Original Article

Infection Rates Matter – Especially for People from Lower Social Class

A Large-Scale Investigation of the Impact of the COVID-19 Pandemic on Mental Health

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Abstract: The COVID-19 pandemic was a long-lasting and stressful event that had enormous psychological, economic, and social consequences. This study extends prior research by examining the relationship between infection rates and mental health as well as its dependency on social class. Therefore, we used large-scale data from a nationwide sample (N = 5,742) across two time periods in the COVID-19 pandemic in Germany (time period 1: April–July 2020; time period 2: January–February 2021). At the beginning of the pandemic, only lower-class individuals experienced mental health detriments with higher infection rates. In the course of the pandemic, however, higher infection rates were accompanied by severe mental health detriments for the general population, but especially for lower-class individuals. We discuss possible mechanisms underlying these effects such as infection rates as indicators of the crisis conditions and social class components as indicators of specific economic, cognitive, and social resources.

Keywords: COVID-19 pandemic, infection rates, social class, mental health, loneliness

The COVID-19 pandemic was a long-lasting and stressful event that had far-reaching consequences for the general population. As a result, the pandemic was accompanied by enormous mental health detriments. Across the world, official mental health reports and plenty of studies showed a rise in mental health problems throughout the COVID-19 pandemic (e.g., Mauz et al., 2021; OECD, 2021; Rajkumar, 2020; Zacher & Rudolph, 2021). But what was the role of the COVID-19 infection rates: Were higher infection rates accompanied by more mental health issues? And if so, was this especially the case for individuals from lower social class? And did these effects persist also one year after the outbreak of the pandemic? To answer these questions, we relied on large-scale data from a nationwide sample in Germany covering two time periods during the pandemic.

By doing so, our study contributes to psychological science in three significant ways. First, it adds to the scarce literature that specifically investigates the relationship between infection rates and mental health (including negative affect, depression, loneliness, and life satisfaction). Second, our study adds to the literature that examines social class with regard to contextual conditions (here, COVID-19 infection rates). Specifically, by linking different components of social class to different mental health detriments in the context of the COVID-19 pandemic, we provide a starting point for a strong future theorizing about the multifaceted construct of social class and its underlying resources. Third, our study used high-quality data from a nationally representative sample across two time periods, thereby providing robust and precise estimates for our findings.

COVID-19 Infection Rates and Mental Health

The COVID-19 pandemic evolved into a major global crisis with massive economic, psychological, and social consequences. An important indicator of these consequences were the daily infection rates. Most governments used infection rates as a criterion to implement measures to prevent the spread of the coronavirus. For example, when certain thresholds of infection rates were exceeded, factories, nonessential stores, restaurants, and hotels as well as universities, most schools, and day care centers were closed, events were canceled, people had to work from home whenever possible, and finally, severe social contact restrictions were introduced. As such, the measures affected how people live, work, and connect and brought noticeable changes in people's daily routines. As a result, people perceived an increased threat, uncertainty, and

stress (Daly et al., 2020; Mauz et al., 2021). The lack of social contacts often resulted in loneliness and depressive symptoms (Entringer & Gosling, 2022; Qiu et al., 2020). In addition, the measures led to a massive collapse of the economy: Many companies had to register short-time work or even dismiss employees. Consequently, the pandemic went along with changes in social and working life, uncertain future prospects, and financial issues, resulting in high mental distress (OECD, 2021).

At the beginning of the COVID-19 pandemic, the most important indicator of the pandemic conditions and the governmental restrictions was the total amount of COVID-19 infections. Higher total amounts of COVID-19 infections indicated greater economic consequences (e.g., due to job loss and part-time work), psychological consequences (e.g., due to perceived threat and uncertainty), and social consequences (e.g., due to social contact restrictions). Consequently, we expected that a higher total amount of COVID-19 infections was associated with greater mental health detriments during the early stages of the COVID-19 pandemic in 2020 (Hypothesis 1).

Social Class, COVID-19 Infection Rates, and Mental Health

Conceptually, individuals' objective social class is a multifaceted construct comprising different objective components, such as wealth, occupational status, and educational attainment (Oakes & Rossi, 2003). According to classic literature in the social sciences, social class is fundamentally linked to the distribution of various forms of resources that constitute individuals' social lives and social contexts (e.g., Bourdieu, 1985; Kraus et al., 2012). Each resource has buffering mechanisms that ease the challenges of everyday life, thereby contributing to good mental health. The lack of resources is generally associated with severe mental health detriments (Hobfoll, 1989; Lazarus & Folkman, 1984).

