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Coronavirus Disease 2019-Public Stigma Scale (COVID-PSS): Development, Validation, Psychometric Analysis, and Interpretation

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Running Title: Coronavirus Disease 2019-Public Stigma Scale

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Abstract

Objective: Amid the coronavirus disease-2019 (COVID-19) pandemic, social stigma towards COVID-19 infection has become a major component of public discourse and social phenomena. As such, we aimed to develop and validate the COVID-19-Public Stigma Scale (COVID-PSS).

Design and setting: National-based survey cross-sectional study during the lockdown in Thailand.

Participants: We invited the 4004 adult public to complete a set of measurement tools, including the COVID-PSS, global fear of COVID-19, perceived risk of COVID-19 infection, Bogardus social distance scale, pain intensity, and insomnia severity index.

Methods: Factor structure dimensionality was constructed and reaffirmed with model fit by exploratory and confirmatory factor analyses and non-parametric item responses theory (IRT) analysis. Psychometric properties for validity and reliability were tested. An anchor-based approach was performed for classifying the proper cut-off scores.

Results: After factor analysis, IRT analysis, and test for model fit, we created the final 10-item COVID-PSS with a three-factor structure: stereotype, prejudice, and fear. Face and content validity were established through the public's and experts' perspectives. The COVID-PSS was significantly correlated (Spearman rank [95% confidence intervals) with the global fear of COVID-19 (0.68 [0.66 to 0.70]), perceived risk of COVID-19 infection (0.79 [0.77 to 0.80]), and the Bogardus social distance scale (0.50 [0.48 to 0.53]), indicating good convergent validity. The correlation statistics between the COVID-PSS and the pain intensity and insomnia severity index were <0.2, supporting the discriminant validity. The reliability of the COVID-PSS was satisfactory, with good internal consistency (Cronbach's α of 0.85 [0.84 to 0.86]) and test-retest reproducibility (intraclass correlation of 0.94 [0.86 to 0.96]). The

proposed cut-off scores were as follows: no/minimal (≤18), moderate (19-25), and high (≥26) public stigma towards COVID-19 infection.

Conclusions: The COVID-PSS is practical and suitable for measuring stigma towards COVID-19 in a public health survey. However, cross-cultural adaptation may be needed.

Keywords: Coronavirus, COVID-19, instrument, psychometric properties, public stigma.

Strengths and limitations of this study

- The COVID-PSS for evaluating and tracking the social stigma towards COVID-19 infection in the public is a new practical scale and has illustrated satisfactory psychometric properties.
- Regarding practicability and feasibility, this scale is easy to use by the general population as it can be completed in five to ten minutes.
- This scale can be used to screen and help target populations and may be incorporated in the public health surveys for clinical and intervention research.
- However, cross-cultural adaptation and longitudinal studies are needed to evaluate and track the public stigma towards COVID-19 with respect to long-term effects.

INTRODUCTION

Since the wide spread of the coronavirus disease-2019 (COVID-19) worldwide, scholars have reported its social impacts and psychological consequences.[1 2] With the COVID-19 outbreak, social stigma, xenophobia, and discrimination have become major components of the public discourse and social phenomena, as the so-called COVID-19 effects.[3 4] Social reactions, including negative emotion, feeling of fear, perception of danger, social sanctions, and antagonism, towards specific high-risk groups have been noted at both national and international levels.[5 6] However, reports addressing the psychological impact of and responses to COVID-19 in terms of public stigma have been limited.

Amid the COVID-19 pandemic, there is a need for a validated instrument for measuring public stigma towards COVID-19 infection that encompasses these unique reactions. The development and use of a standardised scale will provide a better understanding of the stigmas toward COVID-19 and track the public responses to the COVID-19 pandemic. Thus, we aimed to develop and validate the COVID-19-Public Stigma Scale (COVID-PSS), a simple and practicable measurement tool that can be incorporated into research and public health surveys. To maximise the appropriate interventions and minimise stigma, we aimed to establish the validity, reliability, and interpretation of the COVID-PSS by classifying severity cut-off scores corresponding to the psychosocial impact of the COVID-19 pandemic on the daily lives of people; the scores reflected the participants' values and perspectives.

METHODS

Study design and participants

For the national-based public survey—the Health Outcomes and Mental Health Care Evaluation Survey: Under the Pandemic Situation of COVID-19 (HOME-COVID-19)[7], adult

respondents were invited to complete a set of measurement tools for mental and psychosocial problems, including public stigma towards COVID-19 infection during the lockdown in Thailand. Details of the survey protocol are described elsewhere. In brief, an online questionnaire survey via the SurveyMonkey® (https://www.surveymonkey.com) that limits one-time participation per unique internet protocol address was adopted to minimise face-to-face interaction, per the physical distancing strategy. Participants were eligible for this study if they were Thai who were older than 18 years on the date of the survey, could read and communicate in the Thai language, and gave their online informed consent, which was embedded on the first page of the questionnaire. Ethics approval was obtained from the Committee of Research Ethics of the Faculty of Public Health (ET010/2020) and Faculty of Pharmacy (23/2563), Chiang Mai University.

Procedures

Figure 1 presents the series of phases and methods used in the study. Details of the methodology used for this study are described in online supplement (eMethods). Briefly, phase I involved item generation. We conducted a comprehensive literature review of relevant sources on public stigma to COVID-19, including the various paradigms of perceived public stigma towards persons with mental illness[8-12], infectious diseases (HIV, Ebola virus, leprosy, severe acute respiratory syndrome)[13-17], indigenous identity (minority groups)[18], disability (intellectual disabilities)[19], and addictive behaviours (gambling, alcohol use disorder).[20 21] With a sample of the 30 general population, we used a combination of structured and non-structured in-depth interviews to explore the perceived public stigma to COVID-19 infection. The candidate items were selected based on cultural norms and relevance to the COVID-19 pandemic, focusing on the public's experience. The initial item bank was identified to yield the 42-item predefined questionnaire.

