CORRESPONDENCE

Research Letter

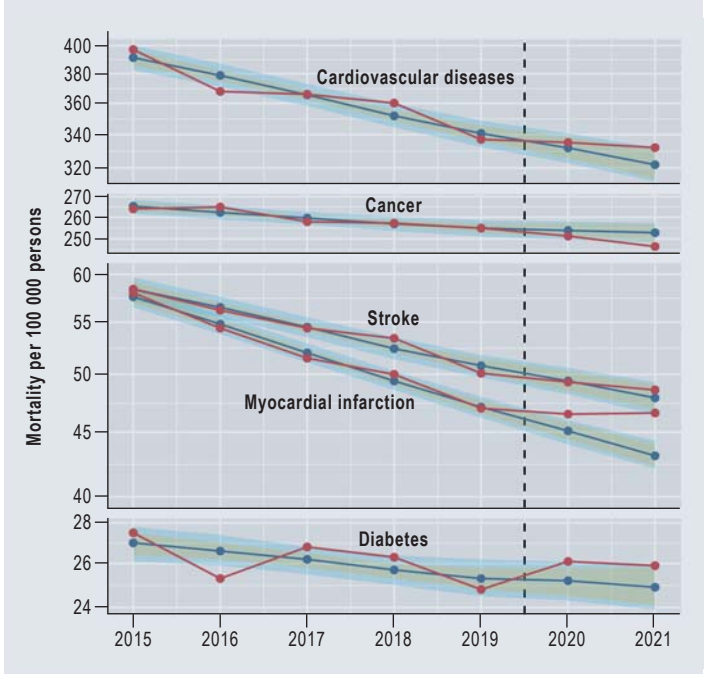
Altered Mortality From Selected Non-communicable Diseases During the COVID-19 Pandemic in Germany in 2020 and 2021

Since the begining of the COVID-19 pandemic, an increase in all-cause mortality has been observed in many countries worldwide (1), which can be explained largely—although not entirely—by deaths due to COVID-19. The extent to which an increase in mortality due to major non-communicable diseases (NCD) has contributed to the excess mortality during the pandemic in Germany remains uncertain and thus has been investigated in the present analysis.

Methods

We used data from the national statistics on the underlying causes of death provided by the German Federal Statistical Office for 2015–2021. We examined mortality due to cancer, diabetes mellitus, and cardiovascular diseases (CVD), as well as the cardiovascular emergency indications acute myocardial infarction and stroke in the resident population of Germany over time. Excess mortality was determined by comparing the observed mortality rate (number of deaths/population number, MR) (O) and the expected mortality rate (E) for 2020 and 2021. The expected mortality rate is based on a trend analysis of mortality rates by means of a negative binomial regression, assuming a log-linear change in the MR per year while considering the age-specific trend in the reference period 2015–19. Observed and expected MRs were age-standardized (German standard population 2011, DEU11). The relative change (ΔMR = [O/E–1]*100) was determined as the reference value for excess mortality.

Figure



Observed and expected mortality rates for selected non-communicable diseases per 100 000 persons in the population 2015–2021 (age-standardized)

Single-cause of death statistic (www.gbe-bund.de/Statistisches Bundesamt) mortality per 100 000 persons from 2015 to 2021 (age-standardized, German standard population 2011): observed (red line); expected (blue line) with 95% confidence interval (light green band) and 95% prediction interval (light blue band including light green band), y axis with log scale and interrupted scale between individual causes of death because of different orders of magnitude of mortality rates by causes of death

Results

We found a decrease in the number of observed deaths due to CVD, myocardial infarction, and stroke in the reference period (2015–19) (*Figure*). For 2020/21, observed mortality rates for myocardial infarction are higher than expected, respectively (ΔMR = 3.1 % and 8.1 %), whereas mortality due to stroke continues within the expected range (*Figure, Table*). Compared with 2015–19, mortality due to CVD show a plateau from 2019–2021 with a tendency towards more deaths than expected in 2021 (ΔMR = 3.2%); however, a similar pattern can be already seen in 2016–2018.. For diabetes, observed MRs fluctuate in 2015–2019, with a falling trend over time and an increase in observed MRs in 2020/21 within the prediction intervals of the expected MRs. For cancer, observed mortality fell during the reference period;this decline continues with mortality lower than expected in 2021 (ΔMR = –2.5 %).