Compared to upper-class individuals, lower-class individuals have a lower employment status – indicating fewer economic resources (e.g., lower wealth, lower job security) – and a lower educational attainment – indicating fewer psychological resources (e.g., lower perceived personal control, lower cognitive skills; Kraus et al., 2012; Oakes & Rossi, 2003). Indeed, lower-class individuals – having fewer economic and psychological resources – tend to be more vulnerable, to be more exposed to threat, and to have poorer mental health (Diener & Suh, 1997; Gallo & Matthews, 2003). For example, Claes and colleagues (2021) found that financial insecurity fully mediated the negative relationship between social class and mental health. The COVID-19 pandemic went along with enormous economic and psychological consequences, which exacerbated the already challenging life circumstances of lower-class individuals. Consequently, the pandemic conditions (e.g., financial insecurity, uncertain future prospects) may be accompanied by particularly severe mental health detriments among lower-class individuals because they had fewer economic and psychological coping mechanisms to deal with the pandemic conditions.

Furthermore, to cope with the challenging life circumstances, lower-class individuals tend to rely on close relationships in their daily lives, indicating the high importance of social resources (Kraus et al., 2012). For example, the social networks of lower-class individuals tend to be smaller, more homogeneous, and more strongly connected than those of upper-class individuals, resulting in a high level of social support and social cohesion (Bianchi & Vohs, 2016; Carey & Markus, 2017). The COVID-19 pandemic, however, went along with enormous changes in social life (e.g., social isolation and social distancing regulations), which threatened the availability of social resources. A lack of social resources has been shown to be associated with severe mental health detriments, such as higher levels of loneliness and depression–anxiety (Anderson et al., 2012). For lower-class individuals, who particularly rely on social resources, the lack of social resources may be accompanied by especially severe mental health detriments because they have fewer social coping mechanisms to face the pandemic conditions. Taken together, we expected that a higher total amount of COVID-19 infections – as a proxy for the severity of the pandemic conditions and, thus, the potential lack of resources – was associated with particularly severe mental health detriments for lower-class individuals (Hypothesis 2).

Effects in the Course of the Pandemic

The COVID-19 pandemic and its massive consequences were not limited to a short period of time in 2020 but still continued in 2021. Thus, an important question of this study was whether the hypothesized relationships also existed one year after the outburst of the pandemic. To address this open question, we examined the relationship between COVID-19 infection rates and mental health and its dependency on social class in a second time period (in 2021). Like the first time period, the second time period was assessed during a nationwide lockdown – again accompanied by enormous economic, psychological, and social consequences. However, the central infection rates changed during the pandemic. While the *total amount of COVID-19 infections per day* was the central indicator of the pandemic process and the governmental restrictions at the beginning of the pandemic (i.e., time period 1), the *7-day COVID-19 incidence rate* was added as a new central measure of the infection rate later in the pandemic (i.e.,

time period 2). To account for this difference, we examined the effects of both infection rates in the second time period.

Given the persistent governmental regulations and the still limited economic, psychological, and social resources, it is conceivable that the pandemic kept its unpredictable negative character and, hence, its detrimental effects on individuals' mental health also one year after the outbreak of the pandemic. Consequently, we expected that higher infection rates were associated with mental health detriments also in 2021 (Hypothesis 3a) and that these mental health detriments were more severe among lower-class individuals (Hypothesis 3b).

In sum, plenty of research demonstrates that the COVID-19 pandemic represented a great burden and resulted in detrimental effects on individuals' mental health. However, to the best of our knowledge, no empirical investigation has addressed the relationship to COVID-19 infection rates (Hypothesis 1), potential differences based on individuals' social class (Hypothesis 2), and the persistence of the effects in the course of the pandemic (Hypotheses 3a and 3b). Thus, our study contributes to the substantive goal of illustrating how the COVID-19 pandemic affected individuals' mental health, especially depending on their social class. A better understanding of these effects is of great practical relevance for designing appropriate public health measures and tailored support services for high-risk (i.e., lower-class) individuals in future crises.

Method

Data

We used data from the project "The Spread of the Coronavirus in Germany: Socio-Economic Factors and Consequences" (SOEP-CoV; Kühne et al., 2020). The SOEP-CoV is a daily rolling cross-sectional survey based on the Socio-Economic Panel (SOEP) – a nationally representative, longitudinal survey of randomly selected households in Germany (Siegers et al., 2020). For the SOEP-CoV project, one member per SOEP household was randomly selected and surveyed on each field day. Further information on the data, study design, and study materials is provided at http://www.soep-cov.com/Methodik/.

