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# COVID-19 pandemic, government responses, and public mental health: Investigating consequences through crisis hotline calls in two countries

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## ABSTRACT

**Rationale:** The coronavirus disease (COVID-19) pandemic is an immense global health threat that has invoked unheard-of containment measures in numerous countries to reduce the number of new infections.

**Objective:** The sequential introduction of severe measures, intentionally aiming at reducing the number of new infections, also imposes sharp restrictions on populations with potentially unintended, detrimental effects on public mental health.

**Method:** We used observational data reflecting the number of phone calls made to national crisis hotlines in Austria and Germany during the COVID-19 pandemic (January 2020–April 2020) to investigate the impact of government restrictions as well as their later revocations on public mental health. Importantly, both countries have comparable health care systems, are similar in their political and socio-economic idiosyncrasies, and took similar restrictive government measures in order to contain COVID-19—but implemented them at different points in time.

**Results:** Analysis indicated that the number of crisis hotline calls increased in both countries. This increase seemed to occur at around the same time as the implementation of restrictive governmental responses. Importantly, the revocation of these governmental restrictions (i.e., re-opening the economy, allowing more social contact) seemed to occur at around the same time as the decrease in the number of calls.

**Conclusions:** The present study supports the notion that the implementation of severe measures affects public mental health. However, the negative mental health effects of COVID-19 may be reduced if severe governmental restrictions are kept in place as briefly as possible.

## 1. Introduction

The coronavirus disease (COVID-19) pandemic is a serious global health threat (World Health Organization [WHO], 2020a). Numerous countries introduced and implemented severe containment strategies to reduce the number of new infections, including placing austere restrictions on their economies and on public social life. The government responses included self-isolation, curfews and stay-at-home orders, social distancing, and travel restrictions alongside the closing of borders, schools, stores, restaurants, and workplaces as well as the cancellation of public events (Blavatnik School of Government & University of Oxford, 2020). Although these severe measures aimed at reducing the number of new infections—a beneficial, intended effect to keep national health care systems from collapsing—concerns were expressed that the

measures would also elicit detrimental, *unintended* effects on the public's mental health.

Torales et al. (2020) noted that the global COVID-19 pandemic may lead to additional mental health problems such as stress, anxiety, depressive symptoms, insomnia, or anger. Gunnell et al. (2020) even warned that the mental health effects of the COVID-19 pandemic could be profound, with rising suicide rates in the future; historic evidence from the 1918–1919 influenza pandemic (Wasserman, 1992) as well as the 2003 severe acute respiratory syndrome (SARS) epidemic (Cheung et al., 2008) support such claims. Thus, the WHO also expressed concerns (WHO, 2020b), arguing that restrictive government responses to COVID-19 with a severe impact on everyday life activities, social routines, and living conditions could increase loneliness, anxiety, depression, insomnia, alcohol and drug abuse, self-harm, and suicidal behavior

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(WHO, 2020c).

In fact, preliminary evidence from China shows how the COVID-19 pandemic may have caused tremendous psychological problems (Li et al., 2020). For example, Qiu et al. (2020) showed that the implementation of extremely strict quarantine measures in order to contain the virus from spreading have impacted public mental health outcomes such as depression. Consistent with these early findings from China, Jacobson et al. (2020) showed that the pandemic elicited a substantial rise in US Internet search volumes related to mental health (e.g., suicidal ideation, anxiety, and negative thoughts). Similarly, Knipe et al. (2020) showed an overall increase in search volume for mental health-related search terms. The latter two search volume studies may be interpreted as further evidence for the possible detrimental mental health effects of COVID-19 restrictions (see Arendt and Scherr, 2017).

The present study contributes to this line of research by examining changes in the number of calls made to telephone crisis hotlines—an important mental health resource during the COVID-19 pandemic (e.g., Zhou et al., 2020). We interpreted crisis hotline calls as an indicator of society's mental health status (see Gould et al., 2018). Importantly, there is still a lack of cross-country and longitudinal empirical evidence for the health impacts of restrictive government responses to COVID-19. We hypothesized that the number of telephone crisis counseling hotline calls had increased during the COVID-19 pandemic compared to the previous year (Hypothesis 1). More specifically, we assumed that severe government responses would operate as stressors for public mental health, and thus, we hypothesized that the change in the number of crisis hotline calls would occur around the same time as the introduction of severe restrictive government responses that put stress on both economic and public social life (Hypothesis 2). Given the long-term, detrimental consequences on public mental health, including severe outcomes such as suicidality, an investigation of the impact of COVID-19 government responses on public mental health is of high importance.

