

Uncovering Income Class Heterogeneity in Self-Reported Anxiety Levels among Indonesians Before and During the COVID-19 Pandemic¹

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Abstract

This study investigates the variation in anxiety levels across income classes in the wake of the COVID-19 pandemic in Indonesia. The research is based on data from nationally representative surveys conducted in 2017 and 2021, and it employs a multilevel mixed-effects ordered logistic model. The unique aspect of this investigation lies in its utilization of the Cantril ladder, a commonly employed tool in public opinion research, to gauge anxiety levels. Participants are prompted to assess their present life circumstances concerning their daily worries and anxieties. The empirical findings provide evidence that individuals in provinces with higher exposures to COVID-19 reported heightened anxiety levels. Furthermore, the results highlight a consistent association between higher household income and lower levels of anxiety. Notably, individuals from the highest income group experienced a substantial decline in anxiety levels during the pandemic. When examining specific income classes, the study reveals heightened anxiety among women in higher-income brackets and among lower-income households residing in urban areas. Furthermore, regarding macroeconomic circumstances, the results illustrate a positive correlation between economic prosperity and anxiety levels among members of low-income households. The study also uncovers a positive connection between income inequality and self-assessed anxiety within upper-middle and high-income brackets.

Keywords: anxiety levels, COVID-19 pandemic severity, income class, Indonesia, multilevel mixed-effects ordered logistic model

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The global impact of the COVID-19 pandemic has led to increased depression, anxiety, and stress in the general public, attributed to psychosocial stressors such as life disruption, fear of illness, and adverse economic effects (Moreno et al., 2020). In 2020, Santomauro et al. (2021) reported a significant rise of 27.6% in major depressive disorder cases and a 25.6% increase in anxiety disorders worldwide, with the most substantial increases observed in heavily impacted areas.

As the world's fourth most populous nation, Indonesia has experienced significant consequences, ranking 20th in total reported COVID-19 cases and 11th in related fatalities (Worldometer, n.d.). Furthermore, considering the substantial variations in COVID-19 exposure across diverse Indonesian provinces, it is essential to carry out an in-depth study exploring the precise impact of the pandemic on anxiety levels in the country while accounting for province-level details.

Socioeconomic factors significantly shape mental health disparities and inequalities (Cockerham, 2016). Income level plays a pivotal role in determining the impact of adverse health events on mental well-being (Choi & Kim, 2023; Marmot, 2002). Individuals with lower incomes face challenges in accessing essential resources, intensifying the adverse effects of health crises on their psychological well-being. Additionally, individual and household incomes are crucial for devising effective government policies to enhance mental health outcomes.

This study empirically investigates the factors influencing changes in anxiety levels during the COVID-19 pandemic in Indonesia, with a specific emphasis on household income heterogeneity. Specifically, the comparison of anxiety levels in 2021 to pre-pandemic levels in 2017 seeks to identify key determinants. Two national cross-sectional survey datasets are employed for analysis, utilizing a multilevel mixed-effect ordinal logistic model for estimation. The outcome measure is self-reported anxiety levels, while pandemic severity is quantified by total number of COVID-19 cases per 100,000 people.

The study further explores household income heterogeneity in two ways: first, by examining the overall impact of income levels on self-reported anxiety, incorporating interaction terms with COVID-19 severity, and providing insights into the income–anxiety relationship during a pandemic. Second, it categorizes individuals into four income classes—low, lower-middle, upper-middle, and high—enabling a detailed exploration of heterogeneity within each class and its association with self-reported anxiety levels. This methodology uncovers intricate details about the correlations between anxiety and individual and household characteristics, emphasizing variations across income brackets.

Literature Review

An extensive body of research has examined the increasing occurrence of anxiety and depression during the pandemic at the country and regional levels. These studies explored anxiety and depression impacts on the general population and specific community groups in Australia (Newby et al., 2020), China (Wang et al., 2020), Hong Kong (Choi et al., 2020), Indonesia (Anindyajati et al., 2021; Julianto et al., 2023; Sunjaya et al., 2021; Sutarto et al., 2021), Ireland (Hyland et al., 2021), Italy (Rossi et al., 2020), Japan (Stickley & Ueda, 2022), Malaysia (Leong Bin Abdullah, 2021), Pakistan (Khan et al., 2021), Poland (Dragan et al., 2021), Turkey (Kurcer et al., 2020), the United States (Blanchflower & Bryson, 2021; Jia, 2021), Eastern European countries (Zhang et al., 2022), South Asian countries (Hossain et al., 2021), and Southeast Asian countries (Pappa et al., 2022). Studies on the impact of the pandemic on anxiety and depression have generally found a strong link between the pandemic and increased levels of these disorders. However, certain studies offer an opposing view, indicating that the pandemic did not significantly increase anxiety and depression. Notable examples include studies in Brazil (Brunoni et al., 2021), Norway (Knudsen et al., 2021), and Serbia (Marić et al., 2022).