For the SOEP-CoV project, data were collected at two time periods. Time period 1 took place at the beginning of the pandemic and the first infection wave in Germany (April to July 2020, 69 survey field days). Time period 2 took place one year after the outbreak of COVID-19 and the second infection wave in Germany (January to February 2021, 28 survey field days). As such, the SOEP-CoV data are highly suitable for our research questions since it (a) includes data from a nationwide sample of the population on a daily basis, (b) covers two different time periods of the COVID-19 pandemic, and (c) comprises all relevant personal and pandemic-related aspects that are relevant to our research questions.

To examine the potential effects of infection rates on mental health, we matched the SOEP-CoV data with the infection rates based on the nationally official reporting data from the Robert Koch Institute (2022). In particular, we matched the SOEP-CoV data for each field day with the infection rates published on the same day. The matching of survey data with publicly available data from an external source is an established procedure to investigate poll effects on a daily basis over a specific time period (Blais et al., 2016).

Participants

We applied two a priori selection criteria to the SOEP-CoV data set to obtain our final sample. First, we only included respondents who were older than 18 years in 2020. Second, to ensure stable estimates in our analyses, we stopped including field days when for the first time, there were fewer than 30 respondents on two consecutive field days. As a result, the final sample included 5,742 respondents. Full details of the sample's sociodemographic characteristics are provided in Table 1.

Measures

Infection Rates

The daily published infection rates were an indicator of the pandemic process and the governmental restrictions in Germany (Robert Koch Institute, 2022). Since the central infection rate as the determinant of governmental restrictions changed during the pandemic, we used two different infection rates for our analyses: (1) the *total amount of COVID-19 infections per day*, which was the central – and also only – indicator of governmental restrictions at the beginning of the pandemic (i.e., in 2020) and (2) the *7-day COVID-19 incidence rate*, which became the central indicator of governmental restrictions in the course of the pandemic (i.e., in 2021).

Social Class

To conceptualize respondents' social class, we used two classical components: employment status and educational attainment (Oakes & Rossi, 2003). Employment status was assessed on a scale ranging from *full-time employed* (1)

Table 1. Sociodemographic characteristics

Sociodemographic characteristics	Proportion/mean	Assessment year
Men (women) in %	39.1 (60.9)	2019
Mean age (*SD*)	53.4 (15.7)	2019
Employment status in %		
Low	37.8/39.6	2020/2021
Medium	25.6/24.2	2020/2021
High	36.6/36.2	2020/2021
Education in %		
Low	8.2	2019
Medium	54.4	2019
High	37.4	2019

to *not employed* (8). We condensed the response options into three levels of employment status: *low* as no gainful employment, *medium* as part-time or irregular employment, and *high* as full-time employment. Educational attainment was assessed by the highest level of education ranging from *in school* (0) to *doctoral degree* (8). We condensed the response options into three levels of education: *low* as less than high school graduation, *medium* as high school graduation, and *high* as bachelor's or master's degree or higher.

Mental Health

To describe individuals' mental health in a multifaceted approach, we considered four different dimensions of mental health: negative affect, depression–anxiety, loneliness, and life satisfaction. Negative affect was assessed by the average across four emotions experienced in the last 4 weeks (e.g., "For each feeling, please state how long you have felt that way in the last 4 weeks. How often have you felt: angry, worried, happy, sad?"; 1 = *very rarely* to 5 = *very often*); the item regarding respondents' happiness was reversely coded for the analyses. Depression–anxiety symptoms were assessed by the PHQ-4 (Löwe et al., 2010) measuring with four items how often in the last 2 weeks respondents have been bothered by problems related to depression and anxiety (e.g., "How often have you been bothered in the last 2 weeks by having a lack of interest or pleasure in your activities?"; 1 = *not at all* to 4 = *almost every day*). Loneliness was assessed by the UCLA Loneliness Scale (Hawkley et al., 2016) measuring with three items respondents' level of loneliness in the current situation (e.g., "How often had you have the feeling that you miss other people having around in the current situation?"; 1 = *very often* to 5 = *never*); the items were reversely coded for the analyses. Life satisfaction was assessed by a single item asking how satisfied respondents are with their life overall in the current situation (e.g., "How satisfied are you with your life in the current situation, all things considered?"; 0 = *completely dissatisfied* to 10 = *completely satisfied*).

Covariates

As control variables, we included sex and age. We controlled for sex because prior research has found gender differences in mental health; for example, women report significantly higher life satisfaction but also more depressive symptoms than men (Becchetti & Conzo, 2022; Salk et al., 2017). We controlled for age because it was a risk factor for COVID-19 infections, and prior research has shown age differences in loneliness and life satisfaction (Bhargava et al., 2020; OECD, 2021).

