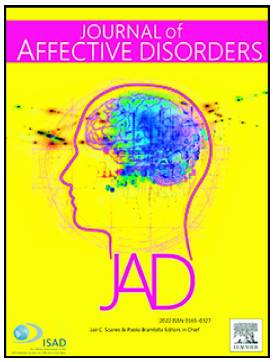

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Suicidal ideation across three waves of the COVID-19 pandemic in Denmark – identifying vulnerable subgroups using COH-FIT data

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ABSTRACT

BACKGROUND: The COVID-19 pandemic and related restrictions might have increased suicidal ideation and behaviors. This study measured suicidal ideation and associated factors in the general Danish adult population during the COVID-19 pandemic.

METHODS: Using repeated cross-sectional Danish adult data from The Collaborative Outcomes study on Health and Functioning during Infection Times (COH-FIT, online anonymous survey, three waves in Denmark, including also representative samples), we estimated self-reported suicidal ideation prevalences during the three waves, and their association with demographic, socioeconomic, and psychological characteristics in multivariable analyses for each wave and pooled across all waves.

RESULTS: We included 2286, 1041, and 1039 individuals (age=18-86, females=52%-55%) from waves I (1-31/05/2020), II (11-20/01/2021), and III (14-20/01/2022). The prevalence of suicidal ideation was higher in wave I (42%) than in waves II (30%, $p<0.001$) and III (28%, $p<0.001$). Odds for suicidal ideation were higher in those with loneliness, financial loss and prior suicidal attempts consistently across all three waves (range OR=4.91; 95%CI=4.02-5.99 to OR=1.84; 95%CI=1.42-2.39). Also, men, respondents with low and medium educational level, and those with a history of mental illness had higher odds of suicidal ideation, yet not consistently across waves. In multivariable analyses across pooled waves, suicidal ideation was associated (in descending order) with loneliness, financial loss, low-medium educational level, prior attempted suicide, history of mental illness, male sex, and younger age.

CONCLUSION: COH-FIT Danish data identified groups vulnerable to suicidal ideation, especially early during the pandemic, with specific demographic, socioeconomic, and psychological characteristics, calling for targeted early interventions during crisis times.

INTRODUCTION

COVID-19 began spreading worldwide in early 2020 and was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. In an attempt to control and constrain the virus and prevent collapse of healthcare systems, most countries initiated lockdowns and adopted measures of movement restriction, quarantine, and isolation. These restrictions varied greatly in intensity across countries and throughout the pandemic, which in Denmark unfolded in three waves. Denmark experienced a full lockdown during the first wave in spring 2020 and the second wave in winter 2020/2021, while the third wave in winter 2021/2022 saw only minimal restrictions, despite high infection rates. Following the first lockdown, there was a widespread concern that social isolation, economic hardship, depression, sub-optimal access to health care services and other pandemic-related stressors would contribute to an increase in suicidal behaviors in both the general population and among vulnerable subgroups, such as people with existing mental illness (Efstathiou et al., 2022; Gunnell et al., 2020; Pirkis et al., 2021). Nevertheless, no overall divergence from existing trends in overall suicide numbers was observed during the first year of the pandemic across high-income countries (Pirkis et al., 2022; Pirkis et al., 2021).

However, suicidal deaths and suicide attempts have been described as a problem that represents only the tip of the iceberg, hiding a larger group of people who experience suicidal ideation and who often suffer in silence (Jobes and Joiner, 2019). Suicidal ideation refers to thinking about or formulating plans for suicide. The ideation exists on a spectrum of intensity from passive thinking to active planning (Harmer et al., 2024). Reviews of suicidal ideation during COVID-19 have found an upward trend of suicidal ideation during the pandemic (Yan et al., 2023) and when compared to pre-pandemic studies (Dubé et al., 2021). However, variations between countries have been documented with higher rates in North America, South America, and Asia than in Europe (Du et al., 2023). The suicide-related impacts of the pandemic may differ based on a country's restrictions, public health measures, sociocultural and demographic factors, and existing support systems (Gunnell et al., 2020). These effects could be more severe in low-resource settings, where economic hardship is worsened by insufficient welfare support (Gunnell et al., 2020). Most studies have assessed

suicidal ideation during early stages of COVID-19, and no studies to our knowledge have examined suicidal ideation at points representing the entire COVID-19 pandemic.

