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Happiness amidst the COVID-19 pandemic in Indonesia: exploring gender, residence type, and pandemic severity

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This study delves into the dynamics shaping happiness levels in Indonesia before and during the COVID-19 pandemic, specifically emphasizing gender and residence-type disparities. Using data from the 2017 and 2021 Happiness Level Measurement Survey, it offers insights into how different population segments were affected. The analysis employs a multilevel mixed-effects ordered logistic model, considering individuals nested within provinces, and measures pandemic severity using positive COVID-19 cases per 100,000 residents. This study evaluates pandemic-related happiness shifts using nationwide cross-sectional survey data from two timeframes. It derives substantial statistical strength from data involving 137,000+ respondents gathered through comprehensive face-to-face interviews. It mitigates recall bias by capturing happiness at two distinct time points, avoiding retrospective measures. The study examines and validates four research questions. First, higher COVID-19 cases in provinces correlate with lower happiness. Second, though women were happier than men, the pandemic reduced this gender-based gap. Third, urban residents were generally happier than rural residents, but the pandemic narrowed this difference. All the estimates exhibit statistical significance at the 1 percent level. Finally, while provincial poverty showed minimal happiness impact, a negative association between unequal per capita expenditure and happiness emerged, providing partial backing for investigating the role of macroeconomic conditions. This study reveals that the COVID-19 pandemic altered happiness dynamics in Indonesia, narrowing gender and residence-based gaps. It also emphasizes the role of socioeconomic factors, particularly unequal per capita expenditure, in influencing individual happiness, highlighting implications for targeted policy interventions.

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Introduction

Studying factors influencing our happiness has been a persistent and important topic of investigation over the years. Happiness holds significant implications for our lives, serving not only as a personal aspiration but also as a societal objective (Petrovič et al. 2021; Veenhoven 2012). Scholars and policymakers have been paying growing attention to subjective well-being (SWB) measures in recent decades. These measures have been sought as alternative ways to gauge economic and social progress, addressing concerns with traditional welfare indicators (Ahmadiani et al. 2022; Deaton and Stone 2013; Delhey and Kroll 2013). Notably, Oishi and Diener's (2014) study revealed that self-reported happiness and life satisfaction could effectively reflect objective societal and economic conditions, quantify individuals' hardships, and evaluate the effectiveness of specific public policies.

The impact of COVID-19 on SWB presents various perspectives. Firstly, a global decline in SWB is evident across studies, including those in China (Yang and Ma, 2020), Germany (Bittmann, 2022a; Möhring et al. 2021), and a multi-country study encompassing China, Japan, South Korea, Italy, the United Kingdom, and the United States (Nguyen 2021). Secondly, the World Happiness Report (WHR) 2021 indicates a non-significant increase in global life evaluation indicators from 2017–2019 to 2020 (Helliwell et al. 2021), similarly reflected in Rajkumar's (2023) research across 78 countries. Thirdly, French researchers discovered improved self-reported health and well-being during lockdown compared to previous years (Recchi et al. 2020). These diverse outcomes underscore the complex link between the pandemic and individuals' SWB, arising from individual and household differences, contextual factors, and varying COVID-19 severity across regions.

As the world's fourth most populous nation, Indonesia has confronted profound repercussions from the pandemic, ranking 20th worldwide in total reported COVID-19 cases and 11th in COVID-19-related fatalities (Worldometer 2023). Moreover, the variability in COVID-19 exposure across provinces and the distinction between urban and rural areas within Indonesia is noteworthy.¹ In light of these circumstances, it becomes essential to undertake an exhaustive study of how the pandemic's severity has uniquely influenced the happiness of Indonesians.

This study aims to empirically examine the factors influencing shifts in happiness levels before and during the COVID-19 pandemic in Indonesian society. Given the indications from prior research that the pandemic affects women (Dang and Nguyen 2020; Fortier 2020; Gausman and Langer 2020; Giurge et al. 2021) and urban dwellers (López-Ruiz et al. 2021; Shams and Kadow 2022) disproportionately compared to other their respected counterparts, our investigation will primarily focus on comprehending the distinct contributions of gender and residency to the observed changes in happiness levels. By exploring how being male or female and where people live affect changes in happiness during the pandemic, we can better understand the different experiences and difficulties faced by different population segments. Significantly, this study stands as a pioneering effort to investigate the changes in happiness levels stemming from the COVID-19 pandemic among the broader populace of Indonesia.

This study addresses several limitations of existing literature on changes in happiness during the COVID-19 pandemic. Many of these previous investigations have not effectively addressed the following limitations: concentration on specific population segments (e.g., healthcare workers, students), employment of single-point-in-time data collection, dependence on convenience sampling for participant recruitment, administration of online surveys, limited observation durations, and reliance on participants' retrospective reports of pre-pandemic circumstances.

We overcome these limitations because we use national-level cross-sectional survey data for two different points in time. First, our survey data covers the period before and during the pandemic, enabling us to examine changes in self-reported happiness levels associated with the pandemic's impact. Using survey data from over 137,000 respondents provides this study with robust statistical power, enhancing the precision of our analysis of happiness level changes over time. Second, our survey data was collected through face-to-face interviews, employing a rigorous sampling method. This approach ensures a more representative sample distribution, avoiding biases from self-selection in online surveys (Andrade 2020).

Third, our study evaluates happiness at multiple time points. This method acts as a temporal anchor, assisting respondents in recalling and distinguishing their experiences more accurately. Given that respondents often generalize or simplify their experiences when recalling over an extended timeframe, evaluating happiness at different times enables a comprehensive capture of fluctuations and variations in individuals' emotional states. In this study, assessing happiness at two distinct time points, before and during the COVID-19 pandemic, guarantees a more accurate portrayal of an individual's SWB and alleviates recall bias (Hyman 2013; Tadic et al. 2014).

This study consists of six sections. In Section 2, we offer a summary of pertinent prior studies, followed by an investigation into the research questions posed in this study. Section 3 explains the methodologies and models used and outlines the data sources. Section 4 examines and analyzes the outcomes from the estimations, while Section 5 discusses the results. Finally, Section 6 summarizes the findings and offers policy recommendations based on the results.

Literature review and research questions

Theoretical background. The *reactivity theory*, embraced by social scientists, including economists and sociologists, asserts that SWB, particularly happiness, is influenced by objective external conditions at both the individual and social levels (Lee 2022). These objective conditions encompass various factors such as income, age, gender, marital status, occupation, family structure, geographic region, and government policies (Diener 1984). According to the reactivity theory, individuals' perceptions and assessments of their happiness primarily stem from their passive responses to these objective conditions. In simpler terms, individuals tend to react to the circumstances and external factors surrounding them, significantly impacting their SWB. Within the framework of our study, positive events like economic improvements or technological advancements consistently raise happiness levels. In contrast, adverse events such as natural disasters (Calvo et al. 2015; Rehdanz et al. 2015; Sekulova and van den Bergh 2016) or the COVID-19 pandemic tend to decrease happiness.

The impact of the COVID-19 pandemic on happiness in Indonesia. Before the pandemic, numerous studies in Indonesia explored factors influencing happiness across various scopes. These studies encompassed general population happiness levels (Aryogi and Wulansari 2016; Landiyanto et al. 2011; Sohn 2013; Sujarwoto et al. 2017) and specific demographic segments (Anna et al. 2019 on fishermen; Sollis et al. 2023 on native-immigrant). Regional studies (Firmansyah et al. 2017; Nandini and Afiatno 2020) shed light on context-specific happiness factors. Specific topics like religiosity (Kurniawati and Pierewan 2020), height (Sohn 2014), decentralization (Sujarwoto and Tampubolon 2015), and income inequality (Furwanti et al. 2021) were examined, providing valuable insights. Furthermore, Pattinasarany (2018)

conducted a cross-national analysis exploring happiness and life satisfaction determinants in Indonesia, Thailand, Japan, and South Korea.

In both pre-pandemic and pandemic contexts in Indonesia, the World Happiness Report (WHR) and the Happiness Index are commonly used measures of happiness.² However, these two references provide contradictory information regarding the impact of the COVID-19 pandemic on the happiness levels of individuals in Indonesia. The WHR indicates a decrease in the happiness level of Indonesian people from 5.345 from 2018 to 2020 to 5.240 from 2019 to 2021 (Helliwell et al. 2020; 2021; 2022). In contrast, the Happiness Index shows an increase from 70.69 in 2017 to 71.49 in 2021 (Badan Pusat Statistik 2021a).