## 2. Method

We conducted an observational study and investigated changes in the number of crisis hotline calls over time. We relied on a most-similar-systems research design (see Anckar, 2008)—a research design in which countries are included in the analysis that are as similar as possible, with the aim of keeping constant as many extraneous variables as possible. We used observational data reflecting the number of phone calls made to national crisis hotlines in Austria and Germany to investigate the impact of government restrictions as well as their later revocations on public mental health. Importantly, the two countries have comparable health care systems and they are similar in many aspects of their political, economic, and social life. In contrast, they differ in terms of the timing with which specific government measures had been implemented.

### 2.1. Number of calls

We asked for the number of daily calls from crisis hotline services in Germany and Austria (i.e., *Telefonseelsorge*) to be made available for our study; we were provided with data covering the period from January 21 to April 20, 2020, for Austria, and from January 1 to March 31, 2020, for Germany. Unfortunately, the German crisis hotline service was not able to provide data for April due to a massively increased workload and capacity utilization. Thus, the observation periods differed in both countries. We requested data for these time periods for 2019 and 2020, with the 2019 data being used as controls. We compared the observed values (2020) with the expected values (2019). For each day of the observation period, we calculated the difference between the 2020 and 2019 data. Thus, the target outcome of the present study was the difference in the number of calls between 2020 and 2019 for each day of the observation period. There were no missing observations (i.e., there were no missing records of hotline calls on any day of the observation periods).

### 2.2. Statistical analysis

We looked at the time series data of hotline calls for both countries and tested whether there was an increase in the number of crisis hotline calls. Of note, we used a nonlinear regression analysis to fit a function that fits the data. We used Prism (GraphPad Software, Inc.) for curve fitting. Each day's number of calls (i.e., the 2020–2019 difference score) served as an input value, which allowed us to fit a function and also to calculate a confidence band (95%). We decided to use a function with a threshold to operationalize a pre-pandemic baseline. After a visual inspection of the distribution, we fitted a sigmoid function (utilizing a variable slope) to the data points for Germany and a Gaussian distribution function to the data points for Austria. Both functions model a similar functional relationship regarding the increase in the number of calls. However, as we will present in detail below, the relaxation of the severe measures (i.e., re-opening the economy, re-increasing social contact) and a decreasing number of crisis hotline calls were only observed in Austria during the observation period. A Gaussian distribution function models this pattern.

Furthermore, our nonlinear regression analysis relied on an iterative approach that started with initial values for each parameter. Afterward, the iterative approach adjusted the parameters to make the curve come closer to the observed data points. The iterative process stopped when the adjustments made no substantial difference to the sum-of-squares (see Arendt, 2017). We relied on the  $R^2$  value (coefficient of determination) that quantifies the goodness of fit. In addition, we used the runs test (i.e., Wald runs test for randomness, see Motulsky and Christopoulos, 2004) to estimate whether the curve deviates systematically from the observed data. Of note, a run is a series of consecutive points that are either all below or all above the regression curve. The runs test compares the actual number of runs with the predicted number of runs (based on the number of available data points). A significant  $p$  value in the runs test indicates that the functional model fits the observed data poorly. Thus, a non-significant  $p$  value is desired. Detailed statistics on the full functional models can be obtained upon request.