The primary aim of this study was to examine the prevalence of suicidal ideation among adult Danes during the COVID-19 pandemic, and to identify potential vulnerable subgroups. An additional goal was to examine whether the prevalence of suicidal ideation differed across the three different waves of the pandemic and likewise whether the characteristics of the vulnerable subgroups changed across waves and therefore the duration and severity of the pandemic. For instance, economic uncertainty and related stress might have been at its highest in the first wave due to business closures and rise in unemployment rates, which was later alleviated by government interventions, such as wage compensation schemes and financial support for businesses. Insight into psychological consequences of lockdown and social isolation can provide a knowledge base for the emotional responses to the pandemic. These results may help identify vulnerable groups to whom interventions could be targeted when facing lockdowns or similar circumstances in the future.

METHODS

Setting

On February 26, 2020, Denmark confirmed its first case of COVID-19. Following the WHO's declaration of a global pandemic on March 11, 2020, the Danish government implemented a national lockdown. Over the next two years from March 11, 2020, to February 1, 2022, Denmark experienced three waves of the pandemic (Figure 1). This study investigates suicidal ideation at three different timepoints, each corresponding to one of the three pandemic waves, which varied in their levels of restrictions. The lockdown in **wave I** involved several restrictions with great impact on everyday life, including assembly bans, guidelines on social distancing, closing of educational institutions and daycare facilities, and a complete lockdown of restaurants, sport activities, cultural institutions etc. Public sector employees were required to work from home, and private companies were encouraged to adopt similar measures. Additionally, legal

sanctions were imposed on public gatherings exceeding 100 people, later reduced to as few as 5 during the second wave. In May 2020, some restrictions were eased. However, leading up to **wave II** in the winter of 2020/2021, most restrictions were reintroduced, and new measures were implemented, such as wide use of masks in public indoor spaces and on public transportation. In early 2021, a national vaccination program was implemented and by the summer of 2021 most Danes were vaccinated. **Wave III** began in the fall of 2021 with the emergence of the highly contagious Omicron variant of COVID-19 leading to a massive increase in the number of confirmed cases as well as hospitalizations. However, this did not impact restrictions, and by the winter of 2021/2022, only a few restrictions remained in place. On January 11, 2022, the WHO estimated that more than half of the population of Europe would contract the Omicron variant within the following 6 to 8 weeks. On February 1, 2022, all restrictions were lifted in Denmark, and COVID-19 was no longer classified as a critical public health threat.

Data

The study is based on data from the Danish part of The Collaborative Outcomes study on Health and Functioning during Infection Times (COH-FIT), which is a large-scale anonymous survey, including more than 150 countries from all six inhabited continents, which continuously collected data from the general population representative and weighted non-probability samples from 26/04/2020 to 19/06/2022 globally. COH-FIT aims to identify risk factors affecting the general population and vulnerable subgroups during the COVID-19 pandemic. The co-primary outcomes of COH-FIT were WHO-5 and P-score, but in this secondary analysis we also measured suicidal ideation among many other factors. Additional information about this global study is available elsewhere (Solmi et al., 2022a, 2022b; Solmi et al., 2024; Solmi et al., 2023). For the Danish population, data were collected through online questionnaires at three points: towards the end of wave I in May 2020, during wave II in January 2021, and during wave III in January 2022 (Figure 1). This approach allowed us to analyze suicidal ideation across the three pandemic waves. In May 2020, the questionnaire was promoted by The Danish Mental Health Fund and the National Institute of Public Health, University of Southern Denmark, through newsletters sent to members and in news media as well as social media (May 1-31, 2020). A total of 3134 men and women aged 18-84 participated. To retrieve a

representative sample of Danish adults (18+ years) according to sex, age, geographic position, educational level, and occupation, the two subsequent data collections in January 2021 (January 11-20, 2021) and in January 2022 (January 14-20, 2022) were performed by a survey agency. A total of 1170 and 1174 men and women aged 18-86 participated in wave II and III, respectively. Individuals with missing information on either suicidal ideation (n=701, 118, 121) or other included risk factor variables (n=147, 11, 14) were excluded leaving study populations of 2286, 1041, and 1039 in waves I, II and III, respectively.

Suicidal ideation

All information was based on survey data from COH-FIT. Suicidal ideation was assessed with a single item. Respondents were asked to recall how often they had thoughts about killing themselves during the past two weeks on a scale from 0 (never) to 100 (all the time). Most respondents reported 0 (65%) on the scale and the responses were thus dichotomized into two categories: 0 and 1+, reflecting no suicidal ideation and some level of suicidal ideation within the past two weeks, respectively.