Phase II was the development of the pilot questionnaire. We asked a panel of experts to comment on the 42-item predefined questionnaire to determine the importance of the items and subsequently reduced it to the 30-item pilot questionnaire. The items were rated on a five-point Likert scale, which allowed for greater variation in response; a higher score indicated higher social stigma. Another sample of 30 respondents was invited to complete the 30-item pilot COVID-PSS to evaluate such dimensions as face and content validity. Based on public and expert views, the 30-item pilot COVID-PSS was reworded/substituted (Supplementary Appendix S1).

In phase III, involving the refinement of the questionnaire, we recruited a sample from the public through various social media platforms. During Wave I of the HOME-COVID-19 survey in Thailand (21 April to 4 May 2020)[7], a total of 4004 participants completed the 30-item pilot COVID-PSS. We used a 1:1 ratio of participants to enable a random analysis of instrument dimensionality using exploratory factor analysis (EFA) and test for scale structure using confirmatory factor analysis (CFA). In addition, non-parametric item responses theory (IRT) was performed to analyse the unidimensional set of items of the subscales of the COVID-PSS.

In phase IV, psychometric analysis, validity and reliability were tested to verify the psychometric properties of the final COVID-PSS. Participants were asked to complete the items on global fear of COVID-19 using a numerical rating scale (NRS) of 0-10 points, perceived risk of COVID-19 infection using an NRS of 0-10 points, the Bogardus social distance scale using a rank order system of 1-7 points[22], pain intensity using an NRS of 0-10 points[9], and items on the insomnia severity index.[23] Test-retest reliability was then analysed based on a convenience subset of 409 participants who completed the final COVID-PSS a second time, approximately three to five days after their first survey.

Finally, for phase V, meaningful interpretation, we used an anchor-based approach to establish an interpretation of the final COVID-PSS by classifying severity cut-off scores such that they directly reflected the participants' values and perspectives.[24 25]

Statistical analyses

Per the rule of thumb, 10-15 cases per candidate item are required.[26] Thus, the required number of participants in this study ranged from 300-450. To obtain a stable factor structure, enable non-parametric IRT and psychometric analyses, and compensate for missing responses of 30%, we calculated a minimum target of 585 as required per sub-cohort (EFA and CFA cohorts), for a total of at least 1170 participants needed in this study.

All statistical analyses were analysed using STATA 14.0 (StataCorp LP). The confidence intervals (CIs) of the correlation statistics were calculated by the bootstrap resampling method to address the level of significance. *P* values <0.05 were considered statistically significant, using two-tailed tests. Missing values were imputed with a multiple imputation method. However, items or participants with high levels of missing data (>20%) were excluded from the analyses. To describe the study population and results of all test assessments, we analysed standard descriptive statistics, using measures of central tendency and variability for the continuous variables, and frequency and percentage for the categorical variables. Item scores were summarised descriptively, with the normality of score distribution assessed by skewness and kurtosis tests. Items that demonstrated a floor or ceiling effect of >80% were removed.

The Kaiser-Meyer-Olkin measure and Bartlett test of sphericity were performed to ensure the appropriate use of factor analysis. For the EFA cohort, we performed an EFA by a principal factor extraction method, with the factor obliquely rotated using the promax criterion. Eigenvalues greater >1.0 and the scree plot with the number of factors that

explained >5% of the variance were used to define the number of factors retained.[27 28] To develop a practical and concise measurement tool, we considered items as acceptable, an thus retained items, if the loading coefficient was >0.6. The item characteristics were reviewed by a panel of experts designated by the search team to determine item inclusion or exclusion. We then analysed scale structure using CFA (CFA cohort) with the maximum likelihood estimation. A CFA was conducted to confirm how correctly a hypothesised model matched the factor structure by EFA, as described above. To determine the appropriateness of the tested model, we tested the fit indices, including the root mean square error of approximation, standardised root mean squared residual, comparative-fit index, and Tucker-Lewis index.[29-32] Moreover, the coefficient of determination (R-squared) and item-scale correlations (standardised factor loading) were estimated to establish the acceptability of the final structure of the COVID-PSS. The unidimensional set of items of the COVID-PSS was identified and model fit assessed via EFA and CFA, respectively. Subsequently, we implemented the non-parametric IRT analysis to establish the unidimensionality of the set of items with respect to the relation between latent traits and responses to the items.[33] Taken together, the final decision for the final COVID-PSS items was theoretically based on all psychometric performances.

Face and content validity were ensured through the comprehensive development of the questionnaire by literature review, public interviews, and expert review. Convergent validity was evaluated using Spearman's correlation coefficients between the final COVID-PSS and other instruments, including the global fear of COVID-19, perceived risk of COVID-19 infection, and Bogardus social distance scale. Convergent validity was recognised if the correlation value was >0.4. Multiple linear regression was also performed to confirm the linearity of these findings. To establish the discriminant validity, we estimated the bivariate correlation between the final COVID-PSS and the pain intensity scale and insomnia

severity index. We hypothesised a non-significant to fair correlation for the COVID-PSS scores and the specific tools (correlation statistic, 0.0-0.2). Cronbach's α coefficient was calculated to determine internal consistency reliability, with a value of ≥0.70 indicating acceptable reliability.[34] Test-retest reliability was assessed by the intraclass correlation coefficients (ICCs) between the first and second surveys (three to five days later), which a value of ≥0.8 or higher indicating acceptable reproducibility.

The final COVID-PSS was used to measure the degree of social stigma towards COVID-19 infection against three sets of anchor questions, including the global fear of COVID-19, perceived risk of COVID-19 infection, and Bogardus social distance scale. The proposed banding for the final COVID-PSS scores was divided using the mean, median, and mode of the anchor-based questions. The kappa (κ) coefficient of the agreement and area under the receiver operating characteristic curve (AuROC) were calculated to assess optimal COVID-PSS cut-off scores. Sensitivity and specificity with the corresponding 95% CIs were also estimated.[35]

Patients and public involvement

The public was engaged in the expert group during the in-depth interview that performed an item generation process of the COVID-PSS, and they also participated in the pilot testing and refinement of the questionnaire. However, the public was not involved in the study design and conceptualised of the present study.