During the first year of the COVID-19 pandemic, Pappa et al. (2022) found a significant proportion of the population of Southeast Asia was experiencing mild to moderate anxiety and depression symptoms, albeit at lower rates compared to China and Europe. Tay et al. (2022) later discovered a high prevalence of depression, anxiety, and stress symptoms 18 months into the pandemic, particularly among females, younger adults, and low-income individuals. Balakrishnan et al. (2023) revealed an increasing prevalence of reported adverse mental effects in Southeast Asian countries as the pandemic evolved. Nevertheless, Rampal et al. (2023) underscored the resilience exhibited by nations in this region, demonstrated through successful vaccine procurement and intra-regional healthcare diplomacy amid the profound disruptions caused by the pandemic.

The studies referenced predominantly rely on established clinical tools like the Generalized Anxiety Disorder (GAD), Depression, Anxiety and Stress Scale (DASS), and Patient Health Questionnaire (PHQ), and similar tools for measuring anxiety. This study departs from clinical tests by employing the Cantril ladder to assess individuals' anxiety levels. Using Cantril ladders in public opinion research offers a compelling alternative to standardized clinical tests like GAD, DASS, or PHQ, providing a user-friendly, culturally adaptable, and universally understandable method for individuals to self-evaluate their anxiety levels. Their simplicity and visual representation enhance accessibility across diverse demographics, overcoming linguistic and cultural barriers (Di Napoli & Arcidiacono, 2013; Kilpatrick & Cantril, 1960). Moreover, these ladders offer a holistic perspective, encompassing various influences on anxiety beyond clinical symptoms.

Income Class and Anxiety

Pre-pandemic studies (Atkinson, 2015; Mwinyi et al., 2017; Reiss et al., 2019) consistently highlight the significant impact of social class on mental health. Recent pandemic research in Japan (Nagasu et al., 2021) and the United States (Soria & Horgos, 2020) reinforces these findings, indicating increased susceptibility to anxiety and depression among individuals from a lower social class. A meta-analysis (Barbek et al., 2022) further confirms the disproportionately higher risk of anxiety in lower social class groups during the pandemic.

Given the available data, this study employs household income category as the primary indicator of social class. While income information is accessible at the individual and household levels, details about employment status and work sectors may be insufficient to determine social class comprehensively. Despite this limitation, this study recognizes and utilizes the available data to derive meaningful insights into the association between household income class and anxiety. This methodology aligns with a similar approach undertaken by Zhang and Chen (2023) in examining health inequalities by social class in China.

Barone et al. (2022) discuss the pros and cons of using income to distinguish social classes. While income provides a significant determinant of life opportunities and an easily understandable indicator of socioeconomic status, its continuous nature allows for detailed analysis and widespread availability in various datasets. However, limitations encompass potential missing or biased information, annual fluctuations, reliability issues with retrospective data, and a narrow focus on the financial aspect of social inequality.

Marmot (2002) emphasizes income's crucial role in health outcomes, including mental health, supported by three key elements: a country's gross national product, individual income levels, and income disparities among affluent nations and different regions. Aligning with Marmot's perspective, our empirical model includes three income measures. First, household income is a proxy for individual income levels. Second, the gross regional domestic product (GRDP) per capita is used to assess economic well-being at the provincial level. Third, the Gini coefficient of per capita expenditures at the provincial level evaluates income disparities.

Study Research Questions and Importance

In alignment with the study objectives and to streamline the discussion, this study will investigate four research questions (RQs) regarding anxiety levels in Indonesia.

RQ1: What is the effect of the COVID-19 severity on anxiety levels?

RQ2: How does income correlate with anxiety levels?

RQ3: How does COVID-19 severity impact the association between income and anxiety levels?

RQ4: What can four distinct income classes (low, lower-middle, upper-middle, and high) offer in terms of understanding the diversity within each income category and its influence on self-reported anxiety levels?

Given the outlined study objectives and research questions, this study is important for its capacity to guide evidence-based policies for addressing mental health challenges in Indonesia. The study's examination of income, pandemic severity, and anxiety levels enables targeted interventions for specific demographic groups and income classes. The pivotal use of the Cantril ladder for anxiety measurement enriches the study by capturing diverse public opinions as an alternative to the commonly used clinical tests approach.

Materials and Methods

Methodology

This study employs a multilevel mixed-effects ordered logistic model to address nesting and the categorical nature of dependent variables. The use of a multilevel mixed-effects ordered logistic model in this study is justified due to the nested structure of the data, in which individuals (level 1) are nested within provinces (level 2), recognizing this hierarchical structure. Moreover, the model acknowledges the categorical and ordered nature of the dependent variable, anxiety level. Including random intercepts for each province accounts for unobserved heterogeneity and variations in the pandemic impact. This modeling approach allows for including individual and province-level variables, providing a robust analysis of the impact of COVID-19 severity on anxiety level (Mehmetoglu & Jakobsen, 2017; Rabe-Hesketh & Skrondal, 2022).

Our empirical model comprises a latent variable representing underlying anxiety levels, with a main model and an interaction model. The main model investigates the association between the latent variable and individual characteristics, household features, provincial contextual variables, and COVID-19 pandemic severity. The interaction model extends the main model by introducing interaction variables between household income covariates and the measure of pandemic severity.