Characteristics for the identification of vulnerable groups

All characteristics were self-reported through the questionnaire and subsequently categorized. **Demographic characteristics** included sex (men, women), and age (18-29, 30-59, 60+ years). **Socioeconomic characteristics** included highest achieved educational level (none/primary education as low educational level, high school/vocational school as medium educational level, college/university/PhD degree as high educational level), occupational status combined with whether this was within the health care sector or not (not working; working, not in health care; and working, in health care), and financial loss. Financial loss was based on the question "How much financial loss have you suffered SINCE the outbreak of the COVID-19 pandemic?" on a scale from 0 (no loss) to 100 (extreme loss). Responses were grouped into three categories: Respondents answering 0 (45%) were categorized as no financial loss. Respondents answering ≥1 were dichotomized based on the median into moderate (median and below) and high level (above median).

Psychological characteristics included history of mental illness, history of attempted suicide, and current loneliness. To obtain information about mental illness, respondents were asked whether they had ever been diagnosed with mental health conditions by a doctor or psychologist. Respondents indicating at least one mental health condition were defined as having a history of mental illness. Information on history of attempted suicide was based on the question "In the past, BEFORE the COVID-19 outbreak, how many times had you tried to put an end to your life?". Respondents who answered 0 (none) were categorized as "no history of attempted suicide" and respondents who answered 1 or more times were categorized as having a "history of attempted suicide". Information on loneliness was based on information from the question "How lonely have you felt in the last two weeks?" on a scale from 0 (not lonely at all) to 100 (extremely lonely), and the answers were categorized in the same way as for financial loss.

Weights

To ensure three comparable samples with the same distribution of sex, age group, educational level, and occupation, the data collected during the first wave in May 2020 were weighted based on the representative samples from January 2021 resulting in a wave I study sample of 2157. Technically, respondents from groups that were overrepresented (e.g. females with higher educational level) in the convenience sample had a lower weight, while respondents that were underrepresented had a higher weight to compensate the uneven and non-representative distribution.

Statistical analyses

Descriptive statistics were performed to assess the proportion of respondents with suicidal ideation at the three different time points representing each of the three waves during the COVID-19 pandemic. We calculated the prevalence as the proportion of respondents reporting suicidal ideation and assessed differences between waves using a Chi^2 test. We calculated odds ratios (ORs) with corresponding 95% confidence intervals (CIs) to evaluate variations in suicidal ideation during COVID-19 according to demographic, socioeconomic, and psychological characteristics. To examine the prevalence of suicidal

ideation among adult Danes during the COVID-19 pandemic and identify potentially vulnerable subgroups, we combined data from the three samples in a sex- and age-adjusted logistic regression model, as well as a mutually adjusted model with all included demographic, socioeconomic, and psychological characteristics. Additionally, to determine if the prevalence of suicidal ideation varied across the three waves and if the characteristics of vulnerable subgroups changed over time, we stratified these models by pandemic waves. All analyses were conducted in SAS Enterprise Guide version 8.1, two-sided, with alpha=0.05.

RESULTS

Altogether, 2286 respondents were included in the data collection from the first wave, while the second and third wave samples comprised 1041 and 1039 respondents, respectively (Table 1). There was a higher proportion of respondents reporting suicidal ideation in the first wave (42%) than in the second (30%, $p<0.001$) and third wave (28%, $p<0.001$), respectively.

Demographic characteristics

Regarding the demographic characteristics, pooling all waves, men had increased suicidal ideation in the fully adjusted model (OR: 1.22 (95% CI: 1.05-1.41)) (Table 2). Looking at waves separately, a significant association between men and suicidal ideation only emerged in wave 1 (Figure 2). Compared to the youngest age group (18-29), there was no significant difference for those aged 30-59, whereas the oldest age group (60+) had lower odds of reporting suicidal ideation (OR: 0.78 (95% CI: 0.62-0.98)) in the fully adjusted model (Table 2). For those aged 30-59, the lack of association remained stable across the three waves whereas the lower odds of the oldest compared to the youngest age-group was only apparent in the first wave (Figure 2).

Socioeconomic characteristics

We observed higher odds of suicidal ideation among respondents with a low educational level (OR: 2.01 (95% CI: 1.68-2.41)) as well as medium educational level (OR: 1.31 (95% CI: 1.11-1.56)) compared to respondents with a high educational level in the model pooling responses from three waves. The association with suicidal ideation was only present in the first wave, when considering waves separately (Figure 2). We did not observe a significant elevation in OR for healthcare workers (OR: 1.23 (95% CI: 0.97-1.57)). The results were stable across all three waves (Figure 1). Respondents reporting moderate (OR: 2.50 95% CI: (1.79-3.49)) and high (OR: 2.14 (95% CI: 1.85-2.47)) financial loss had higher odds of suicidal ideation (Table 2), consistently across waves (Figure 2).