RESULTS

Among the 4322 participants screened in the first wave of the HOME-COVID-19 survey, 318 (7.4%) participants with non-completed questionnaires were excluded (Supplementary, Figure S1). However, no significant difference was found between those

who completed the survey and those with partial responses (Supplementary, Table S1). As such, only the complete cases were accepted and considered in our analysis. A total of 4004 participants who completed the instruments test were eligible for this study. We found no difference in characteristics after we randomly split the study population into a 1:1 ratio for the EFA (n = 2002) and CFA (n = 2002) cohorts. Overall, the participants had a mean age ± standard deviation of 29.1 ± 10.8 years. Among the participants, 65.4% were women. The participants' characteristics are described in Table 1.

According to the item analysis, three items of the 30-item pilot questionnaire (Q16, Q29, Q30) were removed owing to floor effects exceeding 80% (Supplementary, Table S2). Based on the statistical criterion and clinical judgment of the panel experts, the factor analysis of the EFA cohort identified 15 candidate items (Q1, Q2, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q27) with factor loading more than 0.6 that encompassed the three potential factors. The 15-item prototype of the COVID-PSS explained 82.0% of the variance (Supplementary, Table S3). For the CFA cohort, the unidimensionality of each factor (subscale) and the overall three-dimensional model were then evaluated and reevaluated by examining the modification indices. The CFA affirmed three unidimensional sets of items (subscale) with acceptable fit indices. Results of the CFAs of evaluated and re-evaluated models are illustrated in Supplementary, Table S4. The information criteria indices favoured reducing the sets of 15 candidate items to a 10-item refinement, supporting the three-dimensional model. The first factor had three items (Q2, Q4, Q5); factor 2 had three items (Q6, Q9, Q10), and factor 3 had four items (Q8, Q13, Q14, Q27). The correlated factors model of the 10-item COVID-PSS is presented in Supplementary, Figure S2. A non-parametric IRT analysis also supported the 10-item tool with a three factor structure in terms of unidimensionality, local independence, and monotonicity (Supplementary, Table S5). The final decision of the 10-item COVID-PSS captured three retained factors, namely, stereotype,

prejudice, and fear (Table 2). The final validated Thai and non-validated English version of the 10-item COVID-PSS are provided in Supplementary, Appendix S2 and S3, respectively.

The face and content validity of the final 10-item COVID-PSS were established through comprehensive item bank generation, public and expert review, as well as factor analysis. The correlation among the final 10-item COVID-PSS subscales ranged from 0.35-0.53 (Supplementary, Table S6). The psychometric properties of the final 10-item COVID-PSS are presented in Table 3. As expected, the final 10-item PSS and its subscales were all markedly positively correlated with the sets of the psychosocial impact of COVID-19 on daily life, including global fear, perceived risk, and social distance (P <0.001 for all). Furthermore, multiple linear regression also demonstrated these findings in terms of linearity; a one-unit increase in the sets of the psychosocial impact of COVID-19 scores substantially predicted an increase in the final 10-item COVID-PSS and its subscales (adjusted R-squared range from 0.06-0.84, P <0.001 for all, Supplementary Table S7 and Figure S3). With respect to the correlation statistics, the pattern of correlations between the final 10-item COVID-PSS and the specific tools (pain intensity scale and insomnia severity index) was in line with the aforementioned hypothesis (Spearman's correlation <0.2, Table 3), which indicated appropriate discriminant validity. The reliability of the final 10-item COVID-PSS was satisfactory, with Cronbach's α of the subscales and the summary score ranging from 0.76-0.85, and the test-retest of subsample with the ICCs ranging from 0.90-0.94 (Table 3).

The distribution of the final 10-item COVID-PSS scores characterised by the anchor-based questions (global fear of COVID-19, perceived risk of COVID-19 infection, and the Bogardus social distance scale) are provided in Supplementary, Table S8. The proposed sets of the 10-item COVID-PSS severity bands were classified into no/minimal-, moderate-, and high-stigma towards COVID-19 infection. The set U of the possible banding was preferred as the optimal 10-item COVID-PSS cut-off scores based on the κ coefficient (Supplementary,

Table S9) and AuROC (Supplementary, Table S10). The categorised scores were proposed as no/minimal (≤18), moderate (19-25), and high (≥26), reflecting public values and perspectives on the anchors-based questions. The AuROC demonstrated the following ranges: no/minimal (0.65-0.82), moderate (0.50-0.65), and high (0.75-0.80). With respect to the discrimination, however, the anchor-based questions on the social distance scale provided the lowest the AuROC, sensitivity and specificity compared with the others (Table 4).

DISCUSSION

During the early months of the COVID-19 pandemic, there was no validated measurement tool for evaluating and tracking the social stigma towards the COVID-19 infection among the public. In response to this unprecedented occurrence, we developed, validated, and investigated the psychometric properties of the COVID-PSS in the Thai public. To verify public significance and utility, we also established a banding system for the COVID-PSS (no/minimal, moderate, or high) through assigning meaning to the public's values and perspectives in terms of psychosocial responses to the COVID-19 pandemic.

The COVID-PSS was developed under a comprehensive and multidimensional approach that held a conceptual model of measurement using EFA and CFA. Non-parametric IRT also reaffirmed the fundamental assumptions (unidimensionality, local independence, and monotonicity) of the dimensional model. The final 10-item COVID-PSS consisted of three dimensions of public stigma towards the COVID-19 infection, namely, stereotype, prejudice, and fear. Factor 1 had three items related to the general public stereotype towards COVID-19 infection; Factor 2 had three items related to the prejudice for people infected with COVID-19; and Factor 3 had four items related to the fear of the COVID-19 outbreak.

Considering the absence of a reference standard, it is theoretically coherent that more participants with greater COVID-PSS scores will yield a higher degree on the psychosocial

responses to the COVID-19 pandemic—feeling of fear, perceived risk, and social distance (Supplementary, Table S7). All positively and substantially correlated subscales of the 10-item COVID-PSS and the sets of the psychosocial impact of the COVID-19 scores also reflected the conceptualisation of the measurement tool. The 10-item COVID-PSS showed acceptable reliability with respect to internal consistency and test-retest reliability (reproducibility). Removal of any item did not change our findings in terms of the Cronbach's α coefficient, indicating the robustness of the internal consistency and cohesion of the scale.