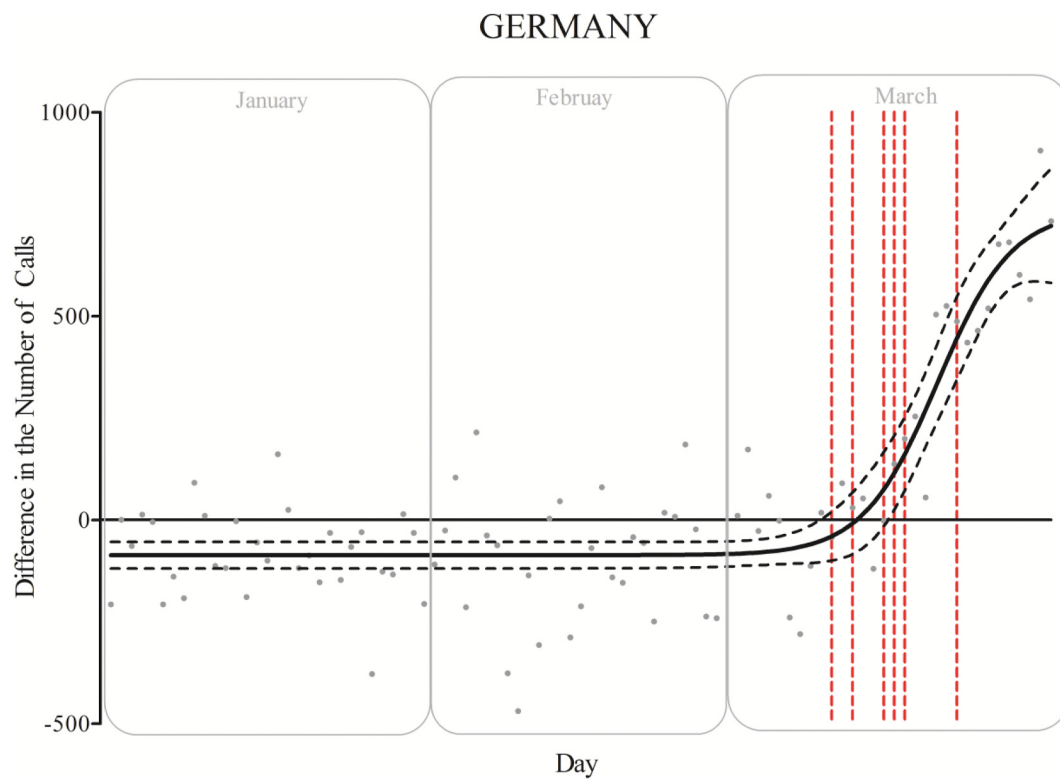
Finally, we marked the points in time when severe and potentially stress-inducing government responses had been introduced (or lifted), as long as they were theoretically related to public mental health (i.e., loneliness, hopelessness, unemployment, depression). Doing so allowed us to carefully assess whether the government responses occurred around the same time as changes in the number of crisis hotline calls.

## 3. Results

Hypothesis 1 predicted that the number of calls increased during the COVID-19 pandemic. More specifically, Hypothesis 2 predicted that the change in the number of calls would occur around the same time as the onset of severe government responses that elicited sharp restrictions being placed on the economy and on public social life. We present our analysis of the German data first and the Austrian data second.

### 3.1. Germany

Fig. 1 shows the differences in the number of calls to the German crisis hotline between 2019 and 2020 over time. As can be deduced from the figure, there was an increase in the number of calls in March. We fitted a sigmoid function to the data points ( $df = 86$ ,  $R^2 = 0.76$ ). The runs test provides evidence that there is no significant deviation of the functional model from the actual empirical data,  $p = .251$  (data points above the curve = 49, data points below the curve = 41). The number of calls in 2020 remained steadily lower than in 2019 at the beginning of the observational period from January to early March, and only after then did they rapidly increase and reach the highest level. Importantly, restrictive government responses, as indicated by the vertical dashed lines in Fig. 1, occurred around the same time as the increase in hotline calls.



**Fig. 1.** Number of calls to a German crisis hotline for each day of the observation period. *Note.* Number of calls to a German crisis hotline for each day of the observation period (i.e., daily difference between the 2020 and 2019 data). A nonlinear regression analysis was used to fit a sigmoid function. Each vertical line marks a day when restrictive government responses were put in place (in this temporal order): the recommendation to cancel public events (March 10); the first social distancing measures and prohibiting nursing home visits (March 12); a nationwide curfew as well as cross-border controls (March 15); nationwide school closures, store closures, and restrictions on certain group gatherings (March 16); travel warnings and an entry ban (March 17); and contact restrictions (March 22).