Psychological characteristics

Respondents with mental illness had higher odds of suicidal ideation (OR: 1.54 (95% CI: 1.33-1.78)) than respondents without a mental illness (Table 2), however, this difference was not present for the second wave and the third wave (Figure 2). In contrast to this, those with a history of suicide attempt had increased odds of suicidal ideation in the analyses pooling data from all three waves (OR: 1.84 (95% CI: 1.42-2.39)) and consistently across all waves, with increasingly higher ORs in waves 2 and 3 (Figure 2). Higher odds for suicidal ideation were observed pooling data from all three waves for moderate (OR: 4.39 (95% CI: 3.48-5.54)) and high loneliness (OR: 4.91 (95% CI: 4.02-5.99)), which was consistent across the three waves (Figure 2).

DISCUSSION

Main findings

In this study, we found a higher proportion of respondents reporting suicidal ideation in the earlier phase of the pandemic, being higher in the first wave than in the second and third wave, respectively. We further examined potential vulnerable subgroups in terms of demographic, socioeconomic, and psychological characteristics across the three waves. We found that men had higher odds of suicidal ideation than women

in all three waves, and that the age group of 60+ were had lower odds than younger age groups, especially during the first wave. We found some differences between educational groups in the first wave, with higher odds for suicidal ideation in the low and medium education groups, which attenuated in the second and third wave. However, the results seemed to be driven by the numbers from the first wave. We observed only numerically higher odds for suicidal ideation among respondents working in healthcare across all three waves, but these results were not statistically significant. Both the moderate and high-level groups of financial loss were at higher odds of suicidal ideation, but no trend was observed across the three waves. We further observed higher odds for suicidal ideation among respondents with a history of mental illness during the first wave, but not for the second and third wave. Conversely, the odds for suicidal ideation were higher in the second and third wave among respondents with a history of attempted suicide. Finally, both the moderate and high loneliness groups were at higher odds of suicidal ideation in all three waves.

Comparison with previous findings

Variations in COVID-19 transmission rates, hospitalizations, deaths, restrictions, and access to healthcare and social services complicate comparisons between findings, as studies were conducted during a period of significant differences in settings across otherwise comparable countries. Moreover, studies were conducted at various time points during the pandemic, limiting the generalizability of their findings to other populations or time periods. Various studies have examined suicidal ideation during COVID-19 including a number of reviews and studies focusing on specific regions (Valle-Palomino et al., 2023) or subgroups, such as adolescents (Brewer et al., 2023; Danielsen et al., 2023), healthcare workers (García-Iglesias et al., 2022), and individuals with pre-existing mental health conditions (Barlattani et al., 2023). One review and meta-analysis pooled 16 studies and found that the prevalence of suicidal ideation had increased (Yan et al., 2023), and another review found higher prevalences of suicidal ideation compared to pre-pandemic times in some countries but not all (Shobhana and Raviraj, 2022). A meta-analysis conducted as part of a review pooled 104 studies and found that the prevalence of suicidal ideation was 14.7% in the general population, with

higher prevalences in 2021 and 2022 than in 2020 but with relevant variations across regions (Du et al., 2023).

Due to the heterogeneity in the reviews, we compare our results with studies that are based on nationally representative data of the general adult population in settings somewhat similar to Denmark, although the studies cover a shorter period of the COVID-19 pandemic than our study. A Canadian study assessed suicidal ideation across three pandemic timepoints and found prevalence rates of 4.1% in fall 2020, 5.3% in winter 2020/2021, and 5.8% in summer 2021 (Turner et al., 2023). Contrary to our findings, these results indicated somewhat higher prevalence rates in later waves compared to the first wave, but the overall prevalence of suicidal ideation was 5-10-fold lower than in the Danish population, likely at least partly due to differences in the ascertainment of and threshold definitions for suicidal ideation. However, consistent with our findings regarding age effects, in that study, the odds of suicidal ideation were higher for respondents under the age of 35 years and with pre-existing mental illness (Turner et al., 2023). Another Canadian study reported prevalences of suicidal ideation among adults aged 18-34 years of 4.2% in the fall of 2020 and 8.0% in the spring of 2021 (Liu et al., 2023), also indicating an increase in the level of suicidal ideation over time, yet, again, the overall prevalence of suicidal ideation was 3.5-9.5-fold lower than in the Danish population. A Norwegian study based on repeated cross-sectional data examined suicidal ideation before and during the first six months of the COVID-19 pandemic and found stable levels across three different timepoints in the pandemic and when compared to pre-pandemic levels (Knudsen et al., 2021). In that study, also no difference between sex, age groups and educational level was observed. The study relied on interview data, which may have influenced responses regarding suicidal ideation due to stigma and social desirability of responses. Another Norwegian study of suicidal ideation in the early stages of COVID-19 found consistent with our study results that a history of attempted suicide, lower age, and having economic concerns associated with higher odds of current suicidal thoughts (Bonsaksen et al., 2021). However, in both Norwegian studies, the prevalence of suicidal ideation was around 3-4%, which is about 10-fold lower than in our study. Again, these differences in the prevalence rates of suicidal ideation are likely, at least in part, due to methodological differences in the ascertainment and case definition of suicidality. A US study using