In establishing the optimal cut-off scores, our findings revealed that the cut-off scores by the AuROC methods were acceptable in terms of the theoretical and practical merits of the external anchor-based questions, particularly with the perceived risk of COVID-19 infection scale. The proposed cut-off scores were ideal for dividing participants who experienced no/minimal or high stigma towards COVID-19 infection. However, discrimination among the moderate groups was poor. Taken together with validity, reliability, and public utility, we hypothesised that the COVID-PSS will be suitable to capture the social stigma towards the COVID-19 pandemic and the impact on psychosocial responses in the Thai public.

Our study was performed with a comprehensive method. An initial item bank was generated via a qualitative approach to obtain the public's values and perspectives, which reflect the cultural norms. This approach is recognised as a cornerstone to developing psychometric measurement tools.[34] Meanwhile, a sophisticated quantitative approach verified a conceptual factorial structure (construct validity) via EFA. CFA and non-parametric IRT also reaffirmed the three dimensionality of the final 10-item COVID-PSS.

However, the limitations of this study must be noted. Although the conceptual factorial structure and psychometric properties, along with the adequate sample size, give an acceptable performance scale, external validation studies in different countries and settings

are warranted to establish the generalisability of the measurement tool. Moreover, the 10-item COVID-PSS was developed and validated only in the general population; validation in other specific groups, such as healthcare workers, minorities, and vulnerable groups, would be needed. This measurement tool, nonetheless, is intended to be broadly used in all aspects of the general population to quantify the social stigma towards the COVID-19 pandemic.

To our knowledge, the COVID-PSS is the first tool that aimed to quantify the public stigma towards the COVID-19 infection in a nationwide community. The 10-item COVID-PSS could be incorporated in public health surveys as a part of clinical and intervention research. In terms of practicability and feasibility, this scale is easy to use by the general population; it can be answered in five to ten minutes. Furthermore, the proposed cut-off scores for severity banding of the COVID-PSS can help in targeted population interventions, as well as inform the decision-making process for the government and public health officials to minimise stigma. Indeed, the scale can be used to determine and maximise the effectiveness of interventions. Nonetheless, the confirmed cases in a community, cultural norms, degree of public fear, degree of media-related consumption regarding the COVID-19 outbreak, government management strategies, and public resilient coping towards the disaster or infectious outbreak may not be uniform across countries and over time. As such, cross-cultural adaptation and longitudinal studies are needed to evaluate and track the public stigma towards COVID-19 with respect to long-term effects. Further studies should enhance the translation of the scale, and the responsiveness validity should be investigated to assess the long-term consequences of the public stigma towards the COVID-19 pandemic.

CONCLUSION

The final COVID-PSS consisted 10 items and captured a three-dimensional structure: stereotype, prejudice, and fear. The 10-item COVID-PSS for evaluating and tracking public

social stigma towards the COVID-19 infection is a practical scale and illustrates satisfactory psychometric properties for validity, reliability, and public utility. This scale could be used and incorporated in public health surveys alongside clinical and intervention research.

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Contributors

RA, YR, CP, WB, S. Nanta, and WC helped to finalise the study protocol and recruit study participants. PK helped to translate the questionnaire from the Thai version to a non-validated English version of the instrument. KT, NW, and TW helped to design the study, interpret the study results, and commented on the previous version of the manuscript. S. Nochaiwong and CR were responsible for the statistical analyses and approved the final manuscript. S. Nochaiwong designed the study, and was responsible for the conduct of the study, and drafted the first version of the manuscript. All authors approved the final draft of the manuscript. S. Nochaiwong is the supervisor of the study.

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Competing interests

All authors declare no competing interests. All the researchers involved performed this study in the context of their research.

Patient and public involvement

Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication

Not required.

Ethics approval

The study was approved by the Committee of Research Ethics of the Faculty of Public Health (ET010/2020) and Faculty of Pharmacy (23/2563), Chiang Mai University.

Data availability statement

Data will be shared upon reasonable request and with permission according to the Health Outcomes and Mental Health Care Evaluation Survey Research Group (HOME-Survey) data release policy.

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Figure legends

Figure 1 Methods for the Development, Validation, Psychometric Analysis, and Interpretation of the COVID-PSS

Abbreviations: AuROC, area under the receiver operating characteristic; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale; CFA, confirmatory factor analysis; EFA, exploratory factor analysis; IRT, item response theory.

