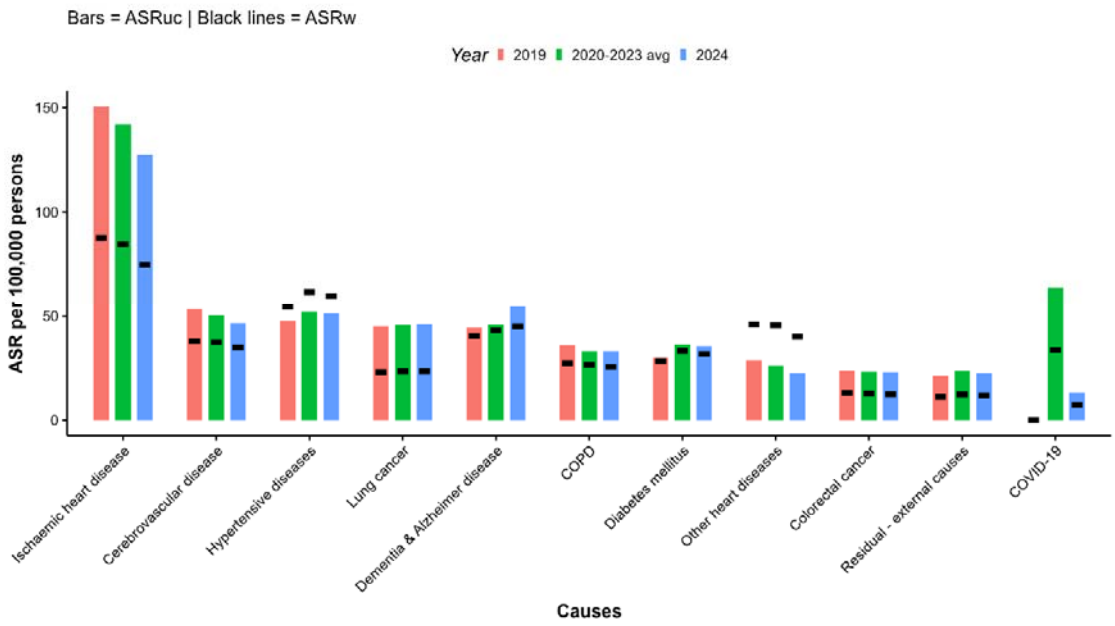

Fig. 3: Age standardized unweighted (ASRuc) and weighted death counts (ASRw) of the top 10 causes of death (as of 2019) and COVID-19 for 2019, 2020-2023 and 2024. The category "Ill-defined causes" is not shown. ASRuc = age standardised underlying causes; ASRw = age standardised weighted counts.