two cross-sectional surveys reported a prevalence of suicidal ideation of 3.4% in 2017-2018 and 16.4% in 2020 (only 2.4-fold lower than our 2020 prevalence of suicidal ideation), reflecting an increase during the initial period of the pandemic compared to the pre-pandemic time (Raifman et al., 2022). In line with the findings of our study, the authors reported higher prevalences among respondents experiencing economic precarity and loneliness, emphasizing these groups as being potentially particularly vulnerable (Raifman et al., 2022). Regarding the effect of sex, some studies reported no differences (Knudsen et al., 2021; Raifman et al., 2022), while others found higher prevalences of suicidal ideation in women (Bonsaksen et al., 2021) and some in men (Du et al., 2023; Turner et al., 2023). These mixed findings might reflect that men and women may experience vulnerability at different times during the pandemic or also have additional differential characteristics that predispose them more or less to the presence or emergence of suicidal ideation.

Strengths and limitations

The COH-FIT Danish data have several strengths. An important strength is that we were able to assess potential vulnerable subgroups in terms of both demographic, socioeconomic, and psychological characteristics in a large study population. Moreover, the rapid dissemination of the online survey in May 2020 enabled us to assess suicidal ideation among a large group of Danish adults at a critical starting point of the COVID-19 pandemic. Combined with two subsequent surveys, this approach enabled us to document suicidal ideation across the three waves of the pandemic. However, the differences in sampling methods should be noticed. The surveys from 2021 and 2022 were conducted using a representative sample of Danish adults recruited by a survey agency, whereas the 2020 sample was recruited through newsletters, and social media. Using the representative sample from 2021, we were able to weight the 2020 data accordingly to enable comparison across the three samples and concurrently enhance the generalizability of the findings. Nevertheless, after applying the weights, the 2020 population differed from the two other samples showing higher proportions of respondents with a mental illness, a history of suicide attempt, and reported loneliness – all recognized predictors of suicidal ideation (McClelland et al., 2020; Nock et al., 2008; Roberts et al.,

1998). Given the nature of recruitment, the 2020 sample was a convenience sample susceptible to self-selection bias. If those individuals who felt most aligned with the study objectives were more likely to participate, e.g., those who felt greatly impacted by the COVID-19 pandemic, the 2020 sample may not be representative of the general population even after applying weights. Thus, the higher prevalence of suicidal ideation observed in Wave I may partly be explained by the higher proportion of individuals with mental illness, a history of suicide attempts, and reported loneliness in the 2020 sample compared to the subsequent representative samples. Some additional limitations should also be noticed. First, as stated earlier, suicidal ideation refers to a spectrum from passive thinking to active planning. Although respondents could provide answers ranging from 0 to 100, the variation among those reporting any level of suicidal ideation (≥1) was relatively low, with medians of 10 (wave I), 5 (wave II), and 4 (wave III) (Table 1). Consequently, we were unable to assess different severity levels of suicidal ideation that correspond to distinct points along the suicidality spectrum. Second, like other studies of suicidal ideation during COVID-19, we measured suicidal ideation using a single item. Research indicates that use of single-item self-report questions to assess suicidal behaviors can lead to misclassification, and thus our results might be subject to such bias (Millner et al., 2015). It is also important to note that dichotomizing this variable may mask important variation in severity, potentially reducing the sensitivity of the measure and limiting the clinical interpretability of the findings. Third, due to the cross-sectional study design, we were unable to examine changes in suicidality at the individual level across the pandemic. Fourth, the anonymous design of the survey did not allow us to follow-up the same individuals, but we did collect data longitudinally at the population level, and without concerns regarding stigma or social desirability of the responses to a question regarding a sensitive topic. Finally, we only assessed variations for and risk factors of suicidal ideation and cannot comment on how much these are related to actual suicide attempts or deaths from suicide and what the correlates of these relevant outcomes are.

CONCLUSION

In this repeated cross-sectional study, we examined prevalent suicidal ideation and sought to identify potential vulnerable subgroups during the three waves of the COVID-19 pandemic in Denmark. The prevalence of suicidal ideation was higher in the first wave than in the subsequent two waves, but this result may partly be explained by self-selection bias due to differences in sample recruitment. Individuals experiencing financial loss, current loneliness, low education, and with a history of attempted suicide, or of mental illness had higher odds of suicidal ideation and the associations were stable across the three waves for financial loss, loneliness, and history of suicide attempt. These groups were thus potentially vulnerable and might be targeted by public health interventions in future pandemics.