Table 1 Participant Characteristics

Characteristics	Overall (n=4004)	EFA cohort (n=2002)	CFA cohort (n=2002)	*P* Value
Age, year (mean ± SD; range)	29.1 ± 10.8; (18 – 79)	29.1 ± 11.0; (18 – 73)	29.0 ± 10.7; (18 – 79)	0.712
Sexual identity				
Male	1231 (30.7)	632 (31.6)	599 (29.9)	0.269
Female	2619 (65.4)	1301 (65.0)	1318 (65.8)	
Others	154 (3.9)	69 (3.4)	85 (4.3)	
Marital status				
Single	3208 (80.1)	1601 (80.0)	1607 (80.3)	0.549
Married/domestic partnership	693 (17.3)	344 (17.2)	349 (17.4)	
Divorced/widowed/separated	103 (2.6)	57 (2.8)	46 (2.3)	
Education level				
Illiterate/primary school/junior high school	127 (3.2)	58 (2.9)	69 (3.4)	0.593
Senior high school/diploma/high vocational	1893 (47.3)	953 (47.6)	940 (47.0)	
Bachelor's degree/higher education	1984 (49.6)	991 (49.5)	993 (49.6)	
Religion				
Irreligion	375 (9.4)	176 (8.8)	199 (9.9)	0.233
Buddhist/Christian/Muslim/Others	3629 (90.6)	1826 (91.2)	1803 (90.1)	
Occupation				
Unemployed/retired	391 (9.8)	198 (9.9)	193 (9.6)	0.960
Employed	2024 (50.5)	1009 (50.4)	1015 (50.7)	
College student	1589 (39.7)	795 (39.7)	794 (39.7)	
Living status				
Alone	576 (14.4)	279 (13.9)	297 (14.8)	0.624
With family	3164 (79.0)	1586 (79.2)	1578 (78.8)	
With others	264 (6.6)	137 (6.8)	127 (6.3)	
Person income, Baht/month				
≤10000	1905 (47.6)	956 (47.7)	949 (47.4)	0.974
10001 – 20000	1054 (26.3)	526 (26.3)	528 (26.4)	
>20000	1045 (26.1)	520 (6.0)	525 (22.2)	
History of mental illness	359 (9.0)	187 (9.3)	172 (8.6)	0.439
History of Chronic NCD†	599 (15.0)	303 (15.1)	296 (14.8)	0.790
Quarantine status				
Never	1781 (44.5)	879 (43.9)	902 (45.0)	0.206
Past	1575 (39.3)	813 (40.6)	762 (38.1)	
Current	648 (16.2)	310 (15.5)	338 (16.9)	
Fear of COVID-19, (mean ± SD; range)	6.7 ± 1.8 (1 – 10)	6.6 ± 1.8 (1 – 10)	6.6 ± 1.8 (1 – 10)	0.945
Perceived risk of COVID-19 infection, (mean ± SD; range)	5.5 ± 2.2 (2 – 10)	5.5 ± 2.1 (2 – 10)	5.5 ± 2.2 (2 – 10)	0.367
Bogardus social distance scale, (mean ± SD; range)	2.8 ± 1.1 (1 – 7)	2.8 ± 1.1 (1 – 7)	2.8 ± 1.1 (1 – 7)	0.111
Pain intensity scale	3.5 ± 2.8 (0 – 10)	3.5 ± 2.8 (0 – 10)	3.5 ± 2.8 (0 – 10)	0.959

Insomnia severity index	8.7 ± 5.5 (0 – 28)	8.6 ± 5.5 (0 – 28)	8.7 ± 5.5 (0 – 28)	0.444

Data are expressed as the frequency (percentage) of patients, unless otherwise indicated.

†To includes diabetes mellitus, hypertension, dyslipidemia, stroke and heart disease, chronic kidney disease, chronic lung disease, and cancer.

Abbreviations: CFA, confirmatory factor analysis; COVID-19, coronavirus disease-2019; EFA, exploratory factor analysis; SD, standard deviation.

Table 2 The Final 10-Item COVID-PSS (n=4004)†

Item	Scoring structure	Mean ± SD; median (range)	Standardised factor loadings (95% CI)‡			R-squared
			Stereotype	Prejudice	Fear	
Item 1: Most people infected with COVID-19 do not take care of their health. (Q2)	1-2-3-4-5	2.2 ± 1.1; 2 (1-5)	0.61 (0.55-0.64)	..	..	0.37
Item 2: Most people infected with COVID-19 do not follow expert medical advice. (Q4)	1-2-3-4-5	3.1 ± 1.3; 3 (1-5)	0.77 (0.75-0.79)	..	..	0.60
Item 3: Most people infected with COVID-19 like to party or socialize often. (Q5)	1-2-3-4-5	2.8 ± 1.3; 3 (1-5)	0.79 (0.77-0.80)	..	..	0.62
Item 4: Most people infected with COVID-19 are contaminated with germs. (Q6)	1-2-3-4-5	1.8 ± 1.1; 1 (1-5)	..	0.73 (0.71-0.75)	..	0.54
Item 5: Most people infected with COVID-19 are a burden to their families and society. (Q9)	1-2-3-4-5	1.9 ± 1.1; 2 (1-5)	..	0.75 (0.73-0.77)	..	0.54
Item 6: Most people infected with COVID-19 are socially irresponsible. (Q10)	1-2-3-4-5	2.0 ± 1.1; 2 (1-5)	..	0.72 (0.70-0.74)	..	0.50
Item 7: Most people infected with COVID-19 are a danger to other people. (Q8)	1-2-3-4-5	2.7 ± 1.3; 3 (1-5)	..	..	0.65 (0.63-0.67)	0.42
Item 8: I fear people infected with COVID-19. (Q13)	1-2-3-4-5	2.6 ± 1.2; 3 (1-5)	..	..	0.82 (0.81-0.84)	0.68
Item 9: I fear people who are at risk of COVID-19 infection even if they have not been infected yet. (Q14)	1-2-3-4-5	2.3 ± 1.1; 2 (1-5)	..	..	0.77 (0.75-0.78)	0.59
Item 10: I fear being infected with COVID-19 if I live in a community with people who are infected with COVID-19. (Q27)	1-2-3-4-5	2.6 ± 1.2; 3 (1-5)	..	..	0.64 (0.62-0.66)	0.41
Overall	Possible range 10-50	24.2 ± 7.6; 24 (10-50)	..	..	..	0.98

†The final COVID-PSS items are expressed as a non-validated English version.

‡Based on standardised confirmatory factor analysis.

Abbreviations: CI, confidence interval; COVID-PSS coronavirus disease 2019-public stigma scale; SD, standard deviation.