Discussion

In Germany, observed mortality due to myocardial infarction in 2020/21 was higher and due to cardiovascular diseases tended to be higher than expected based on a continuation of the trend in the reference period 2015–2019. This may have contributed to excess in mortality in Germany during the pandemic. The results of our analysis point to an initial publication from the USA for the time period 03/2020–03/2022, which showed that observed mortality due to cardiovascular diseases was 4.9% higher than expected (2). Analyses of the decline in life expectancy in Germany during the pandemic further showed that the decline was not due to COVID-19 alone, but that 20% might be attributable to other causes of death (3).

There are several methodological limitations which need to be considered. The principle of classifying a death by a single underlying cause leads to a decision in favor of a single cause of death even though several diseases might

have contributed at the same time—for example, if someone dying with COVID-19 and a myocardial infarction is coded as a death due to myocardial infarction. The reverse scenario is also conceivable—in Italy, the fall in mortality due to chronic obstructive pulmonary disease during the pandemic was explained by a shift towards more frequent coding of COVID-19 as the underlying cause (4). This could also be discussed with regard to lower mortality due to cancer in 2021; although, the lower mortality may possibly reflect also a long-term mortality trend. To be able to better assess possible shifts in the cause-of-death statistics in Germany, it would be necessary to use multiple cause of death statistics on a nationwide basis. Unreliability resulting from monocausal death statistics can be assumed to affect estimates of time trends in diabetes mortality. People are more likely to die with diabetes as an underlying disease and not as the main cause of death, which may explain fluctuations in mortality. Beyond shifts in cause of death statistics, excess mortality in times of a pandemic needs to be analyzed in conjunction with bottlenecks in the healthcare system and patients' fears leading to reduced healthcare utilization. This is particularly relevant with regard to myocardial infarction as an acute life-theatening event requiring immediate coordinated care.

It should also be noted that decisions about the methodical approach to determine expected mortality can affect the results (5). For this reason we carried out various model calculations and opted for the calculation that best fitted the model. By using predictive intervals we used a conservative approach in our analysis. Analyses using alternative models (Poisson regression) yielded similar results while using less conservative estimates and showed excess mortality for cardiovascular diseases and myocardial infarction (results not shown here).

A comprehensive and continuing analysis of cause-specific mortality is important for understanding the effects of crisis situations—such as the COVID-19 pandemic—on developments in cause-specific mortality and to take appropriate steps for the protection of and care for people with communicable and non-communicable diseases in pandemic times. Further studies are needed to investigate direct and indirect consequences of the pandemic, such as long-term sequelae of COVID-19 or disruption of healthcare continuity.

Jens Baumert, Christa Scheidt-Nave, Henriette Steppuhn, Fabian Tetzlaff, Klaus Kraywinkel, Matthias an der Heiden, Annelene Wengler, Birga Maier

Robert Koch Institute, Department 2: Epidemiology and Health Monitoring, Berlin; Baumert, Scheidt-Nave, Steppuhn, Tetzlaff, Kraywinkel, Wengler, Maier; baumertj@rki.de

Robert Koch Institute, Department 3: Infectious Disease Epidemiology, Berlin; an der Heiden

Funding
In the context of third-party projects, Jens Baumert was funded by the German Federal Ministry of Health (extension of the project national diabetes surveillance with a broader scope to surveillance of non-communicable diseases, grant numbers 2522DIA700 and 2523DIA002) and Fabian Tetzlaff was funded by the German Cancer Aid.