Analytic Strategy

The SOEP-CoV survey interviewed different respondents on each field day. To account for the nested data structure (respondents nested in field days), we conducted linear mixed-effects models in R (R Development Core Team, 2014) with its mixed-effects model package *lme4* (Bates et al., 2014). To test whether higher infection rates were accompanied by mental health detriments and whether they were larger for lower-class individuals, we regressed respondents' mental health on the daily infection rates (Level 2), their social class (Level 1), and the cross-level interaction between both. In particular, we conducted one separate model per combination of infection rate, social class component, and mental health dimension. We followed established recommendations and group-mean centered all Level 1 predictors and *z*-standardized all variables to yield standardized point estimates (Snijders & Bosker, 2012) and to interpret the cross-level interaction between infection rates and social class on mental health meaningfully and unambiguously (Enders & Tofighi, 2007).

Table 2. Relationship between infection rates, social class, and mental health

	Negative affect				Depression–anxiety				Loneliness				Life satisfaction			
	Employment		Education		Employment		Education		Employment		Education		Employment		Education	
Predictors	*zPE*	*p*	*zPE*	*p*	*zPE*	*p*	*zPE*	*p*	*zPE*	*p*	*zPE*	*p*	*zPE*	*p*	*zPE*	*p*
Total amount of COVID-19 infections per day																
2020																
(Intercept)	.013	.435	.015	.381	−.003	.833	−.002	.895	−.046	.026	−.047	.024	−.001	.938	.000	.990
Covariates																
Gender	−.206	<.001	−.205	<.001	−.102	<.001	−.108	<.001	−.134	<.001	−.134	<.001	.050	<.001	.060	<.001
Age	−.048	.002	−.015	.239	−.134	<.001	−.064	<.001	−.114	<.001	−.083	<.001	.088	<.001	.052	<.001
Infection rate	.013	.378	.013	.370	−.011	.414	−.008	.519	**−.081**	**<.001*** **	***−.082***	**<.001*** **	.003	.846	.004	.784
Social class	−.084	<.001	−.080	<.001	−.133	<.001	−.090	<.001	−.078	<.001	−.054	<.001	.078	<.001	.032	.029
IR × SC	**−.031**	**.011***	−.009	.468	−.006	.603	.001	.934	−.019	.112	**.025**	**.037***	.018	.158	**.028**	**.023***
2021																
(Intercept)	.011	.434	.013	.362	.021	.208	.020	.230	.024	.107	.022	.134	−.018	.304	−.016	.396
Covariates																
Gender	−.198	<.001	−.204	<.001	−.108	<.001	−.122	<.001	−.128	<.001	−.131	<.001	.055	<.001	.059	<.001
Age	−.098	<.001	−.052	<.001	−.205	<.001	−.128	<.001	−.123	<.001	−.093	<.001	.100	<.001	.068	<.001
Infection rate	.023	.088	**.027**	**.047***	**.043**	**.012***	**.041**	**.017***	**.049**	**< .001*** **	**.045**	**.001** **	**−.040**	**.030***	−.037	.057
Social class	−.103	<.001	−.057	<.001	−.165	<.001	−.074	<.001	−.067	<.001	−.046	.002	.070	<.001	.051	.001
IR × SC	−.017	.219	−.015	.265	**−.031**	**.022***	−.017	.215	.002	.860	.000	.977	.008	.577	.012	.392
COVID-19 incidence rate																
2021																
(Intercept)	.011	.456	.013	.378	.021	.201	.021	.220	.024	.102	.022	.130	−.018	.330	−.015	.416
Covariates																
Gender	−.198	<.001	−.204	<.001	−.108	<.001	−.122	<.001	−.128	<.001	−.131	<.001	.055	<.001	.059	<.001
Age	−.098	<.001	−.052	<.001	−.205	<.001	−.128	<.001	−.123	<.001	−.093	<.001	.100	<.001	.068	<.001
Infection rate	−.023	.109	−.027	.059	**−.044**	**.012***	**−.043**	**.015***	**−.050**	**<.001*** **	**−.046**	**.001** **	**.038**	**.042***	.035	.072
Social class	−.103	<.001	−.057	<.001	−.164	<.001	−.075	<.001	−.066	<.001	−.046	.002	.071	<.001	.052	<.001
IR × SC	.016	.262	.016	.251	**.031**	**.030***	.019	.179	−.005	.702	.000	.981	−.010	.470	−.016	.276

Note. zPE = standardized point estimate. *IR* = infection rate. *SC* = social class. Significant effects of infection rate and infection rate × social class are displayed in bold: *$p < .05$. **$p < .01$. ***$p < .001$.