Table 3 Psychometric Properties of the Final 10-Item COVID-PSS (n=4004)

Psychometric Properties	**COVID-PSS Correlation (95% CI)**			
	Subscale: Stereotype	**Subscale: Prejudice**	**Subscale: Fear**	**Summary Score**
Validity				
Face and content validity	Satisfactory with comprehensive item generation process and expert review (three epidemiologist, two psychiatrists, one social scientist, two hospital directors, and in-depth interviews with thirty general population)			
Convergent Validity				
With global fear of COVID-19	0.28 (0.25 to 0.30)*	0.44 (0.41 to 0.46)*	0.84 (0.83 to 0.85)*	0.68 (0.66 to 0.70)*
With perceived risk of COVID-19 infection	0.37 (0.34 to 0.40)*	0.54 (0.51 to 0.56)*	0.92 (0.91 to 0.92)*	0.79 (0.77 to 0.80)*
With the Bogardus social distance scale	0.20 (0.17 to 0.23)*	0.42 (0.39 to 0.44)*	0.57 (0.54 to 0.59)*	0.50 (0.48 to 0.53)*
Discriminant Validity				
With pain intensity	-0.01 (-0.04 to 0.02)***	0.01 (-0.02 to 0.04)***	0.08 (0.05 to 0.11)*	0.04 (0.01 to 0.07)**
With insomnia severity index	-0.03 (-0.06 to 0.00)***	0.05 (0.02 to 0.08)**	0.09 (0.06 to 0.12)*	0.05 (0.02 to 0.08)**
Reliability				
Internal consistency: Cronbach's α	0.76 (0.75 to 0.78)	0.77 (0.75 to 0.79)	0.80 (0.79 to 0.82)	0.85 (0.84 to 0.86)
Reproducibility: intraclass correlation†	0.90 (0.76 to 0.95)	0.94 (0.93 to 0.95)	0.93 (0.88 to 0.96)	0.94 (0.86 to 0.96)

Noted: Spearman's rho correlation test, *P-values <0·001; **P-values <0·05; ***P-values >0·05.

†Based on the sub-cohort for test-retest n=409.

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease-2019; COVID-PSS, coronavirus disease-2019-public stigma scale.

Table 4 Public Meaningful and Interpretation of the 10-Item COVID-PSS Using Participant-Based Anchors

COVID-PSS cut-off scores	No. of participant (%)	Impact on psychological-related to COVID-19								
		Fear of COVID-19			Perceived risk of COVID-19 infection			Bogardus social distance scale		
		Sensitivity (95% CI)	Specificity (95% CI)	AuROC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	AuROC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	AuROC (95% CI)
No/minimal (18 or lower)	983 (24.6)	84.5% (78.7-89.2)	78.6% (77.3-79.9)	0.82 (0.79-0.84)	76.1% (73.0-79.1)	87.7% (86.5-88.8)	0.82 (0.80-0.84)	40.5% (38.2-42.7)	89.2% (87.8-90.5)	0.65 (0.64-0.66)
Moderate (19 to 25)	1364 (34.1)	44.4% (42.0-46.8)	73.5% (71.7-75.3)	0.59 (0.57-0.60)	49.6% (47.4-51.8)	81.4% (79.6-83.0)	0.65 (0.64-0.67)	34.2% (32.0-36.3)	66.0% (64.0-68.1)	0.50 (0.49-0.52)
High (26 or higher)	1657 (41.4)	65.2% (63.1-67.2)	85.0% (83.4-86.6)	0.75 (0.74-0.76)	82.5% (80.3-84.6)	77.1% (75.4-78.6)	0.80 (0.78-0.81)	89.2% (84.4-92.9)	61.5% (60.0-63.1)	0.75 (0.73-0.78)

Abbreviations: AuROC, area under the receiver operating characteristic; CI, confidence interval; COVID-19, coronavirus disease-2019; COVID-PSS, coronavirus disease-2019-public stigma scale.

Phase I: Item Generation

- Comprehensive literature review of relevant sources on public stigma to COVID-19
- In-depth interviews with 30 general population

Phase II: Development of the Pilot Questionnaire

- 30-item pilot questions created through public interview and experts review
- Face and content validity

Phase III: Refinement of the Questionnaire

- Items refined by a panel of experts and item analysis
- EFA: 15-item prototype with three factors
- CFA: 10-item with a three-dimensional model
- Nonparametric IRT analysis: 10-item with three factors, respect to the fundamental assumptions (unidimensionality, local independence, and monotonicity)

Phase IV: Psychometric Analysis

- Validity: face, content, convergent, and discriminant
- Reliability: internal consistency and test-retest reproducibility

Phase V: Meaningful Interpretation

- Anchor-based methods: banding and cutoff was assessed by using the kappa coefficient agreement and the AuROC analysis

Final Instrument

- The final 10-item COVID-PSS with three factors structure: stereotype, prejudice, and fear
- The proposed scores were 18 or lower (no minimal), 19 to 25 (moderate), 26 or higher (high)

Online Supplementary Materials

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Supplementary Online Content

eMethods

Study Procedures

A detailed series of studies phases for the development and validation of the coronavirus disease 2019—public stigma scale (COVID-PSS) instrument is provided as follows:

Phase I: Item generation

In process of item selection, content and comprehensive literature review with relevant sources of public stigma to coronavirus disease-2019 (COVID-19) were identified, including the classic theories of Goffman, 1963[1]; labeling theory—Scheff, 1966[2]; community attitudes toward the mentally ill—Taylor and Dear, 1981[3]; an attribution model of public discrimination towards the person with mental illness—Corrigan et al, 2003[4]; and conceptualization of the stigma creation process—Link et al, 2004.[5]

In addition, various paradigms—perceived public stigma across (i) infectious disease (human immunodeficiency viruses [HIV][6,7], Ebola virus[8], leprosy[9], severe acute respiratory syndrome [SARS][10]); (ii) identity and disability (minority groups[11], intellectual disabilities[12]); and (iii) addictive behaviors (gambling, alcohol use disorder[13]) were also reviewed. Of these commonly included dimensional were fear/dangerousness, moral judgment, and personal perception (beliefs/attitudes, anger, and blame).

To explored perceived public stigma to COVID-19 infection, the 30-general public was interviewed using a combination of structured and non-structured in-depth interviews. The candidate items were selected based on cultural norms, relevance to COVID-19 pandemic, and focusing on the public experiences. The initial item bank was identified to yield the 42-item predefined questionnaire.