In Fig. 1, each vertical line represents the day on which restrictive, COVID-19-related government responses had been introduced. These were in chronological order for Germany: the recommendation to cancel all public events (March 10); the introduction of the first social distancing measures (March 12); a nationwide curfew and cross-border controls (March 15); nationwide school and store closures as well as restrictions on group gatherings (March 16); travel warnings and a travel entry ban (March 17); and contact restrictions (March 22). Taken together, the German data provide supporting evidence for a general increase in the number of calls (Hypothesis 1) during the observation period. Visual inspection (Fig. 1) indicates that restrictive government responses seemed to occur around the same time as this increase (Hypothesis 2).

### 3.2. Austria

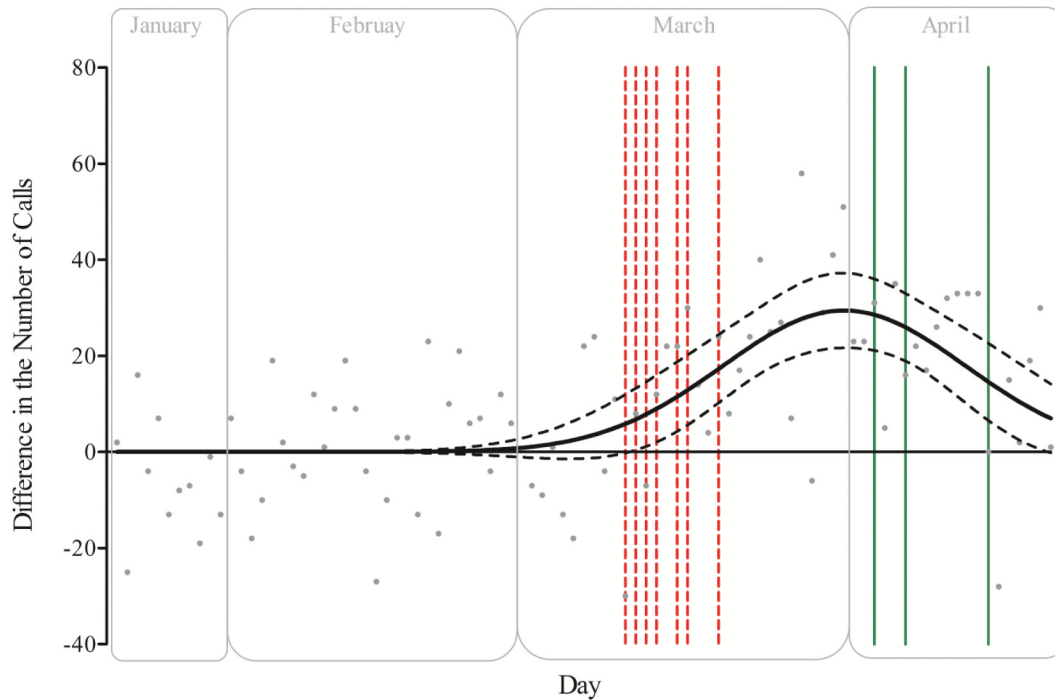
Fig. 2 shows the differences in the number of calls to the Austrian crisis hotline between 2019 and 2020 over time. As can be seen in Fig. 2, after a steady phase from January 2020 until March 2020, with about the same number of crisis hotline calls as the year before, there was an increase in the number of calls in March 2020, consistent with the findings from Germany. Importantly, given that a longer time series was available for Austria, we also identified a decrease in the number of crisis hotline calls in April. Thus, we fitted a Gaussian distribution function ( $df = 87$ ,  $R^2 = 0.39$ ). The runs test provides evidence that there is no significant deviation of the functional model from the actual empirical data,  $p = .550$  (data points above the curve = 47, data points below the curve = 43). The number of additional crisis hotline calls, as compared to the same time frame in 2019, increased and approached a plateau in March 2020—consistent with the observations from Germany. After plateauing in late March 2020, the number of additional

crisis hotline phone calls decreased. Visual inspection (Fig. 2) indicates that the introduction of restrictive government measures (the vertical dashed lines in Fig. 2) seemed to occur at around the same time as an increase in hotline calls, while the relaxation of severe measures (the vertical solid lines in Fig. 2) seemed to occur around the same time as the decrease in the number of calls.