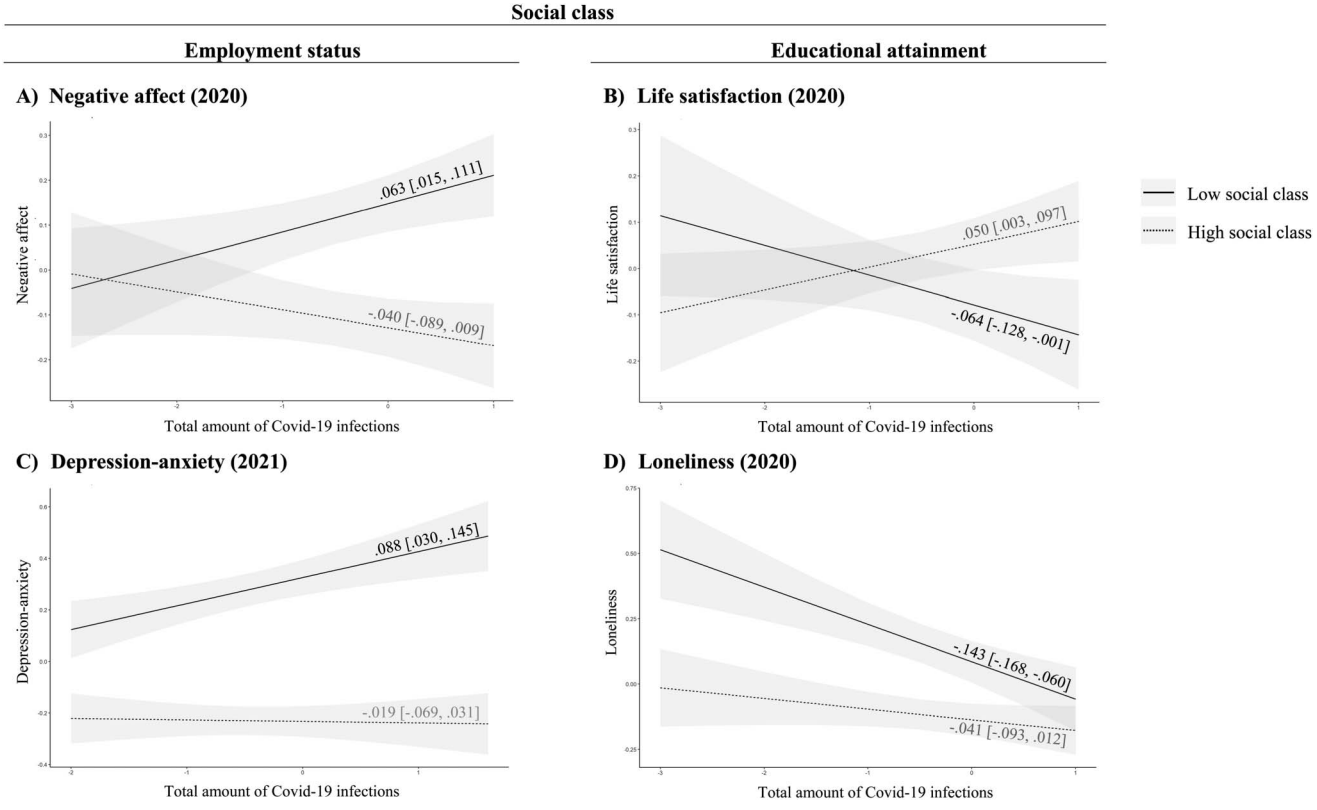

Figure 1. Selected illustration of the moderating effect of social class on the relationship between infection rates and mental health based on simple slope analyses.

Results

All R data analysis scripts and the complete results are publicly available in the Open Science Framework (OSF) at https://osf.io/z8bsq/ (Vogel & Entringer, 2023). Descriptive statistics, preliminary statistical modeling analyses, and detailed results of the simple slope analyses are provided in the electronic supplemental material (see OSF: ESM1–ESM3).

Hypothesis 1

To examine whether higher infection rates were accompanied by mental health detriments, we considered the standardized point estimates indicating the relationships between the total amount of COVID-19 infections per day and each mental health dimension in 2020. The first data row of Table 2 depicts the results. In contrast to our expectation, a higher total amount of COVID-19 infections per day was not related to negative affect, depression–anxiety symptoms, and life satisfaction. Loneliness, however, was *negatively* related to the total amount of COVID-19 infections, suggesting that loneliness decreased (not increased) with higher infection rates (employment status: $\beta = -.081$, 95% CI [−.117, −.045], $p < .001$; educational attainment: $\beta = -.082$, 95% CI [−.118, −.046], $p < .001$).