We specify the main model as follows:

$$y_{ij}^* = x1_{ij}\beta1 + x2_j\beta2 + COVID_j\beta4 + z_{ij}u_j + \epsilon_{ij}$$

while the interaction model is as follows:

$$y_{ij}^* = x1_{ij}\beta1 + x2_j\beta2 + x3_{ij} * COVID_j\beta3 + COVID_j\beta4 + z_{ij}u_j + \epsilon_{ij}$$

$$y_{ij} = \begin{cases} 0 & \text{if } y_{ij}^* \leq \kappa_1 \\ 1 & \text{if } \kappa_1 < y_{ij}^* \leq \kappa_2 \\ 2 & \text{if } \kappa_2 < y_{ij}^* \leq \kappa_3 \\ 3 & \text{if } \kappa_3 < y_{ij}^* \leq \kappa_4 \\ 4 & \text{if } \kappa_4 < y_{ij}^* \leq \kappa_5 \\ 5 & \text{if } \kappa_5 < y_{ij}^* \end{cases}$$

where y_{ij}^* is the unobserved anxiety level for individual i who resides in province j (latent variable); $x1_{ij}$ is the individual and household characteristics of individual i living in province j ; $x2_j$ is the provincial contextual variables for province j ; $COVID_j$ is the COVID-19 pandemic severity measure for province j ; $x3_{ij} * COVID_j$ is the interaction terms of household income covariates with the COVID-19 severity measure; z_{ij} is the covariates corresponding to the random effects; as this model follows a random intercept model, z_{ij} is simply the scalar 1; u_j is the random effects; and ϵ_{ij} is the errors, distributed as logistic with mean 0 and variance $\pi^2/3$ and are independent of u_j .

Data

This study relies on the Happiness Level Measurement Survey (STPK) conducted by the Central Bureau of Statistics (BPS), Indonesia's Central Statistics Agency (Badan Pusat Statistik [BPS], 2017, 2021), as its primary data source.³ The survey simultaneously covered all *kabupaten* (regencies) and *kota* (municipalities) across the 34 provinces. The 2017 survey wave occurred from April 5 to April 30, 2017, while the 2021 survey wave took place from July 1 to August 27, 2021, aligning with the peak of the COVID-19 pandemic in most Indonesian regions. This study specifically targeted 137,958 respondents aged 25–80 years actively employed or primarily involved in household care, including 67,450 participants from the SPTK 2017 dataset and 70,508 from the SPTK 2021 dataset.

The following provides a brief description of SPTK's sampling methodology. For sample selection in the SPTK and other surveys, the BPS utilizes a master sampling frame within each *kabupaten/kota*, consisting of Census Blocks (BS) for periodic survey implementation (BPS 2017, 2021). A BS serves as a designated enumeration zone within a village, encompassing 80 to 120 residential, non-residential, or household census buildings with clear boundaries identifiable in the field. BS selection for the SPTK is done probabilistically from the master sampling frame. Household updates occur at each selected BS, with household respondents chosen based on updated listings, stratified

³ **Data Availability Statement:** The primary datasets analyzed in this study, the Happiness Level Measurement Survey (SPTK) 2017 and 2021, are not accessible to the public. The author is contractually prohibited from granting access to the SPTK data, as specified in the agreement with the Badan Pusat Statistik (BPS). However, the data sets are available for purchase through the BPS (<https://www.bps.go.id/>).

according to factors like the household head's education and the household's structure. Data collection involves direct interviews with respondents using structured questionnaires and computer-assisted personal interviewing applications. The unit of analysis is a randomly selected household, with the head of the household or the spouse (wife/husband) representing the household selected as the respondent.

In this study, we assess anxiety levels using the Cantril ladder. Participants, aided by a visual ladder scale, envision themselves ascending a ten-step ladder starting at zero. Within the SPTK, participants actively self-assess their levels of anxiety by responding to the question, "How worried/anxious are you in daily life?" They respond on a scale ranging from 0 (*not worried/anxious*) to 10 (*very worried/anxious*).

In Figure 1, most of the respondents rated their anxiety levels at the third level, with 20.8% in 2017 and 16.6% in 2021. There is a notable increase in respondents rating their anxiety as seven or more, rising from 3.5% in 2017 to 17.1% in 2021. This signifies a notable increase in the proportion of people experiencing high anxiety levels. The national average anxiety level rose from 3.6 in 2017 to 4.1 in 2021, reflecting a 0.6-point increase.