Multiple studies have explored the effects of the pandemic on SWB in Indonesia. Tjahjana et al. (2021) conducted an online survey a month after the pandemic, indicating that 41% of respondents reported decreased happiness. Rahmanita et al. (2021) collected data 1–3 months post-pandemic, revealing that 59% of respondents expressed happiness in staying at home. Iskandarsyah et al. (2022) explored the effects of COVID-19 information and behaviors on anxiety and happiness a month post-outbreak, noting increased information searches linked to higher anxiety but more testing and treatment information tied to less anxiety and greater happiness. Dwidienawati et al. (2021) found ongoing pandemic adaptation challenges, with no improvement in happiness or life satisfaction reported after a year. Halimatussadiyah et al. (2021) conducted two cross-sectional online surveys in 2020 and 2021, revealing a trend towards heightened happiness. In a separate study, Borualogo and Casas (2022) collected data during the same period, discovering higher SWB and positive affect among boys during the pandemic and improved satisfaction in friend interactions.

The following are overviews of studies using general population survey data to understand the pandemic's impact on SWB in Indonesia's neighboring countries. Tambyah et al. (2023) found a significant decrease in life satisfaction among Singaporeans, dropping from 4.51 in 2016 to 4.18 in 2022 on a scale of 1–6. The study highlighted health risks and job security as primary concerns during the COVID-19 pandemic. Phulkerd et al. (2023) reported that Thai adults had an average life satisfaction score of 22.4 during the 2021 COVID-19 epidemic, down from 25.5 before the pandemic in 2019 on a 5–35-point scale.

Research questions. This study investigates four specific research questions (RQs) to elucidate and support the study objectives within the broader context of the Indonesian population. Limited research has explored the impact of COVID-19 severity on self-reported happiness at subnational levels due to a lack of reliable data. However, some exception studies exist (Bittmann 2022a; Le and Nguyen 2021). In Indonesia, the impact of the pandemic varies across provinces and districts, each of which implemented unique policies to curb the spread of the pandemic and cope with its consequences (Arifin et al. 2022). This study examines a connection between the severity of COVID-19 and self-reported happiness, anticipating that increased severity will correspond to decreased reported happiness.

RQ1: To what extent does the severity of COVID-19 contribute to a reduction in individuals' happiness levels?

Global research suggests women typically report higher life evaluations than men (Blanchflower and Bryson 2022; Blanchflower and Oswald 2011; Fortin et al. 2015). However, women worldwide bear a disproportionate burden of socio-economic challenges during crises like natural disasters, economic downturns, and pandemics. Such inequity stems from gender roles and

undervaluation of women's work, leading to increased caregiving responsibilities and exposing women to short-term economic instability and long-term welfare declines (Dinella et al. 2023; Fortier 2020; Langer et al. 2015). This study investigates whether the severity of COVID-19 has narrowed the gap in self-reported happiness between women and men.

RQ2: To what extent does the severity of the COVID-19 pandemic lessen women's happiness advantage over men?

International evidence indicates that, at low levels of economic development, substantial gaps favor urban over rural areas in income, education, and occupational structure, resulting in higher SWB for urban residents than for rural residents. Such higher life satisfaction holds despite urban challenges like pollution and congestion. However, these economic disparities diminish as development progresses, enabling rural areas to close the gap and even surpass urban life satisfaction (Burger et al. 2020; Easterlin et al. 2011). In Indonesia, Sohn (2013) identified a positive association between living in urban areas and happiness. Additionally, Sujarwoto (2021) observed that individuals residing in rural settings expressed lower life satisfaction than their urban counterparts. Given the COVID-19 pandemic's disproportionate impact on urban areas compared to rural regions, an intriguing query arises: How did the severity of the pandemic influence the link between urban living and self-reported happiness?

RQ3: To what extent does the severity of the COVID-19 pandemic diminish the happiness advantage of urban residents compared to rural residents?

Incorporating contextual variables in measuring self-reported happiness in a multilevel framework is crucial for more accurate analyses and informed policymaking (Ballas and Tranmer 2012; Gómez-Balcácer et al. 2023). Analytically, incorporating contextual variables like macroeconomic and socio-economic conditions enhances research depth and accuracy. From a policy standpoint, this approach provides a robust foundation for informed decision-making, resulting in more effective and targeted policies. This study utilizes three provincial-level contextual variables: COVID-19 severity (as discussed in RQ1), poverty incidence, and income inequality.

RQ4: To what extent do provincial macroeconomic conditions, specifically poverty and income inequality, impact individuals' happiness levels?

These research questions delve into diverse facets of the pandemic's influence on happiness levels within Indonesian society. They examine consequences such as health risks, economic disruptions, and social isolation (RQ1). Furthermore, they investigate the role of societal norms, gender roles, and structural inequalities in women's experiences during the pandemic (RQ2) and assess potential challenges in urban areas (RQ3). Finally, the study evaluates the impact of macroeconomic factors, specifically poverty and income disparities, on happiness levels during the pandemic (RQ4).

Materials and methods

Multilevel mixed-effects ordered logistic model. In this study, we estimate a multilevel mixed-effects ordered logistic model that incorporates nesting while considering the dependent variables' categorical nature and providing adjusted standard errors that add precision to the coefficients (Rabe-Hesketh and Skrondal 2022). By using multilevel models, we can control for individual and province variables, isolating the impact of pandemic severity on self-reported happiness levels (Mehmetoglu and Jakobsen 2017; Snijders and Bosker 2012). Observations in our study

comprise individuals (level 1) nested within provinces (level 2). Our multilevel regressions are computed with random intercepts for each province to account for the fact that provinces are affected differently by the pandemic and that respondents in one province might be more similar than respondents in another. Finally, we used an ordered logistic model due to the ordered nature of the dependent variable.

We postulate a latent variable (y^*) representing an individual's underlying happiness. In this study, we will estimate two models: the 'main' (hereafter: Main Model) and the 'with interaction terms' (hereafter: Interaction Model) models. The Main Model's latent variable is associated with individual traits, household attributes, and provincial-level contextual variables. Individual traits encompass gender, age along with its squared term, marital status, highest education level attained, and employment status. Household-level attributes include residence type and household income. Three contextual variables at the provincial level consist of the poverty rate, income inequality, and the count of COVID-19-infected individuals per 100,000 population, reflecting COVID-19 severity. In contrast, the Interaction Model encompasses the Main Model and incorporates additional interaction variables between gender and residence-type covariates with the severity of the pandemic measure.³ We assume that individuals residing in provinces hardest hit by the pandemic will experience a more significant decline in happiness than those in the less affected provinces.

The Main Model is specified as follows:

$$y_{ij}^* = x_{1,ij}\beta_1 + x_{2,j}\beta_2 + COVID_j\beta_4 + z_{ij}u_j + \epsilon_{ij}$$

while the Interaction Model is specified as follows:

$$y_{ij}^* = x_{1,ij}\beta_1 + x_{2,j}\beta_2 + x_{3,ij} * COVID_j\beta_3 + COVID_j\beta_4 + z_{ij}u_j + \epsilon_{ij}$$

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

where: y_{ij}^* is the unobserved happiness for individual i who resides in province j (latent variable); $x_{1,ij}$ is the individual and household characteristics for individual i living in province j ; $x_{2,j}$ is the provincial contextual variables for province j ; $COVID_j$ is the COVID-19 pandemic severity measure for province j ; $x_{3,ij} * COVID_j$ is the interaction terms of gender and type of residence covariates with COVID-19 severity measure; this study assesses three specifications incorporating interaction terms: one specific to women, another specific to urban settings, and a third encompassing both women and urban factors; 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 .

This model, $x_{1,ij}$ and $x_{2,j}$ do not contain a constant term because its effect is absorbed into the cutpoints (κ).

Table 1 illustrates the estimation strategies employed in this study, encompassing three distinct approaches presented in 12 specifications. First, the Main Model uses all observations to illustrate the relationship between happiness levels and each covariate. Second, the Interaction Model examines how COVID-19 severity affects the connection between being female, living in urban areas, and happiness levels. The second approach

Table 1 Presentation of estimation results.