Hypothesis 2

To examine whether higher infection rates were accompanied by more severe mental health detriments for lower-class individuals, we considered the standardized point estimates indicating the cross-level interactions of the total amount of COVID-19 infections per day and social class on each mental health dimension in 2020. Again, the first data row of Table 2 depicts the results. For employment status as social class component, there was a significant negative cross-level interaction with the total amount of COVID-19 infections on negative affect ($\beta = -.031$, 95% CI [−.055, −.007], $p = .011$). Simple slope analyses indicated that only individuals with lower employment status were affected by a higher total amount of COVID-19 infections, suggesting that only individuals with little or no gainful employment (but not with a full-time employment) experienced higher levels of negative affect with higher infection rates (see Figure 1A).

For educational attainment as social class component, there was a significant positive cross-level interaction with

the total amount of COVID-19 infections on life satisfaction (β = .028, 95% CI [.004, .052], p = .023) and loneliness (β = .025, 95% CI [.002, .048], p = .037). Simple slope analyses indicated that only lower-educated individuals tended to experience lower life satisfaction with higher infection rates (see Figure 1B). In addition, they indicated that higher infection rates were associated with loneliness only for lower-educated individuals. Contrary to our expectations, however, higher infection rates were *negatively* related to loneliness for lower-educated individuals, suggesting that individuals with lower educational attainment experienced lower (and not higher) levels of loneliness with higher infection rates (see Figure 1D).

Hypotheses 3a and 3b

To examine (a) whether higher infection rates were accompanied by mental health detriments one year after the outburst of the pandemic and (b) whether they were greater for lower-class individuals, we repeated the analyses in 2021 with the total amount of COVID-19 infections and the COVID-19 incidence rate. The results are shown in the second and third data rows of Table 2. In line with Hypothesis 3a, a higher total amount of COVID-19 infections was accompanied by higher levels of negative affect, loneliness, and depression–anxiety symptoms as well as lower life satisfaction. In contrast, higher COVID-19 incidence rates tended to inversely mirror the results of the total amount of COVID-19 infections. Differences in the main effects of infection rates on negative affect and life satisfaction between analyses considering different social class components can be attributed to sample differences regarding social class in the daily rolling cross-sectional data and disappeared by controlling for that (see OSF: ESM2). In line with Hypothesis 3b, there was a significant negative cross-level interaction between infection rates and employment status on depression–anxiety symptoms (β = −.031, 95% CI [−.058, −.005], p = .022). Simple slope analyses indicated that only individuals with lower employment status were affected by higher infection rates, suggesting that, with higher infection rates, lower-employed individuals showed greater depression–anxiety symptoms (see Figure 1C). The same pattern emerged for COVID-19 incidence rates as infection rates, supporting the robustness of this effect.

Robustness Checks

To check the robustness of our results, we first repeated the analyses including COVID-19–specific (i.e., work from home) and sociodemographic information (i.e., household composition); the results remained the same (see OSF: ESM4a). Second, we included employment status and educational attainment as continuous variables in our analyses to investigate the effects of infection rates in general and its interaction with social class within a single statistical model. Thereby, our statistical modeling approach builds on established recommendations in the multilevel literature (Enders & Tofighi, 2007; Hox, 2010) and previous research theoretically linking social class components with personal resources (Wanberg et al., 2020). However, it is also reasonable that the social class components indeed have a rank order, but that differences are not meaningful and equal. Thus, we repeated the analyses based on dummy coding for employment status and educational attainment. The statistical analyses with and without dummy coding yielded conceptually identical conclusions whether the effects of infection rates on mental health differs for people from different social classes (see OSF: ESM4b); however, no conclusions can be drawn about the effect of infection rates in general based on the analyses with dummy coding.

Third, the assessments of the four mental health dimensions differ regarding the time period under consideration. Although previous research assumed that respondents answer the scales referring to their current emotional state (e.g., Entringer & Gosling, 2022; Zhang et al., 2020), it is also well possible that respondents take into account the last couple of days and weeks to answer these items. Hence, we repeated all analyses by matching the SOEP-CoV data with the infection rates 4 and 2 weeks prior to the interview, respectively. With a time lag of 2 weeks, the results remained unchanged. With a time lag of 4 weeks, the result pattern slightly changed for negative affect and life satisfaction. In particular, in 2020, the cross-level interactions between infection rates and social class were no longer significant, and in 2021, the main effect of infection rates became partially nonsignificant (see OSF: ESM4c). However, the time lag of 4 weeks is a very conservative criterion because it assumes that respondents equally weigh every single day in the last 4 weeks to come up with an assessment. Previous research, however, has shown that this is not the case and that respondents weigh the past days more than the earlier days when they make assessments of their mental health (Kahneman et al., 2004; Suh et al., 1996). Thus, we believe that this finding does not threaten the validity of our findings.