Figure 1

Distribution of Anxiety Levels, 2017 and 2021

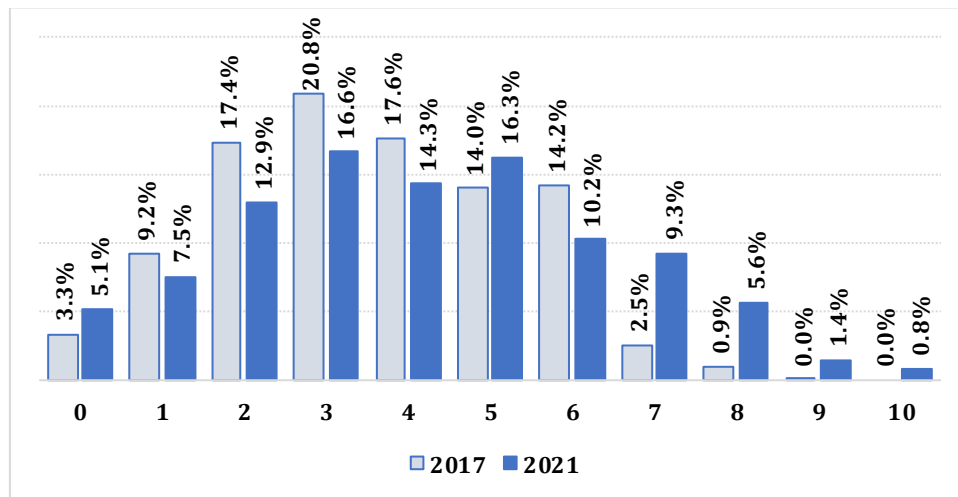
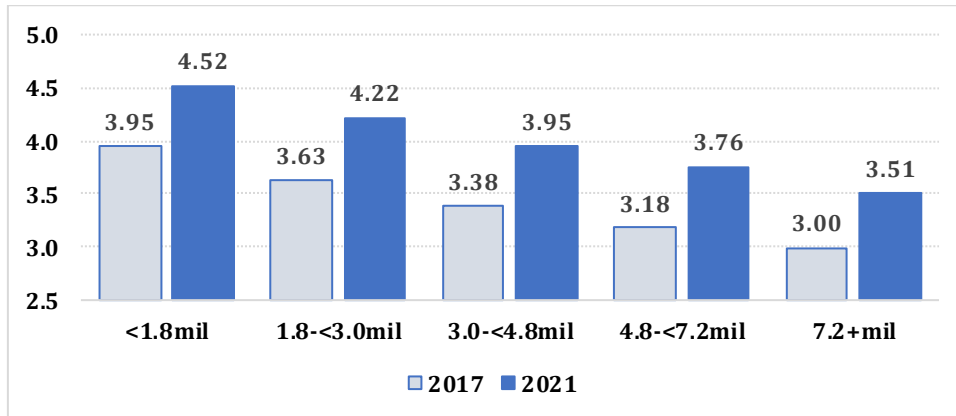


Figure 2 reveals that self-reported anxiety levels decrease with increased household income. Overall, anxiety levels were higher in 2021 compared to 2017 across all income groups. In 2021, the lowest-income group (less than 1.8 million IDR [125USD]/month) had an average anxiety level of 4.5; in 2017, it was 4.0. In contrast, the highest income group (7.2 million IDR [500USD]/month and above) had anxiety levels of 3.5 in 2021 and 3.0 in 2017.

Figure 2

Average Anxiety Levels by Monthly Household Income, 2017 and 2021



Note. Income categories in USD are roughly: <\$125, \$125-\$208, \$208-\$333, \$333-\$451, \$500 +

To estimate multilevel mixed-effects ordered logit models, anxiety levels must be recoded. To attain a more equitable dispersion of anxiety levels, the classifications for rungs zero and one were merged into a solitary category. In a similar fashion, the categories pertaining to rungs six through ten were consolidated into a single category.

Table 1 shows the mean and standard deviation of all variables used in this study by year. Provincial characteristics and individual and household characteristics comprise these groups of variables.

Table 1

Mean and Standard Deviation of Data

Variable	Excluded case (if binary variable)	2017		2021	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Individual and Household		(N = 67,450)		(N = 70,508)	
Level of Anxiety (scale 0-10)	N/A	3.57	1.78	4.13	2.26
Level of Anxiety (scale 0-5)	N/A	3.56	1.64	3.91	1.75
Female	Male	.514	.500	.513	.500
Age (years)	N/A	46.4	12.3	47.5	12.5
Married	Single or divorced	.834	.372	.820	.384
Completed Primary	Did not complete primary	.276	.447	.301	.459
Completed Junior Secondary	Did not complete primary	.159	.366	.172	.377

Table 1

Mean and Standard Deviation of Data (Contd.)

Variable	Excluded case (if binary variable)	2017		2021	
		M	SD	M	SD
Completed Senior Secondary	Did not complete primary	.234	.423	.242	.428
Tertiary	Did not complete primary	.111	.315	.102	.303
Suffers from Chronic Disease	Did not complete primary	.102	.302	.080	.271
With Disabilities	No disabilities	.066	.249	.054	.225
Urban	Rural	.419	.493	.429	.495
Household Size (person)	N/A	3.97	1.73	3.81	1.65
Household income/month:					
Lower-Middle: IDR 1.8-3.0 million (125-208USD)	Low: IDR 0-1.8 million	.292	.455	.315	.465
Upper-Middle: IDR 3.0-4.8 million (208-333USD)	Low: IDR 0-1.8 million	.190	.393	.206	.404
High: IDR 4.8+ million (333+USD)	Low: IDR 0-1.8 million	.204	.403	.203	.402
Province Contextual		(N=34)		(N=34)	
log(Total COVID-19 Cases)	N/A	0.00	-	6.34	0.58
log(GRDP per capita)	N/A	17.28	0.44	17.35	0.44
Gini Expenditures per capita	N/A	.364	.034	.355	.036

Source: SPTK, KawalCOVID19 and BPS.