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Declaration of interests

MS received honoraria/has been a consultant for Angelini, AbbVie, Boehringer Ingelheim, Lundbeck, Otsuka. CUCl has been a consultant and/or advisor to or has received honoraria from: AbbVie, Alkermes, Allergan, Angelini, Aristo, Autobahn, Boehringer-Ingelheim, Bristol-Meyers Squibb, Cardio Diagnostics, Cerevel, CNX Therapeutics, Compass Pathways, Darnitsa, Delpor, Denovo, Draig, Eli Lilly, Eumentis Therapeutics, Gedeon Richter, GH, Hikma, Holmusk, IntraCellular Therapies, Jamjoom Pharma, Janssen/J&J, Karuna, LB Pharma, Lundbeck, MedInCell, MedLink, Merck, Mindpax, Mitsubishi Tanabe Pharma, Maplight, Mylan, Neumora Therapeutics, Neuraxpharm, Neurocrine, Neurelis, Newron, Noven,

Novo Nordisk, Otsuka, PPD Biotech, Recordati, Relmada, Response Pharmaeutical, Reviva, Rovi, Saladax, Sanofi, Seqirus, Servier, Sumitomo Pharma America, Sunovion, Sun Pharma, Supernus, Tabuk, Takeda, Teva, Terran, Tolmar, Vertex, Viatris and Xenon Pharmaceuticals. He provided expert testimony for Janssen, Lundbeck and Otsuka. He served on a Data Safety Monitoring Board for Compass Pathways, IntraCellular Therapies, Relmada, Reviva, Rovi. He has received grant support from Boehringer-Ingelheim, Janssen and Takeda. He received royalties from UpToDate and is also a stock option holder of Cardio Diagnostics, Kuleon Biosciences, LB Pharma, MedLink Global, Mindpax, Quantic, Terran.