Table	Specification	Model	Observations
		Null, Main, and Interaction Models with <i>all observations</i> :	
3	[1]	- Null Model (model with no predictors)	137,958
3	[2]	- Main Model	137,958
3	[3]	- Interaction Model:	
3	[4]	• Women*COVID	137,958
3	[5]	• Urban*COVID	137,958
3	[5]	• Women*COVID and Urban*COVID	137,958
		Main Model with <i>disaggregated samples</i> :	
A1	[6]	- Gender: Men	67,096
A1	[7]	- Gender: Women	70,862
A1	[8]	- Type of residence: Rural	79,469
A1	[9]	- Type of residence: Urban	58,489
A1	[10]	- Region: Sumatera	39,793
A1	[11]	- Region: Java-Bali	47,304
A1	[12]	- Region: other (outside Sumatera and Java-Bali)	50,861

Notes: Table 4 summarizes estimates for women, urban residents, and COVID-19 severity covariates across specifications [2] and [6]-[12].

investigates moderation effects. Lastly, the third approach delves into the factors impacting happiness across specific subgroups based on gender, residence type, and region. This granular analysis offers insights into potential differences or similarities in the determinants of happiness among these subgroups, aiming to unravel complex relationships among predictors in understanding SWB across diverse contexts.

Model estimation is performed using the *meologit* procedure in Stata 17.0 (StataCorp 2021). The *meologit* procedure estimates ordered logistic regression containing both fixed effects (in this study: $x_{1,ij}$ and $x_{2,j}$ along with their interaction terms) and random effects (u_j).

The Happiness Level Measurement Survey (SPTK). This study relies on the Happiness Level Measurement Survey (SPTK) from 2017 and 2021, administered by the Central Statistics Agency of Indonesia (Badan Pusat Statistik; BPS) (Badan Pusat Statistik 2017; 2021a).⁴ The 2021 wave of SPTK fieldwork took place from July 1 to August 27, 2021, during Indonesia's peak of the COVID-19 pandemic. The data relating to COVID-19 exposure, i.e., total positive cases of COVID-19, was taken from KawalCOVID19, who collected data primarily from the Ministry of Health. The macroeconomic data on poverty levels and inequality of per capita expenditures (Gini coefficient) are all sourced from the BPS.

SPTK extends across every province and district in Indonesia, where districts consist of *kabupaten* (regencies) and *kota* (municipalities). Within each district, the BPS has established a master sampling frame comprising Census Blocks (BS) for the periodic implementation of various surveys. A BS constitutes a designated enumeration zone within a village locality consisting of 80 to 120 residential, non-residential, or household census buildings with distinct boundaries identifiable in the field. BS selection for SPTK is selected probabilistically from the master sampling frame. Household updating takes place at each selected BS, with the selection of household respondents based on updated listings that are stratified according to factors such as the household head's education and the household's structure.

The data collection involves conducting direct interviews with respondents utilizing structured questionnaires and computer-assisted personal interviewing applications.⁵ The unit of analysis is a randomly selected household. In each sampled household, the head of the household or the spouse of the head of the household (wife/husband) is selected as the respondent to represent the household. This study focuses on 137,958 respondents aged 25–80 years who are working or spend most of their time taking care of the household.⁶ Apart from the level of happiness, SPTK contributed data at the individual and household levels.

Level of happiness. The level of happiness is evaluated using the so-called Cantril ladder (Cantril 1965; Levin and Currie 2014). The SPTK employs a ladder diagram to measure happiness, prompting respondents to visualize themselves on a scale with steps numbered from zero at the bottom to ten at the top. Respondents are asked to evaluate their happiness using the question, “How happy are you with life as a whole?” The answer ranges from 0 (very unhappy) to 10 (very happy).

Figure 1 shows that the distributions of happiness are skewed to the left. Most respondents evaluate their happiness on the eighth rung (34.1 percent in 2017 and 35.6 percent in 2022). The national average was calculated at 7.78 in 2017, while for 2021, it will be slightly lower at 7.76.

For a comparative analysis of self-reported happiness in this study with neighboring nations, Pattinasarany (2018) investigated happiness and life satisfaction in Indonesia, Thailand, Japan, and South Korea to compare self-reported happiness with neighboring nations. The study used collected data to explore lifestyles and values related to social well-being in seven Asian countries, including the Philippines, Taiwan, and Vietnam. Results revealed similar happiness distribution, with Indonesia and Thailand displaying a left-skewed pattern, indicating majority contentment. Indonesian adults reported slightly higher average happiness (7.68) than their Thai counterparts (7.65). In Japan (6.25) and Korea (5.93), happiness levels exhibited a more normal distribution, with averages not reaching the same highs as observed in Indonesia and Thailand.

Analyzing happiness at the provincial level indicates that Gorontalo and North Maluku reported the highest average levels in 2017 (8.43) and 2021 (8.54), respectively (Fig. 2). In contrast, the lowest averages were recorded in East Nusa Tenggara in 2017 (7.32) and Bali in 2021 (7.26). While the national average in 2017 and 2021 remains relatively unchanged, significant differences emerge at the provincial level between the two years. Providing context, half of the 34 provinces saw an increase in their average happiness levels from 2017 to 2021, while the remaining provinces experienced a decline. Central Sulawesi notably showed the most substantial surge, with an increase of 0.347 points, while

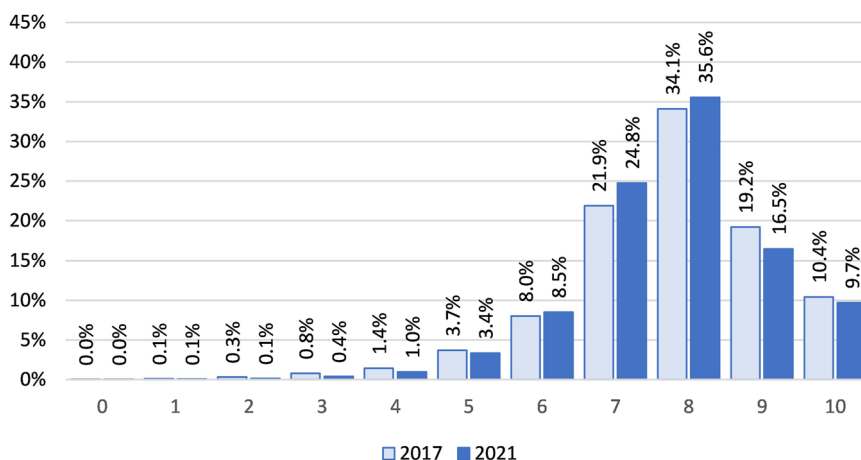


Fig. 1 Distribution of Happiness Levels, 2017 and 2021. Source: Calculated from SPTK.

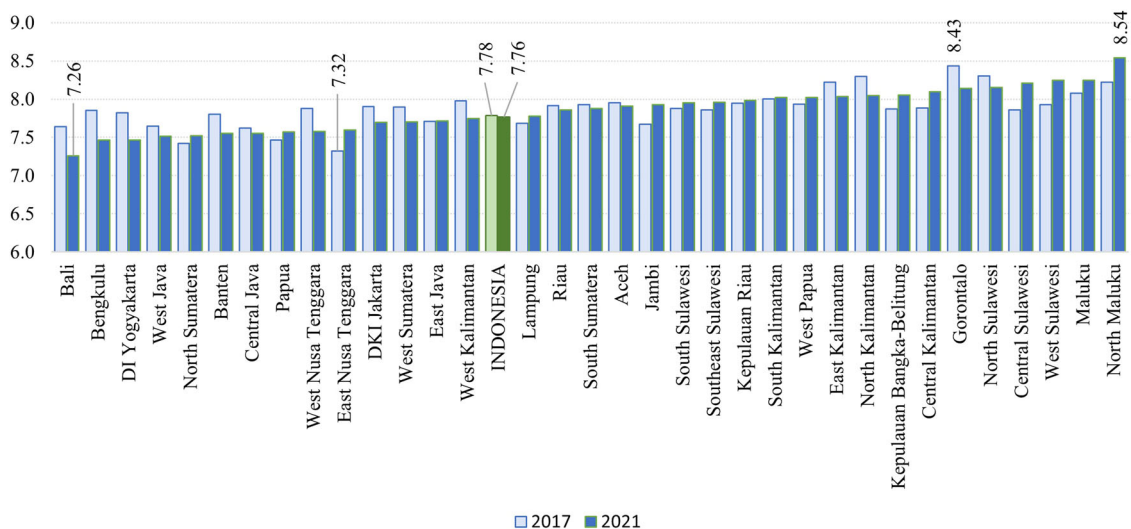


Fig. 2 Average Happiness Levels by Province, 2017 and 2021. Source: Calculated from SPTK.