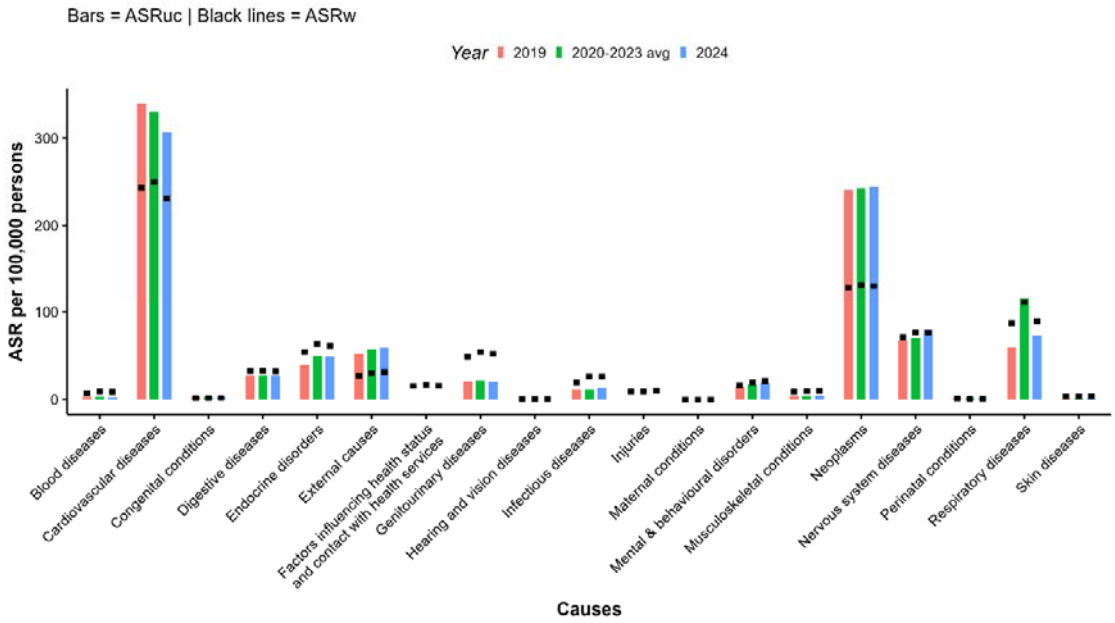

Fig. 4: Age standardised unweighted (ASRuc) and weighted death counts (ASRw) of the 19

high-level factors for 2019, 2020-2023 and 2024. COVID-19 is included in "Respiratory diseases". The category "Ill-defined causes" is not shown. ASRuc = age standardised underlying causes; ASRw = age standardised weighted counts.

Number needed to vaccinate

Even with the assumed perfect VE (100% protection), in age strata below the age of 80 years, NNV is more than 1,700 and in age strata below the age of 65 years it is more than 12,000, irrespective of gender (Table 2). The more realistic approach (50% VE) doubles these NNV estimates, indicating NNV of 186 and 348 for males and females even in the highest age category (95+ years). When using weighted death counts, estimated NNV is about 50-80% higher than for raw UC (depending on strata; Table 2). E.g., below the age of 65, NNV is always more than 20,000.

DISCUSSION

We showed that in Austria the relative mortality of age groups of 60 years or older (i.e. those at substantive risk to die of COVID-19) was lower (even substantially lower in many strata) in 2024 than it was pre-pandemic (2017-2019). Conversely, increased post-pandemic mortality was documented for young age groups. Analysis of multiple causes of death via death certificates, offered hints that COVID-19 deaths were likely overestimated. The over-estimation may have apparently occurred not only in 2024, but throughout the entire pandemic. When COVID-19 was listed as a cause, it was almost always listed as the underlying cause during the pandemic. While gradually a larger share of COVID-19 was listed as "other cause", even in 2024 it was mostly listed as the underlying cause. Lastly, we estimated NNV to save a single life in 2024 in Austria, which was extremely high for all but the very oldest, even if one were to assume a best-case implausibly ideal scenario with 100% VE.

SARS-CoV2 infections no longer had any substantial impact on mortality patterns in 2024. Age strata that had more than 5% increased mortality in 2024 compared to the pre-pandemic (mortality ratio >1.05), were low-risk strata of young individuals with a single, or no reported COVID-19 death. It is unlikely that those differences are directly caused by recent undiscovered SARS-CoV-2 infections. Conversely, the increase in mortality in young individuals should raise concerns about the advent of non-COVID-19 reasons and/or reasons related to adverse consequences of the pandemic response (e.g., mental health, external causes and nervous system diseases). Escalating problems of violence, alcohol, drug overdose, and suicides in young age strata have been described already in different countries [25–28] and may create a persisting legacy of the pandemic that needs to be tracked and addressed.

We recently estimated 2.5 million SARS-CoV-2 infections in 2024 across Austria [29]. In this context the total reported COVID-19 death count of 1,212 is already low, corresponding to an infection fatality rate of 0.048%. However, given our findings on death certificates we are likely still overestimating COVID-19 deaths and hence also the infection fatality rate. ASRw was lower than ASRuc throughout the pandemic, with no major changes in their ratios between 2020 and 2024 for those 60 years and older. This indicates that even with lower UC counts, COVID-19 was, and still is likely overcounted as an UC.

Changes in the top 10 causes of death in 2019 and 2024 may reflect real changes or artefacts of death certificate compilation. The decrease in “Ischaemic heart disease” in particular, is likely too large to reflect a genuine improvement. This may partially be due to a change in UC categorization of individuals with multiple comorbidities and unclear main reason for death. Here the tendency of using “Ischaemic heart disease” as an UC may have become partially replaced by UC categorized as COVID-19.

In high-level causes the effect of COVID-19 may be seen against the group of “Respiratory diseases”. Throughout the pandemic (2020-2023), there was a decrease in other recorded respiratory diseases. Respiratory diseases have traditionally had a high

ASRw/ASRuc, suggesting that they are typically listed as contributing rather than underlying causes of death. This pattern was markedly reversed with COVID-19.