Note. The total number of COVID-19 cases and deaths in 2017 was zero; however, logarithmic values are assigned as zero.

Results and Comparison with Earlier Studies

Table 2 presents the anxiety level estimates using a multilevel mixed-effects ordered logistic analysis of the main (column 1) and interaction models (column 2). The estimates of the main model serve as a reference for the findings of this study. In contrast, the interaction model estimates denote changes in the household income class suspected of having occurred due to the COVID-19 pandemic. Meanwhile, columns 3–6 present the main model's estimation outcomes for four household income classes. These groupings are determined based on monthly household income data from the SPTK dataset. Column 3 delineates the low-income class, which comprises members whose monthly household incomes fall below 1.8 million IDR (125 USD). Individuals from the lower-middle-income

class (column 4) and upper-middle-income group (column 5) have monthly household incomes between 1.8 IDR and 3.0 million IDR (125-208 USD) and 3.0 and 4.8 million IDR (208-333 USD), respectively. We merged the top two SPTK household income categories (4.8 to less than 7.2 million IDR [333-500 USD] and 7.2+ million IDR [500+ USD]) into the high-income class due to the limited number of observations (column 6). It is important to acknowledge that the nominal household income values projected for 2017 to 2021 are assumed to be equivalent, given that inflation rates have been omitted from this study.

Table 2
Multilevel mixed-effects ordered logistic estimates of anxiety levels

	Main Model [1]			Interaction Model [2]			Low Income [3]			Lower-Middle Income [4]			Upper-Middle Income [5]			High Income [6]		
	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p
Contextual Variables																		
GRDP per cap	0.208	0.072	.004	0.208	0.072	.004	0.363	0.142	.011	0.105	0.073	.151	0.005	0.073	.945	-0.013	0.066	.849
Gini Expend per cap	1.059	0.611	.083	1.105	0.612	.071	-0.351	0.944	.710	0.278	0.847	.743	2.483	0.921	.007	1.463	0.836	.080
COVID-19 Cases	0.064	0.002	<.001	0.067	0.003	<.001	0.064	0.003	<.001	0.071	0.003	<.001	0.066	0.004	<.001	0.051	0.004	<.001
κ1	1.260	1.320		1.282	1.318		3.469	2.549		-0.376	1.326		-1.301	1.329		-2.186	1.196	
κ2	2.272	1.320		2.294	1.318		4.456	2.549		0.664	1.326		-0.249	1.329		-1.200	1.196	
κ3	3.127	1.321		3.149	1.318		5.318	2.549		1.547	1.326		0.623	1.329		-0.395	1.196	
κ4	3.809	1.321		3.831	1.319		6.016	2.550		2.262	1.326		1.309	1.329		0.212	1.196	
κ5	4.574	1.321		4.597	1.319		6.822	2.550		3.032	1.326		2.057	1.329		0.914	1.196	
Var: Province (con)	0.051	0.015		0.051	0.015		0.078	0.034		0.053	0.014		0.051	0.014		0.040	0.011	
LR test (p-score)	<.001			<.001			<.001			<.001			<.001			<.001		
ICC	.015			.015			.023			.016			.015			.012		
Observations	137,958			137,958			40,695			41,905			27,333			28,025		

Table 2*Multilevel mixed-effects ordered logistic estimates of anxiety levels (Contd.)*

	Main Model [1]			Interaction Model [2]			Low Income [3]			Lower-Middle Income [4]			Upper-Middle Income [5]			High Income [6]		
	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p
Contextual Variables																		
GRDP per cap	0.208	0.072	.004	0.208	0.072	.004	0.363	0.142	.011	0.105	0.073	.151	0.005	0.073	.945	-0.013	0.066	.849
Gini Expend per cap	1.059	0.611	.083	1.105	0.612	.071	-0.351	0.944	.710	0.278	0.847	.743	2.483	0.921	.007	1.463	0.836	.080
COVID-19 Cases	0.064	0.002	<.001	0.067	0.003	<.001	0.064	0.003	<.001	0.071	0.003	<.001	0.066	0.004	<.001	0.051	0.004	<.001
κ1	1.260	1.320		1.282	1.318		3.469	2.549		-0.376	1.326		-1.301	1.329		-2.186	1.196	
κ2	2.272	1.320		2.294	1.318		4.456	2.549		0.664	1.326		-0.249	1.329		-1.200	1.196	
κ3	3.127	1.321		3.149	1.318		5.318	2.549		1.547	1.326		0.623	1.329		-0.395	1.196	
κ4	3.809	1.321		3.831	1.319		6.016	2.550		2.262	1.326		1.309	1.329		0.212	1.196	
κ5	4.574	1.321		4.597	1.319		6.822	2.550		3.032	1.326		2.057	1.329		0.914	1.196	
Var: Province (con)	0.051	0.015		0.051	0.015		0.078	0.034		0.053	0.014		0.051	0.014		0.040	0.011	
LR test (p-score)	<.001			<.001			<.001			<.001			<.001			<.001		
ICC	.015			.015			.023			.016			.015			.012		
Observations	137,958			137,958			40,695			41,905			27,333			28,025		

RQ1: The Effect of the COVID-19 Severity on Anxiety Levels

Estimation results reveal that individuals in provinces with higher cases to COVID-19 per 100,000 population reported increased levels of anxiety. This positive relationship between pandemic severity and anxiety levels holds for the main and interaction models (columns 1–2) and the main model disaggregated by household income classes (columns 3–6). These findings address RQ1, showing that higher severity of COVID-19 is associated with higher levels of anxiety in the population.