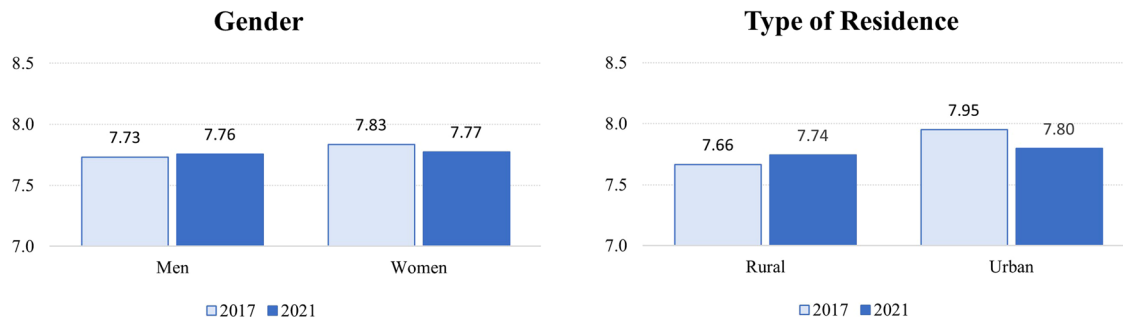


Fig. 3 Average Happiness Levels by Gender and Type of Residence, 2017 and 2021. Source: Calculated from SPTK.

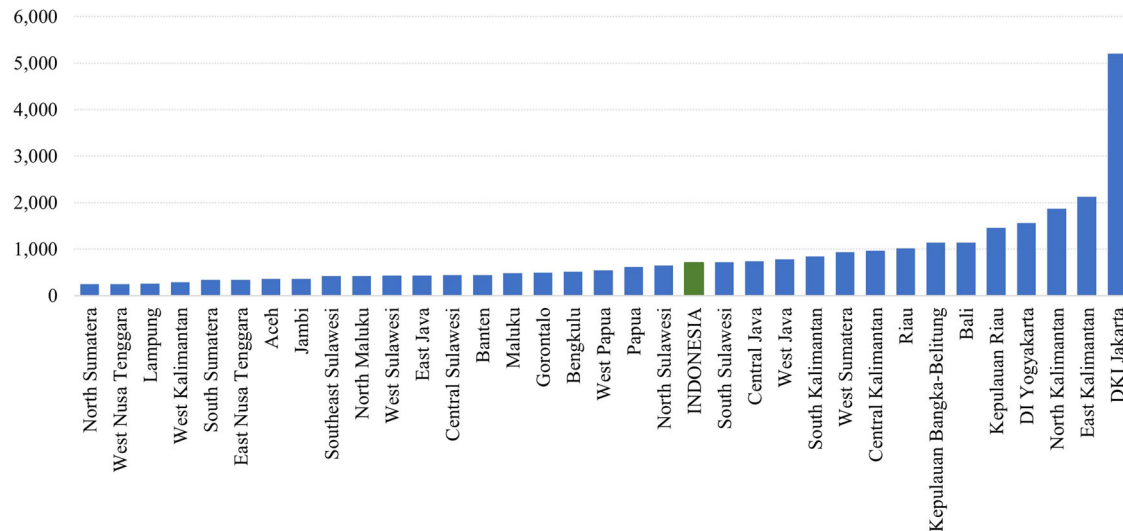


Fig. 4 Total COVID-19 Confirmed Cases per 100,000 Population by Province, 2021. Source: Calculated from KawalCOVID-19.

Bengkulu province witnessed the most significant decrease, dropping by 0.387 points. Recognizing the nested nature of individuals within provinces, the variance in average happiness levels between years at the provincial level becomes a crucial consideration.

In our examination of gender and residence type on changes in SWB during the pandemic, Fig. 3 illustrates average happiness levels categorized by gender and residence type. The left panel reveals that, on average, women reported higher happiness levels than men. However, there was a slight increase in men’s average happiness during the pandemic (+0.03 points), while women experienced a decrease (−0.06 points). In the right panel, it is evident that individuals residing in urban areas typically demonstrated higher average happiness levels than those in rural settings. Interestingly, individuals in rural areas reported higher happiness levels in 2021 compared to 2017 (+0.08 points). In contrast, those living in urban areas displayed the opposite trend, experiencing a decline in happiness levels over the same period (−0.15 points).

Given the limited number of respondents rating their happiness level between zero and five, these five responses were aggregated to achieve a more balanced distribution. Furthermore, data recoding follows the ordered logistic method, requiring each cell to include at least three percent of observations.

Total COVID-19 cases per 100,000 population. In this study, the evaluation of the severity of the COVID-19 pandemic relies on the total population with confirmed exposure to COVID-19. Although daily data has been available since March 2, 2020, the

SPTK data lacks specific interview date information. A cut-off point, set on June 30, 2021, was established to determine COVID-19 severity for all survey respondents, conveniently aligning with the day preceding the start of SPTK face-to-face interviews. We used a normalization process to enable meaningful province-to-province comparisons, specifically normalizing the data per 100,000 population.

Figure 4 illustrates the unequal distribution of confirmed COVID-19 cases among provinces. DKI Jakarta records the highest incidence of COVID-19 cases, reaching 5210 per 100,000 population. Conversely, North Sumatra reports the lowest number of cases, only 246 per 100,000 population. These findings underscore the diverse impact and transmission rates of COVID-19 observed across different provinces.

Concluding the data discussion, Table 2 displays the mean and standard deviation of all variables used in this study, categorized by year.

Estimation results

Table 3 displays happiness level estimates from a multilevel mixed-effects ordered logistic analysis covering the Main and Interaction Models. The Main Model serves as the baseline, while the Interaction Model estimates examine potential changes in gender and type of residence covariates influenced by the COVID-19 pandemic.

We begin by discussing the results of the Null Model, which incorporates no predictors (Table 3, column [1]). The Intraclass Correlation Coefficient (ICC) for the Null Model is 0.038 (second row from the bottom), indicating that approximately 3.8 percent

Table 2 Mean and standard deviation of data.

Variable	Excluded case (if binary var)	2017		2021	
		Mean	Std Dev	Mean	Std Dev
Individual and Household		(N = 67,450)		(N = 70,508)	
Level of Happiness (scale 0-10)	N/A	7.78	1.43	7.76	1.33
Level of Happiness (scale 0-5)	N/A	2.83	1.30	2.79	1.24
Women	Men	0.514	0.500	0.513	0.500
Age (years)	N/A	46.4	12.3	47.5	12.5
Marital Status: Married	Single or divorced	0.834	0.372	0.820	0.384
Education:					
- Completed Primary	Did not complete Primary	0.276	0.447	0.301	0.459
- Completed Junior Secondary		0.159	0.366	0.172	0.377
- Completed Senior Secondary		0.234	0.423	0.242	0.428
- Tertiary		0.111	0.315	0.102	0.303
Currently Working	Not working	0.774	0.418	0.742	0.437
Urban	Rural	0.419	0.493	0.429	0.495
Household income per month:					
- IDR 1.8-3.0 million	IDR 1.8-3.0 million	0.292	0.455	0.315	0.465
- IDR 3.0-4.8 million		0.190	0.393	0.206	0.404
- Income: IDR 4.8-7.2 million		0.111	0.315	0.113	0.317
- Income: IDR 7.2+ million		0.092	0.289	0.089	0.285
Province contextual		(N = 34)		(N = 34)	
Level of Poverty	N/A	0.116	0.054	0.110	0.050
Gini of Per Capita Expenditures	N/A	0.364	0.034	0.355	0.036
log (COVID-19 Cases)	N/A	0.00	-	6.34	0.58

Source: SPTK, KawalCOVID19, and BPS.
The number of COVID-19 cases in 2017 was zero, but the logarithmic values are assigned as zeros.

of the variability in an underlying response is associated with differences between provinces.⁷ Sommet and Morselli (2017) noted that many authors argue that an ICC below 5 percent, considered insignificant and negligible, leads them to treat the individual as a single unit of analysis, hence opting for a single-level analysis. Nevertheless, we persist with multilevel modeling, recognizing that the minimal ICC (except when zero) does not signify the absence of variation in respondents' happiness levels between provinces. Moreover, disregarding this variation can lead to inaccurate estimates and potentially result in inappropriate policy decisions. The ICCs for the Main and Interaction Models are modest, ranging between 0.037 and 0.041.