Sensitivity analyses showed that our findings on COVID-19 are robust to different weighing approaches. Tested alternative approaches indicated even lower weighted estimates for COVID-19 deaths than the main analysis. COVID-19 deaths may have been both under- and over-counted during the pandemic in different locations and time periods [5]. However, overcounting is far more likely in countries like Austria. Evidence of major overcounting in high-income countries has also accumulated from audits of medical records. In Greece, only 64.9% of audited hospital deaths listed as COVID-19 were found to be attributable or related to COVID-19 upon auditing [6]. In Sweden, 24% of audited deaths that were listed as COVID-19 in death certificates were found to have absolutely no relationship to COVID-19 upon auditing. In most of the others, COVID-19 was found upon audit to be contributing rather than underlying cause. Overall, while death certificates had counted 799 deaths as having COVID-19 UC, clinical record audit found only 213 such deaths [7]. Among 55 deaths recorded as due to COVID-19 in the winter of 2021-2022 in Ireland [30], clinical opinion considered that COVID-19 was the primary cause of death in only 72.7% (40/55). The extent of over-counting of COVID-19 deaths apparently increased with Omicron variants, as documented also in a study in Denmark [31]. Audit studies are also needed in non-high-income countries; there, large under-counting of COVID-19 deaths due to low-testing is sometimes speculated. However, one medical record audit study in Colombia [32] found only 6% undercounting of COVID-19 deaths (231 in death certificates versus 247 in the audit) in 2021. Another study auditing 339 COVID-19-related death certificates in Iran in 2020 found major errors in 58% and minor errors in all of them [32]. These emerging data suggest that under-counting of COVID-19 deaths was a much lesser problem than initially believed, while over-counting has been highly prominent in several settings.

The estimated NNV was huge even with hypothetical 100% VE. When weighted estimates were used instead of raw UC counts, the estimated NNV rose even higher. When using the more realistic 50% VE, even in the 95+ year olds NNV was at 186-348 based on reported deaths and almost double that figure based on weighted deaths. In context of limited life expectancy at such a high age, this NNV may already be too high to suggest yearly vaccinations. While one may argue that other outcomes besides death should also be considered, our results pose questions on whether COVID-19 vaccination programs currently have reasonable benefit-risk, let alone cost-benefit ratios even in the very old. In the endemic phase, rigorous evaluation of COVID-19 vaccines and their real-world use needs to be conducted to see if they still have any indications [33].

The presented estimates have limitations. First, while we stratify by age group and gender, we do not have data on comorbidities. Therefore, our findings cannot be simply generalized to specific patient populations (e.g., immunocompromised patients or nursing home residents) who might have a particularly high risk of COVID-19 deaths. Even within extremely high-risk populations, outcomes may differ, e.g. COVID-19 vaccines may continue to have substantial benefit for immunocompromised who otherwise have high life expectancy, but not in highly debilitated nursing home residents with minimal life expectancy [34] and potential high toxicity from COVID-19 vaccines [35]. Second, the presented values are also descriptive and the shortcomings of reporting in death certificates should be kept in mind [36]. Empirical studies have suggested very high rates of major errors in death certificates, exceeding 50% even in pre-pandemic years [37]. Some causes may be more likely to be chosen as UC than others due to biased perceptions and/or lack of familiarity of the person compiling the certificate. The impact of biases may have been even higher during the highly charged, pressurized conditions of the pandemic crisis and may have fuelled major over-reporting of COVID-19 as UC. Additional in-depth auditing of medical records would be helpful.

Finally, there can be debate on whether mortality rates across age strata should continue to decrease over time, and, if so, what might be a good enough rate. This would translate to mortality rate ratios of <1.00 being desirable for 2024 versus 2019. However, it is unclear to what extend further decreases in mortality (and consequently increases in life expectancy) are feasible in countries that have already reached very high life expectancy. Regardless, age and gender strata over 40 years typically did have substantive declines in mortality in 2024 versus pre-pandemic years, in contrast to the young strata.

In summary, nationwide mortality data in Austria show no visible COVID-19 mortality burden in the post-pandemic phase and indicate overcounting of COVID-19 deaths from 2020-2024. These findings should be factored in ongoing public health policies. Increased mortality patterns in young individuals are of concern, requiring confirmation and further elucidation of the underlying reasons and proper intervention approaches.

Contributors

JPAI conceptualized the study. UR wrote the original draft of the manuscript. SP acquired funding. UR wrote software. UR performed the formal analyses. SP administered the project. All authors contributed to writing, reviewing, and editing the manuscript, and approved the final version before submission.