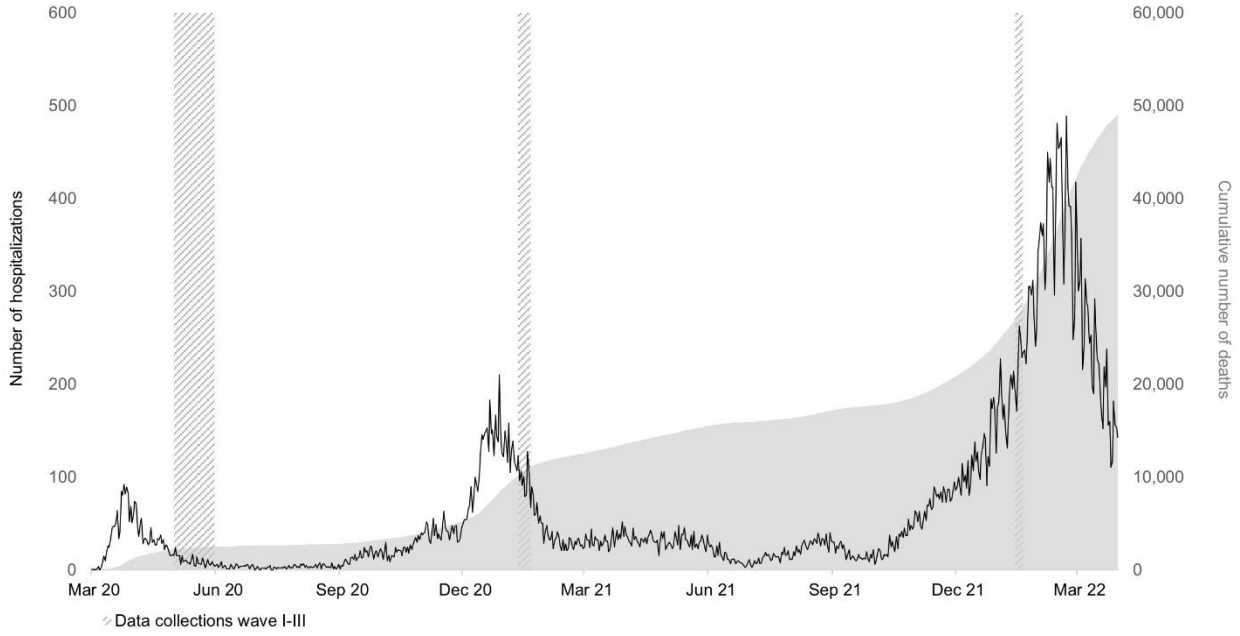
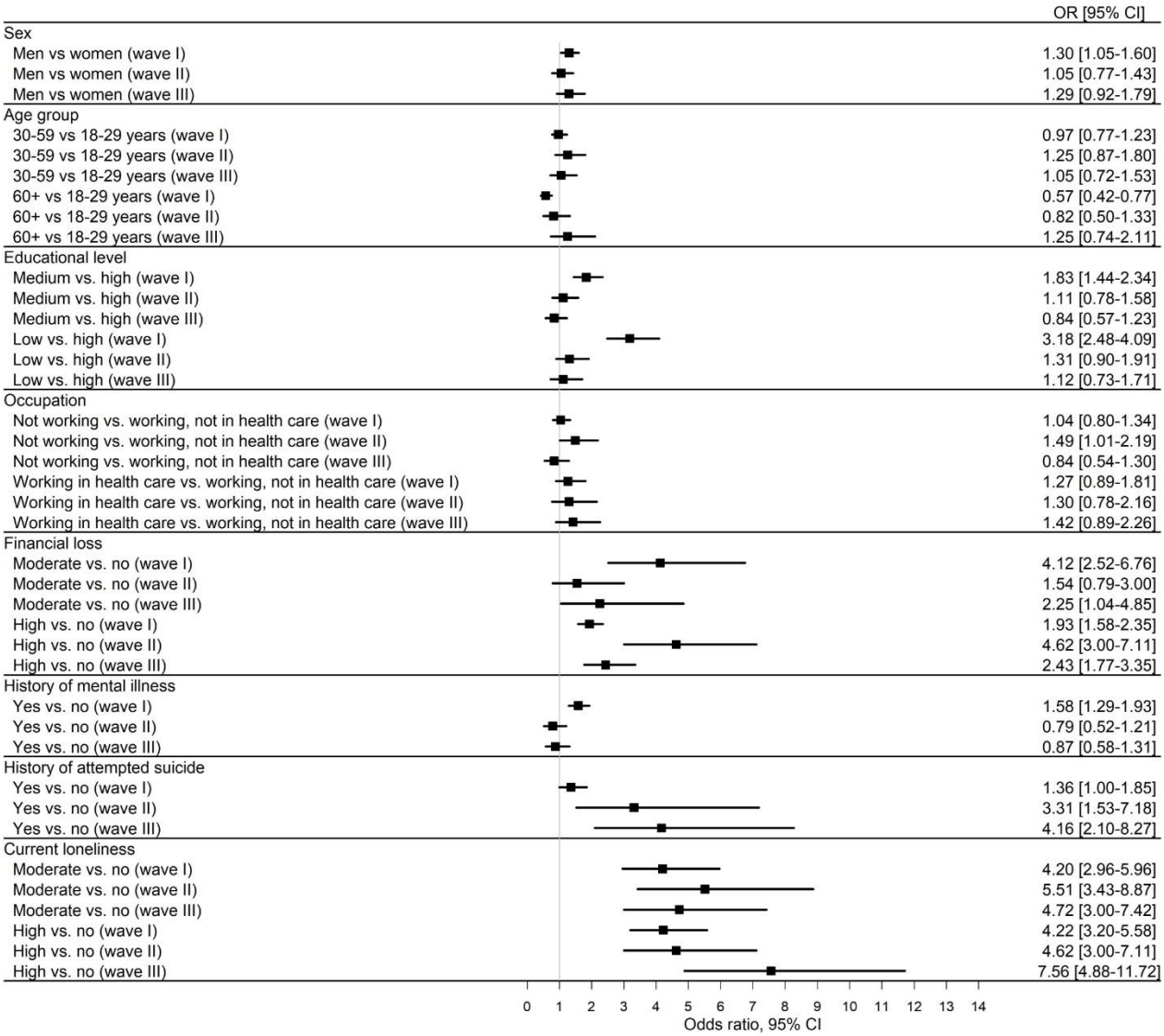


Figure 1. The development of the COVID-10 pandemic in Denmark aligned with COH-FIT data collections



Adjusted for sex, age, educational level, occupation, financial loss, history of mental illness, current loneliness

Figure 2. Adjusted associations between demographic, socioeconomic, and psychological characteristics and suicidal ideation stratified by COH-FIT data collection waves in Denmark