The Likelihood Ratio (LR) test, located in the third row from the bottom, compares the multilevel mixed-effects ordered logistic model with the standard (single-level) ordered logistic model, favoring the former. A p-value of 0.000 for the LR test signifies significant variation in self-reported happiness levels between provinces. The "Variances: Province (constant)" estimates in the fourth row from the bottom indicate the variation in self-reported happiness levels attributed to differences between provinces after accounting for fixed effects and other covariates in the model. This information clarifies how the province-level factor (in our case, poverty rates, Gini coefficient of per capita expenditures, and severity of the pandemic measure) contributes to the overall variability in the outcome. A higher estimated variance suggests a more significant variation in the outcome between provinces.

The severity of the COVID-19 pandemic. The estimation results indicate that individuals in provinces with more COVID-19 cases per 100,000 population tended to assign lower ratings to their happiness (Table 3, column [2]).⁸ Our findings align with international research. A study across China, Japan, South Korea, Italy, the United Kingdom, and the United States found that individuals in areas with elevated COVID-19 rates are more likely to report lower happiness levels (Nguyen 2021). Similarly, a

German study using panel data during the initial COVID-19 wave observed a decline in life satisfaction in regions with higher infection rates (Bittmann 2022a).

Concerns about the robustness of conclusions drawn from estimations using the entire dataset when examining specific characteristics are typical. Table 4 provides Main Model estimates disaggregated by gender (assessing whether estimation results differ for male or female respondents), type of residence (rural versus urban), and major regions in Indonesia (Sumatera, Java-Bali, and Other regions). Table 5 facilitates a comparison of the three primary correlates: gender (women), residence type (urban), and the severity of the COVID-19 pandemic.

These findings indicate that the detrimental impact of the pandemic's severity on happiness levels is observable for both men and women, as well as for residents in rural areas and the Java-Bali and Other regions of Indonesia. However, the absence of statistical significance for urban residents may be attributed to the predominant concentration of the COVID-19 pandemic in urban areas of Indonesia. Similarly, the lack of statistical significance for the Sumatera region is associated with the lower pandemic severity observed in that region. Despite variations across different samples, these consistent findings underscore the negative association between the severity of the COVID-19 pandemic and individuals' happiness levels.

Gender. In Indonesia, on average, women reported higher happiness levels than men (Table 3, column [2]). Upon analyzing a disaggregated sample by residence type, the results indicate that women exhibit higher happiness levels than men in both rural and urban areas (Table 4, columns [8] and [9]). Moreover, women consistently report higher happiness levels than men across all three regions (Sumatera, Java, and others) (Table 4, columns [10], [11], and [12]).

A noteworthy observation is the degree to which women in the Java-Bali region experience a smaller happiness advantage over men compared to their counterparts in Sumatera and other

Table 3 Multilevel mixed-effects ordered logistic estimates for level of happiness.

	Null model	Main model	Interaction model		
	[1]	[2]	[3]	[4]	[5]
Individual and household					
Women		0.160*** (0.011)	0.235*** (0.015)	0.160*** (0.011)	0.226*** (0.015)
Age		-0.041*** (0.003)	-0.041*** (0.003)	-0.041*** (0.003)	-0.041*** (0.003)
Age ² (*1/100)		0.040*** (0.003)	0.040*** (0.003)	0.040*** (0.003)	0.040*** (0.003)
Married		0.442*** (0.014)	0.441*** (0.014)	0.444*** (0.014)	0.443*** (0.014)
Education:					
- Completed Primary		0.119*** (0.015)	0.120*** (0.015)	0.118*** (0.015)	0.118*** (0.015)
- Completed Junior Secondary		0.180*** (0.017)	0.181*** (0.017)	0.179*** (0.017)	0.180*** (0.017)
- Completed Senior Secondary		0.257*** (0.017)	0.258*** (0.017)	0.256*** (0.017)	0.257*** (0.017)
- Tertiary		0.480*** (0.021)	0.482*** (0.021)	0.481*** (0.021)	0.483*** (0.021)
Currently working		-0.051*** (0.013)	-0.053*** (0.013)	-0.053*** (0.013)	-0.055*** (0.013)
Urban		0.094*** (0.011)	0.094*** (0.011)	0.227*** (0.015)	0.223*** (0.015)
Household income per month:					
- IDR 1.8-3.0 million		0.319*** (0.013)	0.320*** (0.013)	0.316*** (0.013)	0.316*** (0.013)
- IDR 3.0-4.8 million		0.576*** (0.015)	0.576*** (0.015)	0.572*** (0.015)	0.572*** (0.015)
- IDR 4.8-7.2 million		0.849*** (0.019)	0.849*** (0.019)	0.844*** (0.019)	0.844*** (0.019)
- IDR 7.2+ million		1.005*** (0.021)	1.005*** (0.021)	0.999*** (0.021)	0.999*** (0.021)
Interaction terms					
Women * log(Total COVID-19 Cases)			-0.023*** (0.003)		-0.020*** (0.003)
Urban * log(Total COVID-19 Cases)				-0.040*** (0.003)	-0.039*** (0.003)
Province contextual					
Level of poverty		-1.229 (0.932)	-1.194 (0.931)	0.053 (0.854)	0.037 (0.855)
Gini of per capita expenditures		-4.401*** (0.683)	-4.439*** (0.683)	-3.215*** (0.676)	-3.293*** (0.676)
log(Total COVID-19 cases)		-0.023*** (0.002)	-0.011*** (0.003)	-0.002 (0.003)	0.008*** (0.003)
κ1	-2.995 (0.063)	-4.816 (0.287)	-4.784 (0.286)	-4.190 (0.277)	-4.186 (0.277)
κ2	-1.996 (0.062)	-3.793 (0.286)	-3.761 (0.286)	-3.167 (0.277)	-3.162 (0.277)
κ3	-0.676 (0.062)	-2.410 (0.286)	-2.378 (0.286)	-1.783 (0.277)	-1.778 (0.277)
κ4	0.831 (0.062)	-0.819 (0.286)	-0.787 (0.286)	-0.191 (0.277)	-0.186 (0.277)
κ5	2.094 (0.063)	0.479 (0.286)	0.512 (0.286)	1.108 (0.277)	1.114 (0.277)
Variances: Province (constant)		0.130 (0.032)	0.142 (0.037)	0.125 (0.031)	0.125 (0.031)
LR test (p-score)	0.000	0.000	0.000	0.000	0.000
Intraclass correlation (ICC)	0.038	0.041	0.041	0.037	0.037
Observations	137,958	137,958	137,958	137,958	137,958

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

regions. One potential explanation is the Java-Bali region’s reputation for embracing a more egalitarian gender culture than other parts of Indonesia, suggesting that gender-based disparities in happiness might be comparatively smaller in the Java-Bali region than in other regions (Hayati et al. 2014; Utomo 2012). Moreover, the Java-Bali region’s higher level of development compared to other parts of Indonesia contributes to enhanced gender equality across various facets, including well-being and happiness.

The Interaction Model estimates reveal that in 2021, the severity of the pandemic led to a decline in women’s happiness relative to men’s (Table 3, columns [3] and [5]). These results indicate that the pandemic’s effect diminishes the relative advantage of being female in terms of happiness levels. Our findings align with several studies (Blanchflower and Bryson 2022; Nguyen 2021), all reporting a decrease in women’s life satisfaction and happiness compared to men during the pandemic.

Type of residence. Individuals residing in urban areas generally experience higher levels of happiness than their rural counterparts (Table 3, column [2]). Easterlin et al. (2011) provided a comprehensive explanation for such findings, highlighting that the availability of material goods like food, clothing, and shelter in urban areas contributes to higher happiness. However, they also

caution that urban life comes with challenges, including traffic congestion, pollution, and feelings of alienation, which can negatively impact happiness.