Fear of infection, severe illness, and mortality, disruptions caused by stricter lockdowns and social distancing measures resulting in decreased social interactions and increased isolation and adverse economic conditions, including business closures, job losses, and financial hardships in severely affected provinces (Fancourt et al., 2021; Fauk et al., 2022; Fitzpatrick et al., 2020; Huato & Chavez, 2021) are all plausible explanations for the positive association. In contrast, a study conducted in India found divergent results (Rehman et al., 2023). The study concluded that despite a surge in COVID-19 cases, symptoms of depression, anxiety and stress decreased over time, reaching their lowest point after the lockdown ended. The authors attributed this distress more to lockdown restrictions than to an increase in cases of COVID-19.

RQ2: The Association Between Income and Anxiety Levels

Estimation results suggest that higher household income is associated with lower anxiety levels, as demonstrated by the decline in anxiety levels with increasing income, particularly in comparison to the lowest-income group (see Table 2, column 1). Higher-income lowers anxiety through better access to improved social support and mental health services, essential and enhanced healthcare, increased leisure opportunities, and more effective life management strategies.

The results underscore a robust correlation between increased household income and diminished levels of anxiety, thereby emphasizing the importance of financial means in mitigating anxiety and demonstrating how socioeconomic determinants can function as safeguards for mental health. This discovery supports RQ2 by confirming that an increase in household income is associated with lower anxiety levels among the general population. The findings align with prior investigations carried out in France (Peretti-Watel, 2020), the United States (Ettman, 2020), and the United Kingdom (Shevlin, 2020).

RQ3: The Impact of the COVID-19 Severity on the Income–Anxiety Relationship

The interaction model estimates (see Table 2, column 2) shed light on the relationship between income and pandemic-related anxiety. Anxiety levels remain consistent regardless of the severity of COVID-19 among those with lower-middle incomes. Upper-middle-income individuals exhibit a slight, nonsignificant negative

correlation between COVID-19 severity and anxiety. On the contrary, high-income individuals experience a significant reduction in anxiety as the severity of COVID-19 increases. The finding implies that high-income individuals have distinctive resilience or coping mechanisms, which substantially decrease anxiety levels during severe pandemics.

The findings address RQ3 by demonstrating the interaction between income class and the external factor of pandemic severity in shaping anxiety levels. In particular, the study shows that the severity of the pandemic had a more pronounced impact on the reduction of anxiety levels among people in the highest income group. The finding aligns with studies conducted in Japan (Nagasu et al., 2021), Israel (Frankenthal et al., 2023), and a systematic review and meta-analysis (Leung et al., 2022).

RQ4: The Dynamics of Anxiety Level Determinants Among Income Classes

Most point estimates consistently show the same sign and statistical significance when examining income classes, with variations in magnitudes. Exceptions to this pattern include estimates related to gender, residence type, GRDP per capita, and income inequality.

In terms of gender, women generally report higher anxiety levels than men, as indicated by various studies (Alexander et al., 2007; Blanchflower & Bryson, 2023). However, this pattern does not persist when considering disaggregated income classes. Specifically, women's anxiety levels in low-income households do not significantly differ from men's (column 3), attributed to shared financial strain, economic insecurity, and challenges related to basic needs and social factors in the low-income class. Conversely, women in higher-income classes consistently exhibit higher anxiety levels than men (columns 4–6), influenced by gender roles, work-life balance issues, and socio-cultural factors (Alon et al., 2020; Dang & Nguyen, 2021). Higher-income women may face added pressure to balance career and family responsibilities, and social norms and disparities in mental health resources may perpetuate gender disparities in anxiety levels.

Concerning residence type, the overall results show no significant difference in anxiety levels between urban and rural areas (Table 2, columns 1–2), contrasting with findings in China (Zhang et al., 2021) and Scotland (McKenzie et al., 2013). However, when disaggregated by household income, higher self-reported anxiety is observed in the low and lower-middle-income classes (columns 3–4), suggesting that urban living intensifies anxiety for lower-income individuals due to factors like population density, noise, pollution, and crime rates.

For the upper-middle-income class, there is no statistically significant distinction in self-reported anxiety levels between rural and urban residents (Table 2, column 5). Conversely, high-income individuals experience lower anxiety levels in urban areas than in rural settings (Table 2, column 6), which can be attributed to their access to secure

housing, recreational facilities, improved mental health services, well-developed social networks, and a broader range of leisure activities, acting as coping mechanisms and reducing anxiety.