Table 1. Characteristics of the COH-FIT study Danish population by waves

	Wave I May 2020[a] (n=2286) n (%)	Wave I May 2020[b] (n=2157) n (%)	Wave II January 2021 (n=1041) n (%)	Wave III January 2022 (n=1039) n (%)
Suicidal ideation				
0	1507 (66)	1253 (58)	733 (70)	749 (72)
1+	779 (34)	903 (42)	308 (30)	290 (28)
Median for 1+ (Q1;Q3)	5 (2;25)	10 (4;46)	4 (2;19)	5 (2;50)
Sex				
Women	1935 (85)	1161 (54)	543 (52)	574 (55)
Men	351 (15)	989 (46)	498 (48)	465 (45)
Age				
18-29 years	282 (12)	617 (29)	296 (28)	276 (27)
30-59 years	1396 (61)	1012 (47)	514 (49)	543 (52)
60+ years	608 (27)	527 (24)	231 (22)	220 (21)
Mean age (SD)	49.1 (14.4)	44.1 (16.2)	43.0 (16.5)	43.3 (16.3)
Educational level				
High	1979 (87)	803 (37)	361 (35)	555 (53)
Medium	159 (7)	686 (32)	365 (35)	290 (28)
Low	148 (6)	668 (31)	315 (30)	194 (19)
Occupation				
Not working	915 (40)	477 (22)	236 (23)	174 (17)
Working, not in health care	947 (41)	1492 (69)	711 (68)	742 (71)
Working, in healthcare	424 (19)	187 (9)	94 (9)	123 (12)
Financial loss				
No	1019 (45)	956 (44)	443 (43)	509 (49)
Yes	1267 (55)	1201 (56)	598 (57)	530 (51)
Median for 1+ (Q1;Q3)	9 (3;30)	15 (3;46)	14 (4;37)	15 (4;50)
History of mental illness				
No mental illness	1024 (45)	1122 (52)	885 (82)	866 (83)
At least one mental illness	1262 (55)	1034 (48)	156 (18)	173 (17)
History of attempted suicide				
No	2024 (89)	1916 (89)	1005 (97)	989 (95)
Yes	262 (11)	241 (11)	36 (3)	50 (5)
Current loneliness				
No	568 (25)	468 (22)	308 (30)	397 (38)
Yes	1718 (75)	1689 (78)	733 (70)	642 (62)
Median for 1 (Q1;Q3)	50 (17;80)	65 (25;89)	47 (16;72)	30.5 (10;61)

[a] unweighted
[b] weighted based on 2021 data

Table 2. Adjusted logistic regression model (suicidal ideation), pooled COH-FIT data collection wave I-III in Denmark

	Proportion with suicidal ideation (%)	Age/sex adjusted model	Mutually adjusted model [a]
Sex			
Women (ref)	787 (35)	1	1
Men	713 (36)	1.09 (0.96-1.23)	1.22 (1.05-1.41)
Age			
18-29 years (ref)	474 (40)	1	1
30-59 years	713 (34)	0.79 (0.68-0.92)	1.04 (0.88-1.23)
60+ years	314 (32)	0.71 (0.60-0.85)	0.78 (0.62-0.98)
Educational level			
High (ref)	469 (27)	1	1
Medium	522 (39)	1.70 (1.46-1.97)	1.31 (1.11-1.56)
Low	510 (43)	2.04 (1.74-2.38)	2.01 (1.68-2.41)
Occupation			
Working, not in healthcare (ref)	1037 (35)	1	1
Not working	326 (37)	1.07 (0.91-1.25)	1.01 (0.84-1.22)
Working, in healthcare	138 (34)	0.96 (0.77-1.19)	1.23 (0.97-1.57)
Financial loss			
No (ref)	473 (25)	1	1
Moderate	78 (43)	2.25 (1.65-3.07)	2.50 (1.79-3.49)
High	949 (44)	2.41 (2.11-2.76)	2.14 (1.85-2.47)
History of mental illness			
No mental illness (ref)	827 (30)	1	1
At least one mental illness	673 (46)	2.05 (1.80-2.34)	1.54 (1.33-1.78)
History of attempted suicide			
No (ref)	1317 (34)	1	1
Yes	184 (56)	2.54 (2.02-3.19)	1.84 (1.42-2.39)
Current loneliness			
No (ref)	153 (13)	1	1
Moderate	296 (38)	4.10 (3.28-5.13)	4.39 (3.48-5.54)
High	1052 (46)	5.68 (4.70-6.86)	4.91 (4.02-5.99)

[a] Adjusted for sex, age, educational level, occupation, financial loss, history of mental illness, current loneliness

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Declaration of interests

☐The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☒The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

MS received honoraria/has been a consultant for Angelini, AbbVie, Boehringer Ingelheim, Lundbeck, Otsuka.

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Highlights

- We examined suicidal ideation among adult Danes across three waves during COVID-19
- We observed the highest prevalence of suicidal ideation in the first wave
- We identified subgroups calling for targeted interventions during crisis times
- Subgroup examples include people feeling lonely and those facing financial loss