Fourth, we repeated our analyses including all dependent variables simultaneously to statistically control for dependencies among the analyses. In particular, we nested respondents in survey days and additionally in each mental health dimension. Except of the main effect of infection rates on negative affect, the result pattern remained exactly the same. Moreover, the main effects of infection rates on life satisfaction increased by controlling for the other mental health dimensions (see OSF: ESM4d), supporting the robustness of our findings.

Discussion

This study investigated the relationship between COVID-19 infection rates and mental health as well as its dependency on social class. By doing so, our study contributes to the overarching goal of illustrating and understanding how the pandemic conditions affected individuals' mental health differently. Overall, our results provide first promising evidence that infection rates were accompanied with multiple mental health detriments, especially for lower-class individuals. At the beginning of the pandemic, higher infection rates were not related to severe mental health detriments in the general population (contrary to Hypothesis 1). When considering individuals' social class, however, higher infection rates were accompanied by mental health detriments among lower-class individuals (supporting Hypothesis 2). One year after the outburst of the pandemic, higher infection rates were related to mental health detriments among the general population (supporting Hypothesis 3a). With regard to depression–anxiety symptoms and loneliness, higher infection rates were accompanied by especially severe mental health issues among lower-class individuals (supporting Hypothesis 3b).

Effects as an Indicator of Time

Different than expected, a higher total amount of COVID-19 infections was accompanied with lower (instead of higher) levels of loneliness in 2020. This negative relationship, however, might rather reflect an effect of the current pandemic situation than an effect of infection rates per se. During time period 1, the first lockdown ended in Germany (May 6, 2020) and social contact restrictions were relaxed. Consequently, it is reasonable that people started to increase their social contacts what in turn eased their loneliness.

In 2021, as expected, a higher total amount of COVID-19 infections was accompanied by higher levels of negative affect, depression–anxiety symptoms, and loneliness as well as a lower life satisfaction. For incidence rates, however, these relationships reversed. This might also reflect an effect of time indicating the duration of the pandemic conditions. During time period 2, the number of new infections decreased in Germany and, hence, the incidence rate (i.e., the number of new infections within the last seven days per 100,000 residents) decreased. That means, the smaller the incidence rates, the longer the duration of the pandemic conditions, what in turn might result in more severe mental health detriments.

Overall, our results support the idea that higher infection rates – as a proxy for the severity of the pandemic conditions – were related to poor mental health. Moreover, this negative relationship seems to have intensified one year after the outbreak of the pandemic: While infection rates were accompanied by mental health detriments only for lower-class individuals in 2020, they were significantly associated with mental health detriments for the general population in 2021. Indeed, exploratory repeated-measures analyses showed that, with the exception of negative affect, the effects of the total amount of COVID-19 infections on mental health significantly increased between 2020 and 2021. In addition, the cross-level interaction between the total amount of COVID-19 infections and employment status on depression–anxiety symptoms significantly increased between 2020 and 2021 (see OSF: ESM5).

Social Class Components as Indicators of Different Resources

The relationships between infection rates and mental health dimensions tended to be stronger (in terms of amount) for lower-class individuals than for upper-class individuals. This supports our idea that lower-class individuals were especially sensitive to pandemic conditions. Depending on the social class component, however, the result pattern differed (see Table 2). These differences might be a first but promising starting point that social class components are linked with different underlying resources. For example, it is conceivable that employment status captures mainly economic resources (e.g., fixed-term employments, risk of a job loss; Scheuring, 2020; Schröder et al., 2020), which in turn might affect individuals' short-term affective state manifesting in long-term mental health disorders like depression–anxiety symptoms. For educational attainment, it is conceivable that it captures mainly psychological (e.g., cognitive coping strategies; Chen & Matthews, 2001) and social resources (e.g., strong social relations within and outside of home; Piff et al., 2010), which in turn might affect individuals' experience of loneliness and satisfaction with life.

To explicitly investigate the role of financial resources, we repeated our analyses with household income per person as additional social class component. As it was not assessed in time period 1, we decided a priori to examine income as a third social class component only in an exploratory manner. The results showed that – in contrast to employment status and educational attainment – higher infection rates were consistently accompanied by more severe mental health detriments for individuals with a higher (not lower) income one year after the outburst of the pandemic (see OSF: ESM6). This is in line with the findings by Wanberg and colleagues (2020), suggesting

that individuals with a higher income might experience a higher threat of losing their material privileges and financial resources. Taken together, our results can serve as a valuable avenue for future research to develop a strong theoretical foundation of social class effects based on different resources and different operationalizations. Although there has been a long history of research theoretically assuming the mediating effect of material and social resources in the relationship between social class and mental health, empirical research examining these mediating mechanisms is scarce. Thus, it is of major importance and most timely to empirically investigate the link between specific resources, social class components, and mental health dimensions in future research.