Regarding the provincial economic performance measure, the estimation results surprisingly reveal an unexpected correlation: higher per capita GRDP is linked to increased anxiety levels (Table 2, columns 1–2). This contradicts the assumption that individuals in economically affluent regions would have lower anxiety levels and diverges from a UK study (Fone et al., 2007). The analysis of income classes further shows that the positive association is limited to low-income individuals (Table 2, column 3), with no significant correlation observed among higher-income classes (Table 2, columns 4–6). This implies that improved economic conditions within local governments may not uniformly benefit low-income residents, as they may encounter difficulties in accessing social welfare programs, quality healthcare, and education, potentially heightening their anxiety.

Lastly, the Gini coefficient of per capita expenditures indicates a positive association with anxiety levels (Table 2, columns 1–2). This suggests that in provinces marked by high-income inequality, individuals are more prone to report heightened levels of anxiety. An Indonesian study also recognized a similar correlation, revealing that regions with greater income inequality had a higher likelihood of mental illness incidence compared to areas with lower Gini coefficients (Hanandita & Tampubolon, 2014).

In the income class analysis, anxiety positively correlates with income inequality among individuals in higher-income classes (Table 2, columns 5–6) but not among those in the lowest and lower-middle-income groups (Table 2, columns 3–4). This discovery suggests that individuals in higher-income classes experience increased anxiety levels as provincial income inequality rises. This phenomenon may be attributed to concerns about preserving their social and economic standing. Additionally, insecurity within higher-income groups arising from inequality faced by less privileged individuals can contribute to this trend, potentially leading to social tension and fragmentation (Tumin, 1970).

In summary, the findings strongly address RQ4, shedding light on the valuable insights gained from classifying individuals into distinct income classes. The analysis reveals significant variations within each income category—low, lower-middle, upper-middle, and high—and their impact on self-reported anxiety levels.

Individual and Household Characteristics

The following is a brief discussion of individual and household characteristics that are not explicitly addressed in the RQs but play crucial roles in determining anxiety levels. The estimation results reveal that individuals are more likely to report higher levels of anxiety if they have a chronic disease (consistent with findings of Frankenthal et al., 2023

and Khan et al., 2020), experience a disability (Okoro et al., 2011), or live in larger households (Noh et al., 2017). In contrast, controlling for other factors, people tend to report lower anxiety levels if they are older (Nagasu et al., 2021), married (Huato & Chavez, 2021), or have higher education (Kenntemich et al., 2023).

Discussions

The research outcomes offer valuable insights into the dynamics of anxiety, exploring the interconnected influences of COVID-19 severity, household income, and other contributing factors. The positive correlation observed between COVID-19 severity and anxiety highlights the pervasive impact of the pandemic on mental well-being (RQ1). Additionally, the robust link between higher household income and lower anxiety levels underscores the protective role of financial stability (RQ2). The nuanced relationship between income classes and pandemic severity unveils distinct resilience levels among socioeconomic groups, especially within different income brackets (RQ3). Furthermore, a closer examination of determinants within income classes reveals intricate patterns that challenge preconceptions about the effects of urban living, economic performance, and income inequality on anxiety levels (RQ4).

Exploring the complex relationship among gender, residential status, and income levels concerning anxiety yields valuable insights into distinct risk factors and challenges encountered by individuals in various economic strata. For instance, acknowledging that women in higher-income brackets may still experience heightened anxiety levels compared to men enables policymakers to formulate targeted strategies addressing gender-specific stressors and societal expectations contributing to female anxiety. Similarly, recognizing that individuals residing in low and lower-middle-income brackets in urban areas face elevated anxiety levels emphasizes the need for policies addressing specific stressors associated with urban living, including high population density, environmental pollution, and limited access to quality healthcare and social support.

Furthermore, considering the influence of provincial contextual factors, such as GRDP per capita and income inequality, allows policymakers to understand better the overarching structural forces shaping anxiety levels. This understanding guides the formulation of holistic approaches to address the fundamental drivers of anxiety, which may involve mitigating income disparities, improving access to resources and opportunities, and fostering social cohesion within communities.

It is important to highlight that this study utilizes a continuous pandemic severity measure calculated at the province level instead of a year dummy variable. This choice offers a more precise measurement of the change in magnitude and direction, avoiding the loss of information associated with time categorization. It enables detailed exploration of variable relationships over time, and this methodology is in line with

approaches used in studies conducted in six developed countries (Nguyen, 2021), the United States (Le & Nguyen, 2021), and Germany (Bittmann, 2022).

Assessing Anxiety Using the Cantril Ladder Approach

As far as we know, this study is the first to employ the Cantril ladder to assess anxiety levels. We want to emphasize a disclaimer regarding using the Cantril ladder in assessing anxiety levels in this study. The Cantril ladder is commonly employed in large-scale surveys and opinion research to gauge subjective well-being across populations. While the Cantril ladder offers valuable insights into an individual's subjective experience, including self-evaluating anxiety levels, aligning with our study objective, it may not directly substitute for specialized mental health tests like GAD, DASS, or PHQ.

Study Limitations

This research exhibits certain limitations, with three notable ones as follows. The study employs four income classes derived from the five income categories in the SPTK datasets. Adding per capita income information to the dataset would improve the classification of income classes, resulting in enhanced precision and validity for a more balanced composition of income categories.