Phase II: Development of the pilot questionnaire

The 42-item predefined was given to three epidemiologists, two psychiatrists, one social scientist, and two general practitioners for comment on ease of understanding, appropriateness of language, and redundancy. The experts also provided feedback and rated each item in order to importance, and reduced to the 30-item pilot COVID-PSS questionnaire. A five-point Likert scale per theorised items was used as it allowed for greater variation in response. A higher score indicated a higher social stigma to COVID-19 infection. An additional 30-general public was invited to complete the pilot 30-item COVID-PSS in this phase to evaluate such dimensions as a face and content validity. There were subsequently interviewed to address the following: the readability of the overall questionnaire, the clarity of the directions and the items/response choices, the comprehension of the questionnaire, and other opinions regarding each item. The 30-item pilot COVID-PSS was reworded or substituted based on recommendations from the public and experts interview (appendix p 10).

Phase III: Refinement of the questionnaire

With respect to the physical distancing strategy and minimize face-to-face interaction, we developed an online questionnaire via the SurveyMonkey® (https://www.surveymonkey.com) that limits one-time participation per unique internet protocol (IP) address. A convenience and snowball sampling strategy will be applied to recruit the general population through various social media networks including public websites, Facebook, LINE, Twitter, and Instagram. Participants had completed a set of questionnaires, including sociodemographic characteristics (age, sex, educational level, marital status, religion, occupation/profession status, the region of residence, living status, number of a household family member, monthly income, job/income loss related to COVID-19 outbreak, financial problems, reimbursement schemes, comorbidities, media exposure, working from home information, quarantine/isolation information, willingness to quarantine during COVID-19 outbreak) and instruments regarding the mental health and psychosocial question, COVID-PSS, as well as the specific tools for verifying the psychometric properties of the COVID-PSS.

During the Wave-I of the Health Outcomes and Mental Health Care Evaluation Survey: Under the Pandemic Situation of COVID-19 (HOME-COVID-19) survey in Thailand (April 21 – May 4, 2020)[14], a total of 4,004 general populations had completed a pilot 30-items COVID-PSS. At this phase, a 1:1 ratio of participants has randomly analyzed dimensionality of the instrument and test for scale structure using exploratory factor analysis (EFA cohort: n=2,002) and confirmatory factor analysis (CFA cohort: n=2,002), respectively. In addition, the nonparametric item responses theory (IRT) was performed to analyze the unidimensional item sets of The COVID-PSS.

Phase IV: Psychometric validation

The validity and reliability were performed to verify the psychometric properties of the final COVID-PSS. The participants were asked to complete the set of convergent validity and anchor-based questions and divergent validity tools as follows:

Convergent validity and anchor-based tools

(i) Global fear of COVID-19

Participants were asked to rate their maximum of feeling fear of COVID-19 by using a numerical rating scale (NRS) as it easy to complete and appropriate for all groups of participants. The global fear of COVID-19 scale of 0 to 10 points, with 0 beings “no fear” and 10 being the “extremely large fear”. Participants choose the number that best describes their feeling of fear of COVID-19.

(ii) Perceived risk of COVID-19 infection

The perceived dangerousness to COVID-19, one question evaluating the impact of COVID-19 pandemic on overall perceived dangerousness in daily life. It consists of 11-point NRS, which 0 stands for “no effect” and 10 stands for “extremely large effect”.

(iii) The Bogardus social distance scale

The Bogardus social distance scale is the cumulative scale—Guttman scale. It has been used to measure varying degrees of closeness in people towards other members of diverse social, ethnic, or racial groups.[15] Participants were asked to rank order system 1-7 points that they would be willing to admit a member of the group in question. The seven statements are as follows:

Would you be willing to marry a member of the COVID-19 infected group?	(1.0)
Would you be willing to have a member of the COVID-19 infected group as your close personal friend?	(2.0)
Would you be willing to have a member of the COVID-19 infected group as your neighbor?	(3.0)
Would you be willing to have a member of the COVID-19 infected group as your colleague at work?	(4.0)
Would you be willing to have a member of the COVID-19 infected group as a citizen of your country?	(5.0)
Would you be willing to have a member of the COVID-19 infected group visit your country as a non-citizen?	(6.0)
Would you be willing to have a member of the COVID-19 infected group be excluded from associating with your country in any way?	(7.0)

Discriminant validity tools

(i) Pain intensity

In relation to pain intensity, it is well established that a measured by an 11-points NRS (0-10) is applicable for unidimensional assessment pain intensity through evidence from the social sciences, notably census and surveys, public opinion polls, and pre- and post-marketing research.[16] Participants were asked to rate their current pain intensity, with 0 indicate for “no pain” and 10 indicate for “pain as bad as can imagine”.

(ii) Insomnia severity index (ISI)

The ISI is a self-report instrument that recalls the insomnia severity over the last past month. It consists of a 7-item with including the severity of sleep onset, sleep maintenance, and early morning awakening problems, sleeps dissatisfaction, interference of sleep difficulties with daytime functioning, noticeability of sleep problems by others, and distress caused by the sleep difficulties. A 5-point Likert scale to rate each item, yielding a total score ranging from 0 to 28 (higher scores indicating the severity of sleep problems).[17,18]

Furthermore, test-retest reliability was then analysed on the basis of a convenience subset of 409 participants who completed the final COVID-PSS a second time, approximately three-five days after the first entry.

Phase V: Meaningful interpretation

The anchor-based methods were used to establish an interpretation of the final COVID-PSS by classifying severity cutoff scores, which has been recognized as the optimal approach to defined the meaning of scale as it directly measures the participants' values and perspectives.[19,20]

Statistical analyses

Item analysis

Item scores were summarized descriptively with the normality of score distribution assessed by the skewness and kurtosis tests. To ensure that the scales captured the full range of potential response within the population and change over time, items that demonstrated a floor or ceiling effect of greater than 80% were removed.

Exploratory factor analysis (EFA)

To ensure an appropriate use of factor analysis, the Kaiser-Meyer-Olkin (KMO) measure and the Bartlett test of sphericity were performed, whereby the KMO values greater than 0.8 and *P*-value of Bartlett test less than 0.05 are suggested for sampling adequacy and the suitability of the data for factor analysis, respectively. For the EFA cohort (n=2,002), we performed an EFA by a principal factor extraction method to construct a factorial structure and increase the relevance of items. Prior communalities were estimated and the factor was obliquely rotated using the promax criterion to allow for factor covariation, and items were treated as continuous variables.