Limitations

Four limitations of our study should be noted and addressed in future research. First, we investigated the effects of infection rates and their dependency on social class on (a) a daily level and (b) a country level. A resolution at a weekly level, however, may have different effects on mental health because the infection rates followed a weekly pattern (i.e., with lower rates at the weekend and the highest rates on Tuesday). To test this possibility, we repeated the analyses with a weekly clustering, but the result pattern remained similar (see OSF: ESM7). A more nuanced geographic resolution may have also different effects because the infection rates might vary depending on the state or rural district level. Future research with a sufficient number of respondents per state-level and survey day is needed to test this possibility.

Second, it was important to us to investigate a multifaceted picture regarding different mental health dimensions, different social class components, and different infection rates. However, this resulted in multiple tests to examine our hypotheses. To control for alpha-error inflation, the significance level for the hypotheses can be adjusted by Bonferroni corrections (for Hypotheses 1 and 2: $\alpha \leq .006$; for Hypotheses 3a and 3b: $\alpha \leq .003$). By applying the adjusted significance levels, only the main effects for loneliness remain significant (see Table 2). Bonferroni corrections, however, tend to be overly conservative resulting in a loss of power (Holm, 1979). Thus, in line with recent recommendations (Troeger, 2019) and recent research (Hanel et al., 2020; Hoogeveen et al., 2022), we interpreted the results without Bonferroni corrections and used instead robustness checks to draw conclusions beyond the analyzed sample to the population. Our largely consistent result pattern across the preliminary statistical analyses and multiple robustness checks (see OSF: ESM1–4d) can be interpreted as support for the reliability and societal relevance of our empirical findings. Nevertheless, it is up to future research to investigate the multifaceted nature of our effect pattern more specifically.

Third, the use of correlational data makes it impossible to investigate causality. For example, it is also possible that poor mental health affects the likelihood of a COVID-19 infection (Ransome et al., 2022). To address the causal nature of our found effects, however, future research is needed that, for example, uses long-term, longitudinal data.

Fourth, we cannot make solid statements with our data about the underlying mechanisms of our effects. Although we assumed that infection rates were a proxy for the severity of the pandemic conditions, they might also be a proxy for the risk of a COVID-19 infection: The higher the infection rates, the higher the risk of getting infected – which might also be accompanied by poor mental health. Replicating the analyses with physical health as dependent variable, however, indicated that higher infection rates were not related to physical health detriments (see OSF: ESM8). Alternatively, it is also possible that our result pattern might at least partly result from the subjectively perceived threat posed by infection rates. In this regard, for example, it might make a psychological difference when the infection rates are close to or even exceed the threshold for raising or lifting governmental restrictions. In addition, people from different social classes might perceive, understand, and interpret the published infection rates differently. For example, lower-class individuals might be especially sensitive to infection rates and experience them as more threatening (Kraus et al., 2009). However, much more research with experimental manipulations or experience sampling is needed to thoroughly test the underlying mechanisms of the found result pattern.

Conclusion

Our research provides evidence that infection rates as a mirror of the pandemic conditions matter for individuals' mental health, especially for lower-class individuals. Thus, from an application point of view, our results (a) highlight the importance of considering contextual effects (e.g., infection rates) in the context of negative, stressful, and challenging events; (b) indicate that certain individuals might be especially affected by challenging economic, psychological, and social conditions (e.g., lower-class individuals); and (c) offer valuable preliminary insights into how social class components are related to specific resources and how they contribute to good mental health. In this regard, our research provides first but promising insights to learn for future challenges and crises (e.g., economic crisis, governmental restrictions). Rendering any effort to understand mental health

detriments in crisis conditions is crucial not only to capture the full range of negative effects but also to unpack the underlying mechanisms as a fruitful starting point to identify protective factors buffering the crisis conditions. Grounded theories on the interplay between economic and social conditions, social class components, and mental health dimensions can contribute to design tailored recommendations for action to mitigate their detrimental effects on mental health, especially for high-risk individuals (e.g., by specific digital support supply for lower-class individuals to stay connected with others).

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Open Data
The SOEP-CoV data set is publicly available upon request at the SOEP – German Institute for Economic Research. The COVID-19 infection rates in Germany for the two time periods of the SOEP-CoV study, the R data analysis scripts, and further supplemental materials are available in the Open Science Framework (OSF) at https://osf.io/z8bsq/ (Vogel & Entringer, 2023).

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