The study's findings are constrained in granularity as the SPTK datasets lack precise location information at the *kabupaten* or *kota* level within a province. The absence of these specific geographic details makes it challenging to capture localized dynamics, disparities, and factors influencing individual anxiety within a province. Moreover, the absence of interview dates in the SPTK datasets hampers the ability to link individual data with the contemporaneous severity of COVID-19, compromising the study's accuracy in reflecting the impact of the pandemic.

Contributions of the Study

This study addresses limitations in pandemic anxiety research discussed in the literature review section. Many cited studies lacked comprehensive data, relied on single-point collection, and employed convenience sampling and online surveys with restricted sample sizes. In contrast, our study utilized data from two national cross-sectional surveys conducted simultaneously to address these shortcomings. Leveraging multi-year cross-sectional data offers valuable insights by comparing diverse populations over time, allowing for identifying societal-level changes and shifts. While lacking individual-level tracking, this approach captures dynamics and alterations in variable relationships through interaction terms. Furthermore, the substantial sample size, exceeding 137,000 respondents, enhances statistical power, facilitating precise analyses of changes in anxiety levels over time.

The administration of SPTK involved rigorous face-to-face interviews, enhancing sample distribution accuracy compared to the potentially biased online surveys. As

cautioned by Andrade (2020), findings from online survey-based studies should be interpreted with care, treating their conclusions as provisional. Additionally, our study enhances the accuracy of anxiety level assessment by collecting self-reported data at two different time points, thereby reducing potential recall bias (Dunlop et al., 2019).

Beyond methodological improvements, this study makes a significant contribution by thoroughly examining the impact of income class on anxiety, an aspect that has been underexplored in previous research. This investigation addresses a gap in the literature, advancing our understanding of how income disparities influence anxiety levels. It underscores the importance of incorporating this dimension into discussions on anxiety, thereby filling a critical void in existing research.

Conclusions and Policy Implications

This study explored the implications of the COVID-19 pandemic on anxiety levels in Indonesia. By analyzing data from the Happiness Level Measurement Survey (SPTK) conducted in 2017 and 2021, representing pre-pandemic and during-pandemic conditions, we aimed to identify factors influencing changes in self-reported anxiety.

Estimation results showed higher anxiety levels in provinces with increased COVID-19 cases per 100,000 people, even after accounting for other factors. This underscored the substantial impact of pandemics, like COVID-19, on mental well-being, emphasizing the need to consider contextual factors and social determinants in anxiety studies. The finding addressed RQ1, providing essential information for addressing mental health challenges during public health crises.

Individuals in the lower-middle, upper-middle, and high-income categories reported lower anxiety levels compared to those in the low-income category, highlighting the influence of income class on anxiety levels and addressing RQ2. The contrast between higher anxiety levels in lower-income individuals and lower anxiety levels in higher-income individuals underscored the role of household income in alleviating anxiety, emphasizing the protective impact of socioeconomic resources on mental well-being.

Estimation results further reveal that the severity of the pandemic moderates the relationship between income and anxiety levels. Notably, a negative interaction term for the high-income class and COVID-19 severity suggested that high-income individuals experience reduced anxiety as the severity of COVID-19 increases. The finding addressed RQ3, indicating that the link between income and anxiety is not fixed but can vary based on the external factor of pandemic severity.

The findings provided crucial insights into heterogeneity within each income class and its impact on self-reported anxiety levels, supporting RQ4. Higher-income women consistently report higher anxiety than men. Urban residence is associated with higher

anxiety for low- and lower-middle-income individuals, while high-income individuals experience lower anxiety in urban areas. Additionally, a positive association between GRDP per capita and anxiety is observed only among low-income individuals. Furthermore, income inequality positively correlated with anxiety among upper-middle- and high-income groups.

Based on these findings, the study recommends initiatives to address anxiety disorders, with a focus on improving the availability and accessibility of affordable mental health services for the lower and middle-class segments. Given that only slightly more than half of the *Puskesmas* (community health centers) offer mental health services, expanding such services is deemed crucial and should be prioritized within the health center services. The latter includes expanding the certified workforce capable of providing mental health services. Additionally, there should be incremental increases in the coverage of mental health services under BPJS Kesehatan, the universal health care provided by the Government of Indonesia.

Regarding specific population groups, the government should prioritize enhancing accessibility to public spaces, like city parks and libraries, for urban residents. Implement mentoring programs and raise community awareness to support people with chronic diseases and disabilities, providing significant assistance, direction, and knowledge for their overall welfare. Additionally, prioritize mental health services on social media platforms for the younger demographic, offering personalized preventive measures to mitigate anxiety levels in this group.

Future research should prioritize improving anxiety assessment methods. Given that the Cantril ladder may not fully encompass diverse anxiety experiences or provide a clinically precise evaluation, upcoming studies should supplement it with a standardized clinical test for anxiety, customized for possible administration through face-to-face interviews. Furthermore, expanding the research by incorporating subsequent SPTK data would allow for evaluating self-reported anxiety before, during, and after the pandemic.

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