Each vertical dashed line notes a day when one or more restrictive government responses were put in place: the call to restrict social life, the prohibition of big events, as well as the closure of universities and colleges, and a restriction on border crossings from Italy (March 10); school closures (March 11); the prohibition of visits to clinics and nursing homes, and the postponement of non-essential surgeries (March 12); the announcement of a nationwide curfew, the closure of non-essential stores and businesses, and hot-spot cities being placed under quarantine (March 13); further business closures and mandatory home offices, and further quarantine measures in parts of Tyrol and Carinthia (March 15); further closures of public institutions (March 16); and the closure of wellness centers and quarantine for air travelers (March 19).

Each vertical solid line notes a day when there was a relaxation of severe measures: picking up meals from otherwise closed restaurants was reinstated (April 3); the announcement of an economic reboot after Easter, the announcement about schools re-opening in mid-May, and the announcement about ending the curfew at the end of April (April 6); and the re-opening of small businesses and hardware stores (April 14). Thus, the Austrian data observations provide supporting evidence that there was also a general increase in the number of crisis hotline calls, which supports Hypothesis 1. Similar to the observations from Germany, restrictive government responses seemed to occur at around the same time as an increase in the number of crisis hotline calls, a pattern consistent with Hypothesis 2. Above and beyond these findings, the Austrian data exclusively allowed us to also look at the effect of the

## AUSTRIA



**Fig. 2.** Number of calls to an austrian crisis hotline for each day of the observation period. *Note.* Number of calls to an Austrian crisis hotline for each day of the observation period (i.e., daily difference between the 2020 and 2019 data). A nonlinear regression analysis was used to fit a Gaussian distribution function. Each vertical dashed line notes a day when one or more restrictive government responses were put in place: the call to restrict social life, the prohibition of big events, as well as closures of universities and colleges, restrictions on border crossings from Italy (March 10); school closures (March 11); prohibiting visits to clinics and nursing homes and the postponement of non-essential surgeries (March 12); the announcement of a nationwide curfew, the closure of non-essential stores and businesses and hot-spot cities being placed under quarantine (March 13); further business closures and mandatory home offices, and further quarantine measures in parts of Tyrol and Carinthia (March 15); further closures of public institutions (March 16); and the closure of wellness centers and quarantine for air travelers (March 19). Each vertical solid line notes a day when there was a relaxation of the severe measures: introducing the possibility of picking up meals from otherwise closed restaurants was reinstated (April 3); the announcement of an economic reboot after Easter, the announcement that schools would re-open in mid-May and the announcement that the curfew would end at the end of April (April 6); and the re-opening of small businesses and hardware stores (April 14).

lifting of previously introduced governmental restrictions: Visual inspection (Fig. 2) indicated that the relaxation of severe measures seemed to occur at around the same time with a decrease in the number of calls; this pattern is consistent with Hypothesis 2.

#### 4. Discussion

We tested the idea that governmental restrictions would have a considerable impact on public mental health. More crisis hotline calls during the COVID-19 pandemic in early 2020, as compared to the same time frame in 2019, were interpreted as an indicator of a higher mental health burden. We found that the number of crisis hotline calls peaked in late March 2020, both in Austria and Germany. The increase seemed to occur at around the same time as the introduction of restrictive government responses to the pandemic. Of note, data relating to the relaxation of some of the severe restrictions (fully or to some extent) was only available for Austria. Our analysis indicated that the suspension of temporarily introduced restrictions (i.e., re-opening the economy, removal of stay-at-home orders) seemed to occur at around the same time as a decrease in the number of crisis hotline calls.

These findings support the notion that severe, restrictive government responses to a global pandemic represent a severe burden for public mental health. However, effects on crisis hotline calls seemed to be temporarily bound to the duration of the imposed restrictions, as the Austrian data show. In Austria, the number of crisis hotline calls tended to decrease broadly at a similar time as severe governmental restrictions were lifted. An important policy implication of the present study is that

the democratic maxim “as long as needed, but as short as possible” seems to hold true for the duration of the socio-economic restrictions during the global COVID-19 pandemic when focusing on public mental health. Thus, the shorter the duration of strict government regulations, the less detrimental seem to be the mental health effects that are elicited, as the findings of the present study indicate.