Data sharing statement

Death certificate data were provided by Statistics Austria. Data are available through an application at Statistics Austria. All other data is publicly available.

Declaration of interests

The authors declare no conflict of interests.

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Table 1: Frequencies of causes most co-occurring with COVID-19 (in 2024) by year, and percentage where COVID-19 was determined the underlying cause.

COVID as underlying cause	2024	2023	2022	2021	2020
	frequency co-occurring (COVID-19 as UC percentage)				
Residual - infections	1,031 (70.2%)	1,315 (77.9%)	2,615 (81.6%)	2,756 (90.4%)	2,134 (97.7%)
Pneumonia	808 (80.3%)	1,587 (87%)	2,957 (93%)	4,848 (94.7%)	3,069 (97.8%)
Hypertensive diseases	535 (72.1%)	1,049 (78%)	2,257 (84.8%)	2,578 (91.8%)	2,017 (93.9%)
Renal failure	415 (69.9%)	791 (74.1%)	1,671 (85.3%)	1,580 (94.3%)	1,326 (93.8%)
Ischaemic heart disease	287 (79.1%)	616 (85.7%)	1,301 (87.4%)	1,481 (94.3%)	1,194 (96.9%)
Dementia & Alzheimer disease	292 (84.2%)	643 (83.2%)	1,439 (92.2%)	1,109 (92.2%)	1,230 (93.2%)
Atrial fibrillation	299 (69.9%)	588 (79.4%)	1,049 (85.8%)	1,086 (89.2%)	818 (91.3%)
Diabetes mellitus	291 (73.9%)	511 (79.5%)	1,222 (87.2%)	1,517 (92.1%)	1,183 (94.5%)
Other heart diseases	298 (68.8%)	633 (68.7%)	1,243 (82.4%)	1,134 (87.8%)	970 (88.8%)
Cerebrovascular disease	193 (72.5%)	401 (79.1%)	848 (87.5%)	643 (93.6%)	624 (93.4%)

Table 2: COVID-19 deaths in 2024 in Austria, unvaccinated populations and NNV with 50% and 100% VE, stratified by five-year age groups and gender

Age group and gender	Unvaccinated population	Reported COVID deaths	Weighted COVID deaths	NNV reported (100% VE)	NNV weighted (100% VE)
<5 male	217,185		0		
<5 female	205,717		0		
5-9 male	232,757		0		
5-9 female	219,456		0		
10-14 male	224,890		0		
10-14 female	211,528		0		
15-19 male	231,021	1	0.5	231,021	462,042
15-19 female	214,953		0		
20-24 male	256,961		0.17		1,541,766
20-24 female	238,877		0		
25-29 male	300,923	1	0.5	300,923	601,846
25-29 female	280,707	1	0.5	280,707	561,414
30-34 male	320,088		0.06		5,761,584
30-34 female	303,087		0		
35-39 male	312,544		0		
35-39 female	302,411	1	1	302,411	302,411
40-44 male	304,801	3	1.95	101,600	156,595
40-44 female	301,111	2	1	150,556	301,111
45-49 male	278,825	1	1.15	278,825	241,457
45-49 female	281,714	1	0.73	281,714	386,351
50-54 male	308,724		0.38		823,264
50-54 female	316,672	1	0.5	316,672	633,344
55-59 male	342,484	8	5.68	42,810	60,284
55-59 female	343,787	3	2.84	114,596	121,175
60-64 male	292,055	24	14.27	12,169	20,462
60-64 female	299,810	7	5.37	42,830	55,816
65-69 male	224,285	28	15.92	8,010	14,090
65-69 female	246,285	11	6.67	22,390	36,935
70-74 male	162,494	48	26.2	3,385	6,202
70-74 female	194,069	26	15.45	7,464	12,557
75-79 male	128,061	73	42.36	1,754	3,023
75-79 female	165,836	61	33.38	2,719	4,968
80-84 male	106,972	174	96.99	615	1,103
80-84 female	156,053	125	69.55	1,248	2,244
85-89 male	44,510	165	90.39	270	492
85-89 female	76,395	121	65.16	631	1,172
90-94 male	16,700	106	57.35	158	291
90-94 female	37,602	129	69.87	291	538
95+ male	3,073	33	17.88	93	172
95+ female	10,120	58	31.44	174	322