Table

Mortality due to selected non-communicable diseases in 2020 and 2021: Observed versus expected mortality rates (age-standardized)

Causes of death (ICD-10)	Year	MR*1 observed DEU11	MR*2 expected DEU11 (95% PI)	ΔMR*3 DEU11 in % (95% PI)
Cancer (C00-C97)	2020	251.2	253.8 [249.5; 257.9]	−1.0 [−2.6; 0.7]
	2021	246.5	252.8 [248.3; 257.4]	−2.5 [−4.2; −0.7]
Diabetes (E10-E14)	2020	26.1	25.2 [24.3; 26.1]	3.6 [0.0; 7.4]
	2021	25.9	24.9 [23.9; 26.0]	4.0 [−0.4; 8.4]
Cardiovascular diseases (I00-I99)	2020	335.2	331.9 [322.8; 340.8]	1.0 [−1.6; 3.8]
	2021	332.1	321.9 [312.2; 332.1]	3.2 [0.0; 6.4]
Myocardial infarction (I21-I22)	2020	46.5	45.1 [44.0; 46.0]	3.1 [1.1; 5.7]
	2021	46.6	43.1 [42.1; 44.3]	8.1 [5.2; 10.7]
Stroke (I60-I64. I69)	2020	49.3	49.4 [48.2; 50.6]	−0.2 [−2.6; 2.3]
	2021	48.6	47.9 [46.5; 49.3]	1.5 [−1.4; 4.5]

Unicausal cause of death statistics (www.gbe-bund.de, Federal Statistical Office of Germany). MR: mortality rate, DEU11: German standard population in 2011 (age groups: 0–44, 45–50, ... 85–89, ≥ 90 years). 95% PI: 95% predictive interval by parametric bootstrapping
*1 Mortality rate per 100 000 persons for 2020 and 2021 (age-standardized): observed
*2 Mortality rate per 100 000 persons for 2020 and 2021 (age-standardized): expected, based on negative binomial regression (NBreg) assuming a log-linear trend in mortality in 2015–2019: NBreg(N_deaths_standardized_DEU11 ~ year + age group+ year x age group + offset (in(N population)), year modeled continuously, age group categorically
*3 ΔMR = (MR observed /MR expected -1)*100

Conflict of interest statement
The authors declare that no conflict of interest exists.

Manuscript received on 21 June 2023, revised version accepted on 24 November 2023.

Translated from the original German by Birte Twisselmann, PhD.

References

1. Wang H, for COVID-19 Excess Mortality Collaborators: Estimating excess mortality due to the COVID-19 pandemic: a systematic analysis of COVID-19-related mortality. Lancet 2022; 399: 1513–36.
2. Han L, Zhao S, Li S, et al.: Excess cardiovascular mortality across multiple COVID-19 waves in the United States from March 2020 to March 2022. Nat Cardiovasc Res 2023; 2: 322–33.
3. Schöley J, Aburto JM, Kashnitsky I, et al.: Life expectancy changes since COVID-19. Nat Hum Behav 2022; 6: 1649–59.
4. Fedeli U, Barbiellini AC, Marcon A, et al.: Mortality related to chronic obstructive pulmonary disease during the COVID-19 pandemic: an analysis of multiple causes of death through different epidemic waves in Veneto, Italy. Int J Environ Res Public Health 2022; 19: 12844.
5. Kowall B, Stang A: Estimates of excess mortality during the COVID-19 pandemic strongly depend on subjective methodological choices. Herz 2023; 48: 180–83.

Cite this as:
Baumert J, Scheidt-Nave C, Steppuhn H, Tetzlaff F, Kraywinkel K, an der Heiden M, Wengler A, Maier B: Altered mortality from selected non-communicable diseases during the COVID-19 pandemic in Germany in 2020 and 2021. Dtsch Arztebl Int 2024; 121: 135–6.
DOI: 10.3238/arztebl.m2023.0262