The difference in happiness levels between urban and rural residents remains consistent across diverse demographics (Table 4, columns [6], [7], [10], [11], and [12]). Particularly noteworthy is the narrower happiness gap between urban and rural residents in the Java-Bali region (Table 4, column [11]), indicating that rural areas in Java-Bali may benefit from enhanced public services and infrastructure compared to other regions. This improved availability of resources in rural Java-Bali contributes to a more equitable distribution of opportunities and resources between urban and rural residents.

Nevertheless, as per the Interaction Model, the pandemic’s severity has weakened the traditional happiness advantage of individuals in urban areas compared to their rural counterparts (Table 2, columns [4] and [5]). Our observation finds backing in urban Pakistan, where Shams and Kadow (2020) documented a decrease in socio-economic satisfaction amid the pandemic, particularly noticeable among unemployed individuals, married couples, men, and older demographics.

Contextual characteristics. The association between poverty levels and happiness lacked statistical significance, suggesting that the poverty rates in a respondent’s province do not influence their

Table 4 Multilevel mixed-effects ordered logistic estimates for level of happiness by groups of respondents.

	Men [6]	Women [7]	Rural [8]	Urban [9]	Sumatera [10]	Java-Bali [11]	Other [12]
Individual and household							
Women	-	-	0.162*** (0.015)	0.157*** (0.017)	0.172*** (0.021)	0.087*** (0.019)	0.216*** (0.018)
Age	-0.038*** (0.004)	-0.045*** (0.004)	-0.040*** (0.004)	-0.044*** (0.004)	-0.048*** (0.005)	-0.052*** (0.005)	-0.027*** (0.005)
Age*2 (*1/100)	0.037*** (0.004)	0.042*** (0.004)	0.038*** (0.004)	0.044*** (0.005)	0.047*** (0.005)	0.049*** (0.005)	0.027*** (0.005)
Married	0.557*** (0.024)	0.358*** (0.019)	0.481*** (0.019)	0.399*** (0.021)	0.529*** (0.027)	0.369*** (0.024)	0.445*** (0.023)
Education:							
- Completed Primary	0.048** (0.021)	0.187*** (0.021)	0.103*** (0.018)	0.134*** (0.028)	0.091*** (0.029)	0.134*** (0.026)	0.131*** (0.024)
- Completed Junior Secondary	0.083*** (0.025)	0.274*** (0.024)	0.135*** (0.022)	0.243*** (0.030)	0.116*** (0.032)	0.221*** (0.031)	0.192*** (0.028)
- Completed Senior Secondary	0.233*** (0.024)	0.284*** (0.024)	0.223*** (0.022)	0.306*** (0.028)	0.158*** (0.031)	0.309*** (0.031)	0.285*** (0.027)
- Tertiary	0.467*** (0.030)	0.507*** (0.030)	0.462*** (0.030)	0.517*** (0.032)	0.380*** (0.040)	0.599*** (0.038)	0.453*** (0.033)
Currently working	0.119*** (0.030)	-0.096*** (0.014)	-0.040** (0.018)	-0.062*** (0.019)	-0.104*** (0.024)	-0.046** (0.022)	-0.008 (0.022)
Urban	0.084*** (0.016)	0.107*** (0.015)	-	-	0.109*** (0.020)	0.046** (0.018)	0.132*** (0.019)
Household income per month:							
- IDR 1.8-3.0 million	0.346*** (0.019)	0.294*** (0.018)	0.318*** (0.016)	0.298*** (0.023)	0.330*** (0.024)	0.355*** (0.022)	0.284*** (0.022)
- IDR 3.0-4.8 million	0.601*** (0.021)	0.553*** (0.021)	0.576*** (0.019)	0.560*** (0.024)	0.653*** (0.028)	0.612*** (0.026)	0.485*** (0.025)
- IDR 4.8-7.2 million	0.847*** (0.026)	0.855*** (0.026)	0.832*** (0.026)	0.858*** (0.028)	0.951*** (0.036)	0.981*** (0.032)	0.660*** (0.030)
- IDR 7.2+ million	1.028*** (0.029)	0.989*** (0.029)	0.911*** (0.031)	1.060*** (0.030)	1.079*** (0.040)	1.227*** (0.036)	0.769*** (0.032)
Province contextual							
Level of poverty	-0.330 (0.997)	-0.499 (1.028)	-0.702 (1.035)	1.342 (0.986)	-0.293 (1.718)	-13.820*** (2.743)	0.524 (1.111)
Gini of per capita expenditures	-6.042*** (0.932)	-2.443*** (0.881)	-4.169*** (0.888)	-2.058*** (0.932)	7.174*** (1.928)	-6.404*** (1.321)	-4.949*** (1.138)
log(Total COVID-19 cases)	-0.011*** (0.003)	-0.031*** (0.003)	-0.004 (0.003)	-0.042*** (0.003)	-0.005 (0.005)	-0.043*** (0.003)	-0.010*** (0.004)
K1	-4.972 (0.371)	-4.345 (0.348)	-4.584 (0.354)	-3.948 (0.365)	-0.833 (0.673)	-6.965 (0.716)	-4.446 (0.430)
K2	-3.925 (0.371)	-3.343 (0.348)	-3.539 (0.354)	-2.959 (0.365)	0.203 (0.673)	-5.876 (0.715)	-3.503 (0.429)
K3	-2.519 (0.371)	-1.980 (0.348)	-2.174 (0.354)	-1.537 (0.365)	1.580 (0.673)	-4.412 (0.715)	-2.199 (0.429)
K4	-0.920 (0.371)	-0.392 (0.348)	-0.622 (0.354)	0.114 (0.365)	3.179 (0.673)	-2.730 (0.715)	-0.685 (0.429)
K5	0.381 (0.371)	0.907 (0.348)	0.620 (0.354)	1.487 (0.365)	4.495 (0.673)	-1.313 (0.715)	0.537 (0.429)
Variances: Province (constant)	0.133 (0.035)	0.139 (0.036)	0.142 (0.037)	0.133 (0.034)	0.054 (0.028)	0.443 (0.270)	0.105 (0.039)
LR test (p-score)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Intraclass Correlation (ICC)	0.039	0.040	0.041	0.039	0.016	0.119	0.031
Observations	67,096	70,862	79,469	58,489	39,793	47,304	50,861

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

Table 5 Selected estimates for groups of respondents.

	Specifi-cation	Obser-vations	Covariates		
			Women	Urban	COVID-19
All observations	[2]	137,958	0.160*** (0.011)	0.094*** (0.011)	-0.023*** (0.002)
Gender:					
- Men	[6]	67,096	-	0.084*** (0.016)	-0.011*** (0.003)
- Women	[7]	70,862	-	0.107*** (0.015)	-0.031*** (0.003)
Type of residence:					
- Rural	[8]	79,469	0.162*** (0.015)	-	-0.004 (0.003)
- Urban	[9]	58,489	0.157*** (0.017)	-	-0.042*** (0.003)
Region:					
- Sumatera	[10]	39,793	0.172*** (0.021)	0.109*** (0.020)	-0.005 (0.005)
- Java-Bali	[11]	47,304	0.087*** (0.019)	0.046** (0.018)	-0.043*** (0.003)
- Other regions	[12]	50,861	0.216*** (0.018)	0.132*** (0.019)	-0.010*** (0.004)

Standard errors in parentheses.*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

happiness. One possible explanation is the substantial variation in poverty rates among districts within a province. For example, in 2021, East Java Province exhibited a poverty rate of 11.4 percent, yet the rates across its 38 *kabupaten/kota* ranged from 4.1 to 23.8 percent (Badan Pusat Statistik 2021b). Nevertheless, a deviation from the typical trend is evident in the Java-Bali region, exposing a negative correlation between higher poverty levels and happiness among respondents (Table 4, column [11]). This finding aligns with the higher poverty population in the Java-Bali region compared other regions in Indonesia (Badan Pusat Statistik 2021b).