Unfortunately, we were not able to investigate the underlying mechanisms and the individual impact of all government responses on public mental health in more detail. We speculate that there may be several possible paths of influence: First, some government responses elicited a massive threat to the economy that led to substantial increases in unemployment rates (Kawohl and Nordt, 2020). As a consequence, the future might have seemed dark to some individuals, possibly increasing feelings of hopelessness. As Kumar and Nayar (2020) note, feelings might get worse when considering that nobody can be “sure what direction the pandemic will take in the coming days” (p. 1), possibly contributing to feelings of uncertainty. Second, government responses such as the stay-at-home orders and social distancing may have contributed to loneliness and depression, which are known risk factors for mental health problems, as already noted above. Third, government responses that forced individuals to stay at home might also have influenced domestic violence, sexual abuse, and child abuse rates (Bradbury-Jones and Isham, 2020). Besides, due to school closings, some parents may have felt stressed and overstrained, which may have led to feelings of exhaustion. Fourth, health professionals, including physicians and nurses, are assumed to be at risk of psychological distress as they are expected to work longer with a higher risk of exposure to the



virus (Zhou et al., 2020). This may also be a substantial stressor. Fifth, the observation of others' panic-buying such as the so-called mass mask panic (i.e., panic-buying of masks; or similar: panic-buying of toilet paper) may also have contributed to a "pandemic fear" that contributed as a stressor (Leung et al., 2020). Although we were not able to provide evidence for a systematic study of the underlying mechanisms in the present study, our ideas related to these six possible paths may stimulate future research.

## 5. Limitations

This study has several limitations that need to be mentioned. First, we utilized a non-experimental, observational design. Therefore, we cannot prove that the government responses causally influenced the number of hotline calls. Thus, the causal order of the onset of government responses and hotline calls should be interpreted with caution. Second, we used data from two countries. Actually, we started with one country and decided to increase the generalizability by including a second country. However, analyzing more countries would not only allow us to test more specific hypotheses but also to generalize our findings beyond European countries. Of interest in this regard, we were not able to test for the individual contributions of specific government responses. Third, we were not able to test whether a specific segment of the population was overrepresented in the crisis calls. A future study may help to identify the social segments that were especially vulnerable to severe government responses. Fourth, we relied on the daily changes in the number of crisis calls. Future studies may provide deeper insights if they could also analyze the topics discussed in each call; there are several possible reasons why individuals could have called the crisis hotline. Whereas some may have felt lonely or hopeless, others may have experienced domestic violence, feared infection or death from the virus or may have grieved the loss of a loved one due to the virus. In addition, it might make a difference whether news media within a given country emphasizes optimism (e.g., "it's getting better," "a vaccine will be available soon") compared to pessimism (e.g., "the most dangerous time is still ahead"). Furthermore, the number of crisis hotline calls might be related to actual suicide statistics: On the one hand, high numbers may indicate a detrimental state of public mental health, contributing to an increase in suicide rates. On the other hand, more calls may indicate a stronger use of professional crisis intervention that may, in turn, be related to a decrease in the number of suicides. Fifth, we categorized governmental responses as severe measures that have been repeatedly noted in the literature and news coverage as stress-inducing and the relaxation or suspension of them as stress-reducing. For example, the onset of the stay-at-home order was interpreted as restrictive and thus as potentially stress-inducing. Conversely, the relaxation/retraction of this order was interpreted as stress-reducing. We followed the common interpretation. However, other government responses may also have elicited an impact on public mental health. For example, the Austrian and German governments repeatedly communicated that they would offer financial support for companies. Although this facet may not be directly related to individual mental health outcomes, such a government response may have indirectly provided a glimmer of hope to at least some individuals. Therefore, the list of government responses is tentative. Sixth, the German crisis hotline service was not able to provide data for April. This is unfortunate given that both observation periods therefore overlapped less.

## 6. Conclusions

Despite these important limitations, the present study provides supporting evidence about publicly raised concerns about the implementation of severe government restrictions relating to the COVID-19 pandemic and their impact on public mental health. One important implication of the present study is that the negative effects may be dampened if the duration of such severe governmental restrictions is

reduced to a minimum. Governments are thus wise to thoroughly consider the tradeoff between the costs and benefits of severe government responses to global health pandemics.

## Credit author statement

Florian Arendt: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing, Visualization. Antonia Markiewicz: Conceptualization, Investigation, Writing - review & editing. Manina Mestas: Investigation, Writing - review & editing. Sebastian Scherr: Conceptualization, Writing - review & editing.

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