Muthia and Isbah's (2022) study sheds light on the lack of a correlation between poverty and happiness, particularly within the impoverished community of DI Yogyakarta Province, Indonesia. The authors argue that impoverished individuals may not find happiness in their economic situation but discover contentment. This occurrence is ascribed to the prevailing belief system and local culture, heavily influenced by the *nerimo* attitude, emphasizing the acceptance of one's circumstances. By adopting this mindset, impoverished individuals improve their psychological well-being, regardless of their difficulties.

Regarding inequality, the estimation results reveal an inverse connection between per capita expenditure inequality at the provincial level and self-reported happiness levels. In another study, Furwanti et al. (2021) utilized cross-sectional data from all Indonesian provinces and a path analysis model, revealing that income inequality significantly and negatively influences happiness in Indonesia.

The findings of this study align with several international reviews exploring the relationship between inequality and happiness. For instance, a review by Ferrer-i-Carbonell and Ramos (2014) demonstrates a negative correlation between income inequality and happiness in Western countries. However, the connection in non-Western countries is diverse and less conclusive. In addition, Schroder (2018) discovered that individuals perceive their SWB as lower when inequality within their own country increases over time, but not when it is higher compared to another country.

Individual characteristics. Following is a concise discussion of individual characteristics that fall outside the scope of the four research questions outlined in this study.

Our model incorporates respondents' age in quadratic terms, revealing a U-shaped pattern in happiness assessment (Easterlin 2004; Blanchflower 2021; Bittmann 2022b; Toshkov 2022). Generally, happiness levels decline with age until reaching a

certain point, after which they begin to rise. In the Main Model, this turning point is identified at 49. The U-shaped pattern corresponds to the "midlife dip" phenomenon, wherein individuals often undergo a decline in happiness during midlife before it subsequently increases later in life, as discussed by Blanchflower and Graham (2020). Factors such as heightened responsibilities, financial pressures, and changes in personal and professional circumstances can influence this midlife dip.

Individuals in a marital union tend to experience higher happiness levels than unmarried or divorced individuals. This observation is supported by Frey's (2018) comprehensive review, affirming that married individuals generally express higher happiness levels than those living alone or in unmarried partnerships. The author highlights the role of marriage or a stable partnership in mitigating loneliness, thereby assisting in alleviating stress related to work life. Various studies (Addai et al. 2014; Tambyah et al. 2023; Wu and Zhu 2016) have also identified the positive influence of being in a marital relationship.

A positive correlation is evident between education and happiness. This finding indicates that higher educational attainment aligns with higher self-reported happiness levels. As noted by Frey (2018), individuals with advanced education tend to enhance their abilities and gain increased access to opportunities, resulting in heightened life satisfaction. The association between education and happiness has been thoroughly examined, including within Indonesia (Landiyanto et al. 2011; Sujarwoto and Tampubolon 2015; Rahayu 2016). These investigations consistently affirm a positive association between education and happiness within the Indonesian context.

In general, employed respondents report lower happiness levels, although differences exist between men and women. Among male respondents, those actively engaged in work display higher happiness levels than those who are not. This positive correlation between working and happiness among men corresponds with findings from various international studies (Clark and Oswald 1994; Di Tella et al. 2001; Winkelmann and Winkelmann 1998). Conversely, employed individuals report lower happiness within the female sample than those unemployed. To the extent that the SPTK dataset defines those not employed as spending most of their time taking care of the household, the negative association between employment and happiness among women can be interpreted as women who are employed facing a double burden of responsibilities at work and home (Chen et al. 2018).

Individuals reporting higher household earnings exhibit higher happiness levels. However, the ongoing debate on whether

income contributes to increased happiness encompasses diverse viewpoints. Some studies advocate for a positive correlation between income and self-reported happiness and, therefore, in line with our findings (Diener and Biswas-Diener 2002; Frey and Stutzer 2002; Lim et al. 2020; Yiengprugsawan et al. 2011; Yu et al. 2019). Conversely, other studies propose that the impact of income on happiness becomes negligible once a certain income threshold is reached (Kahneman and Deaton 2010; Muresan et al. 2020).

Discussions

Our analysis reveals a significant decline in self-reported happiness among Indonesians due to the severity of the COVID-19 pandemic, addressing RQ1. The pandemic severity measure has eroded the longstanding happiness advantage for women and urban residents, addressing RQ2 and RQ3. A concerning negative correlation between income inequality and happiness is evident, addressing RQ4. These findings emphasize the urgent need for targeted interventions to mitigate these effects on the Indonesian populace's well-being.

COVID-19 severity reduces happiness. The decrease in self-reported happiness among Indonesians amid the severity of the COVID-19 pandemic arises from various factors. First, increased vulnerability to COVID-19 elevates health apprehensions and anxiety, giving rise to concerns about the risk of infection for both oneself and loved ones. Consequently, this anxiety diminishes overall well-being (Cleofas and Oducado 2022; Demirbas and Kutlu 2021; van der Vegt and Kleinberg 2020). Second, provinces with higher COVID-19 cases face significant economic disruptions, including business closures, job losses, and reduced economic activity, resulting in financial stress, insecurity, and an overall happiness decline (Cheng et al. 2020; Greyling et al. 2021; Kuhn et al. 2020). Third, residents in heavily affected provinces may encounter challenges such as limited social support networks, reduced opportunities for social engagement, and feelings of loneliness or disconnection, significantly impacting their happiness levels (Lepinteur et al. 2022; Nguyen 2021). Lastly, the increased prevalence of anxiety, depression, or emotional distress among individuals in provinces with higher COVID-19 exposure further contributes to lower self-reported happiness levels (Iskandaryah et al. 2022).

This study underscores the assessment of the COVID-19 pandemic's impact on individuals' happiness, specifically through a severity measure focusing on the number of affected individuals per 100,000 population. This choice differs from using time dummy variables, assigning 1 for 2021 survey data (during the pandemic) and 0 for 2017 survey data (pre-pandemic). The severity measure directly reflects the impact of the COVID-19 pandemic on the population, offering a tangible and quantifiable indicator of its scale within a region. This approach is especially appropriate given the considerable variation in pandemic severity across provinces in Indonesia. Nevertheless, we recognize that relying solely on the severity measure may oversimplify the complex dynamics of the pandemic's impact. Furthermore, Bittmann, (2022a) explores the functional relationship between the severity measure and self-reported happiness, considering alternatives such as linearity (as employed in this paper), quadratic, and others. This exploration opens up possibilities for future studies.

COVID-19 severity moderates gender-residence type association with happiness. The negative and statistically significant interaction terms between COVID-19 severity and gender (being female) indicate that the pandemic's severity affects the

relationship between gender and self-reported happiness. In periods of intensified pandemic severity, the conventional gender gap in happiness, where women usually report higher levels, is disturbed. The negative moderation implies that the pandemic has a more detrimental impact on women's happiness levels than men.

Research conducted by Alon et al. (2020), Blanchflower and Bryson (2022), and Hansen et al. (2022) underscore that the decline in happiness levels among women can be attributed to heightened caregiving responsibilities, especially as primary caregivers for children. Transitioning to remote learning for children has introduced additional challenges and demands for women. Additionally, as frontline workers, women face elevated stress levels in their roles and are vulnerable to potential job layoffs and disruptions in their participation in the labor market. Conversely, a study by Choi et al. (2021) concluded that even before the onset of COVID-19, Korean women demonstrated lower levels of SWB compared to men. Therefore, the well-being disparities observed among Korean women are more likely rooted in pre-pandemic variations rather than directly caused by the effects of the pandemic.

Similarly, the adverse and statistically significant interaction terms between COVID-19 severity and residence type (urban) indicate that the severity of the pandemic influences the connection between living in urban areas and self-reported happiness. During periods of heightened pandemic severity, the typical gap in happiness based on residence type, where individuals in urban areas usually report higher levels, ceased to hold. This adverse moderation implies that the pandemic has a more harmful effect on the happiness levels of individuals in urban residences than those in rural areas.

Mayuzumi's (2022) research provides valuable insights into the effects of the COVID-19 pandemic on the happiness of urban and rural communities in Bali, Indonesia. The results indicate that individuals in subsistence farming villages, heavily dependent on agriculture, witnessed minimal changes in their livelihoods, suggesting little impact from the pandemic. In contrast, urban residents, primarily reliant on tourism, experienced significant job losses and food accessibility challenges due to government curfews and economic stagnation. On the contrary, Nguyen (2021) introduces an alternative perspective by proposing that the pandemic has a more noticeable impact on the unhappiness levels of individuals residing in rural areas than those living in urban settings.

Inequality is a catalyst for diminishing happiness. Examining contextual characteristics unveils that, excluding the Java-Bali region, provincial poverty levels have negligible effects on happiness levels. Nonetheless, there is a discernible negative correlation between inequality in per capita expenditure and happiness.

An important observation from the analysis using region-specific breakdowns is the unexpected positive association between the Gini coefficient and happiness in the Sumatera region. The uniqueness of this result in Sumatera may be ascribed to distinct factors inherent to the region, such as particular social structures, values, or expectations. These regional peculiarities in Sumatera could influence individuals' perspectives on happiness differently than in other locales. A more thorough investigation into the specific factors contributing to these anomalies across regions is necessary to grasp the patterns observed fully.

Study limitations. The research employed a single-question methodology using a 0–10 point Likert scale to assess individual happiness. Although this approach offers a valuable metric, we

acknowledged that happiness is a complex concept with multiple dimensions that a single question may need to be more comprehensive. Consequently, the study recognizes the importance of incorporating additional aspects and nuances to understand better individuals' well-being, including factors like self-evaluated life satisfaction, positive affect, and negative affect.

Moreover, it is essential to consider two significant data constraints when interpreting the findings. First, the SPTK datasets utilized in the study lack precise location information, restricting the analysis to the provincial level and hindering a more detailed examination of the impact of COVID-19 on specific regions or communities within a province. For instance, while information on the poverty rate is accessible at the district level, the unavailability of district codes necessitates using provincial poverty rates.

Second, the datasets do not incorporate information about the interview dates for respondents, which would have facilitated a more precise correlation with the daily severity rate of COVID-19 at the provincial level. Access to interview date information could have offered valuable insights into the temporal relationship between individuals' experiences and the evolving severity of the pandemic in their respective provinces.

Conclusion

The global repercussions of COVID-19 on individuals' lives and well-being are profound. In Indonesia, there is a pressing need for more research on the correlation between happiness and pandemic severity across the population. This study addresses this gap by examining the factors influencing happiness levels before and during the pandemic, specifically focusing on gender and residence type. By posing and answering four research questions (RQs), the study provides valuable insights into the intricate dynamics of happiness during the pandemic in Indonesia.

This study employed data from the 2017 and 2021 Happiness Level Measurement Survey (SPTK) to represent pre-pandemic and during-pandemic conditions, respectively. The data analysis involved using a multilevel mixed-effects ordered logistic model, with individuals nested within provinces as the analytical framework. The severity of the pandemic was proxied using the incidence of positive COVID-19 cases per 100,000 residents.

Our analysis underscores a statistically significant decline in self-reported happiness levels among Indonesians attributable to the severity of the COVID-19 pandemic, directly addressing RQ1. Notably, this severity measure has diminished the longstanding happiness advantage previously experienced by women and urban residents, aligning with the inquiries of RQ2 and RQ3. Additionally, our study highlights a negative correlation between income inequality and happiness, illuminating the intricate interplay of socioeconomic dynamics influencing individual well-being as per RQ4. The robust support for our research questions highlights the multifaceted impact of the pandemic on happiness levels in Indonesia.

Immediate policy interventions are required to tackle these findings, encompassing targeted mental health support to aid individuals in overcoming the challenges of lockdown restrictions and the loss of loved ones; economic assistance to support families facing sudden job loss and economic downturn; reinforced public health initiatives to curb the spread of the virus and mitigate the health impact of the pandemic; educational campaigns to inform the public about necessary health protocols; and community-based social support programs to lighten the overall burden faced by communities in dealing with the pandemic. These measures aim to alleviate the negative impact of the pandemic and socioeconomic disparities on the happiness and overall welfare of the Indonesian population.

In light of the adverse effects of COVID-19 on the happiness of women and urban residents, it is important to implement proactive government programs and policies. To address women's heightened responsibilities, especially in home-based teaching, effective communication, and support between teachers and students, such as regular home visits, are essential. Providing physical visits and care for vulnerable populations, including the elderly, chronically ill, and disabled individuals, can help alleviate some of the burdens on women. Additionally, supporting urban residents involves reinforcing community associations, particularly within neighborhood and religious networks, through collaborative efforts between the Central Government and local administrations.

The future research agenda aims to enhance the comprehensiveness of this study by incorporating field visits that include in-depth interviews and focus group discussions. Validating the findings, gaining deeper insights into individual experiences amidst the challenges posed by COVID-19, and investigating the impact of government assistance are deemed crucial. Complementing the measurement of SWB by incorporating self-evaluated life satisfaction, positive affect, and negative affect will improve our knowledge of the well-being of Indonesians. Furthermore, expanding the study by incorporating subsequent SPTK data will allow for assessing happiness before, during, and after the pandemic.

Data availability

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 datasets are available for purchase through the BPS (<https://www.bps.go.id/>).

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Notes

- 1 The BPS defines an urban area by its primary non-agricultural activities, a functional layout that accommodates urban settlements, and the concentration and distribution of government services, social services, and economic activities. In contrast, rural areas primarily involve agricultural activities, including managing natural resources, and have a functional arrangement that supports rural settlements, government services, social services, and economic activities. In 2022, the urban areas of Indonesia were home to 56.4 percent of the population, while 43.6 percent lived in rural areas.
- 2 The WHR, an annual report comparing happiness levels across countries, relies on three well-being indicators: life evaluation, positive affect, and negative affect (Helliwell et al. 2020). The Happiness Index, developed by the Central Statistics Agency of Indonesia (Badan Pusat Statistik; BPS), incorporates nineteen indicators that assess dimensions such as life satisfaction, affection, and the meaning of life (*eudaimonia*) (Badan Pusat Statistik 2021a). It is important to acknowledge that these two measures evaluate distinct aspects. Hence, direct comparison between them is inappropriate, given their representation of separate entities.
- 3 These interaction terms capture the moderating effect of the severity of the COVID-19 pandemic on the relationships of interest.
- 4 The SPTK is cross-sectional and was conducted in 2012, 2013, 2014, 2017, and 2021. The SPTK has undergone conceptual and methodological improvements (Badan Pusat Statistik 2021a). For comparability purposes, we will use the last two batches. We need to emphasize that the 2021 SPTK does not aim to study the pandemic's effect on the happiness level.
- 5 Amid the COVID-19 pandemic, the 2021 SPTK data collection encountered many hurdles (Badan Pusat Statistik 2021a). Originally scheduled for July 1–31, 2021, the fieldwork encountered setbacks due to local lockdowns and the emergence of the Delta variant. Consequently, the 2021 SPTK initiatives necessitated a two-phase extension, extending field activities to two months. Field enumerators grappled with significant challenges, especially in conducting face-to-face surveys amidst stringent health

- protocols. Setbacks were further compounded as certain respondents refrained from participation due to concerns about infection and the extent to which the virus infected some enumerators. Additionally, due to lockdown restrictions, some survey locations had to be substituted following a month-long delay.
- 6 This study includes 67,450 participants from the SPTK 2017 dataset and 70,508 from the SPTK 2021 dataset.
- 7 The ICC (Intra-Class Correlation) scale spans from 0 to 1. An ICC value of 0 signifies complete independence of residuals, indicating that the assessment of happiness by individuals does not differ across provinces. Conversely, an ICC value of 1 indicates perfect interdependence of residuals, suggesting that variations in individual happiness levels occur exclusively between provinces.
- 8 We also conducted a comparable analysis using the overall count of COVID-19-related deaths to indicate the pandemic's severity. The results reflected similar patterns: Individuals residing in provinces with higher COVID-19 death tolls generally reported lower levels of happiness. Nevertheless, we opted to omit these findings from our report due to the intricacies associated with attributing a death specifically to COVID-19. Determining the precise cause of death poses challenges, as some individuals might have succumbed to the disease while others had concurrent comorbidities. Consequently, this indicator may be susceptible to inaccuracies, making it a relatively less reliable measure (Bittmann 2022a).

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Competing interests

The author declares no competing interests.

Ethical approval

Ethical approval was not required as the study did not involve human participants performed by the author.

Informed consent

Informed consent was not required as the study did not involve human participants performed by the author.

Additional information

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