The eigenvalues greater than 1.0 and the scree plot with the number of factors that explained more than 5% of the variance was used to define the number of factors retained.[21,22] To develop a practical and concise measurement tool, items were considered acceptable and retained if the loading coefficient was greater than 0.6. Item complexity was ascribed to the factor for which the loading coefficient was the highest. The item characteristics were reviewed by the panel experts of the research team to determine item inclusion or exclusion. The included items were named under the relevant factors structure on the basis of their content. Each unidimensional set of items was identified by the EFA, then the CFA was used to assess a model fit using the separate dataset (CFA cohort) in the next step.

Confirmatory factor analysis (CFA)

For the CFA cohort (n=2,002), we then analyzed scale structure using CFA with the maximum likelihood estimation and by treating items as continuous variables. A CFA was tested how correctly a hypothesized model according to the factor structure by EFA as described above. The fit indices (which take into account total sample size) including the root mean square error of approximation (RMSEA) less than 0.100[23,24], standardized root mean squared residual (SRMR) less than 0.100[23,24],

comparative-fit index (CFI) greater than 0.900[25], and non-normed fit index/Tucker-Lewis Index (TLI) greater than 0.900[26], were tested to determine the appropriateness of the tested model. The RMSEA is a parsimony index that assesses the fit between the hypothesized model and the population covariance matrix.

The CFI and TLI are incremental fit indices that evaluated the independence model with the hypothesized model. Meanwhile, the SRMR is the residual-based indices of the difference between a sample and hypothesized variance-covariance matrices. We chose to examine fit indices owing to when the sample size is large, a χ^2 test for model fit is often significant (model is a poor fit), even when the model is, in practice, a good fit. Moreover, the coefficient of determination (R-squared) and item-scale correlations (standardized factor loading), should be at least 0.30 and 0.40, respectively to establish acceptance of the final structure of the COVID-PSS. Thereafter, the model was reevaluated by examining the modification indices.

Nonparametric item response theory (IRT) analysis

Once the unidimensional set of items of the COVID-PSS was identified and assessed model fit by the EFA and CFA, respectively. With regard to the relationship between the latent trait and the responses to the items, we, therefore, implemented the nonparametric IRT analysis to evaluate the fundamental assumptions, including unidimensionality, local independence, and monotonicity. Unidimensionality implies that responses to items are explained by a common latent trait. Local independence implies that responses to items are independent and all the relationships between the items are explained by the latent trait. In other words, local independence implies that a strong redundancy among the items does not indicate. Monotonicity is a key assumption that allows validating the score as an ordinal measure of the latent trait.[27]

The traces of the items, Loevinger's H coefficients (H^s: if H^s less than 0.3, the scale has poor scalability properties; $0.3 \leq H^s < 0.4$, the scale is weak; $0.4 \leq H^s < 0.5$, the scale is medium; and H^s 0.5 or more, the scale is strong) and monotonicity assumption criterion (should be less than 80) were tested to determine the fundamental of nonparametric IRT assumption as described above.[27] Taken together with the CFA, the final decision for the final COVID-PSS items were based on a theoretically of all psychometric performance.

Validity

Face and content validity

Face and content validity are quantitative measures that are present whether the COVID-PSS appears to assess the issues relevant to the social stigma toward the COVID-19 infection. This form of validity was conducted through the comprehensive development of the questionnaire by literature reviews, public interviews, and expert reviews.

Convergent validity

Convergent validity describes the degree to which the proposed assessment converges with other relevant measures. This validity was evaluated using Spearman's correlation coefficients between the final COVID-PSS and other instruments as mentioned above, namely—the global fear of COVID-19, perceived dangerousness to COVID-19, and the Bogardus social distance scale. The correlation statistics were interpreted as slight (0 to 0.2), fair (>0.2 to 0.4), moderate (>0.4 to 0.6), substantial (>0.6 to 0.8), and almost perfect (>0.8). Thus, a moderate correlation value was recognized if the convergent validity was greater than 0.4.

On the basis of the psychosocial effects of the COVID-19 pandemic and impact on public daily life, we postulated that the final COVID-PSS was more substantially converge with the global fear of COVID-19, perceived dangerousness to COVID-19, and the Bogardus social distance scale than other instruments. Additionally, multiple linear regression was used to confirm the linearity of the association between the COVID-PSS summary scores as well as its' subscale and the global fear of COVID-19, perceived dangerousness to COVID-19, and the Bogardus social distance scale.

Discriminant validity

With regard to discriminant validity, non-significant, or slight correlation statistic (0 to 0.2) was expected between the final COVID-PSS and specific tools. To establish the discriminant validity, we estimated the bivariate correlation between the final COVID-PSS and the pain intensity scale, and the ISI. We hypothesised there would be non-significant to fair correlation for the COVID-PSS scores and the pain intensity scale and the ISI scale.

Reliability

An internal consistency (Cronbach's α coefficient) was calculated for each factor of the final COVID-PSS as well as the entire of the COVID-PSS instrument to determine internal consistency reliability and the degree to which every item in a scale measures the same construct. The values of at least 0.70 indicated acceptable reliability of the questionnaire. The item-total correlations between 0.20 and 0.80 were also considerable acceptable.[28]

Test-retest reliability was assessed by the intraclass correlation coefficients (ICCs) between the first and second entry (3-5 days later), in which indicated as slight (≤0.2), fair (>0.2 to 0.4), moderate (>0.4 to 0.6), substantial (>0.6 to 0.8), and almost perfect (>0.8).

Anchor-based methods

The final COVID-PSS was used to measure the degree of social stigma toward the COVID-19 infection against three sets of participant-assessed anchor questions, including the global fear of COVID-19, perceived dangerousness to COVID-19, and the Bogardus social distance scale. The

proposed banding for the final COVID-PSS scores was divided using the mean, median, and mode of the anchor-based questions. The kappa (κ) coefficient of the agreement was calculated for each set of possible severity strata. The κ coefficient of 0-0.2 was indicated as slight agreement, greater 0.2-0.4 fair, greater 0.4-0.6 moderate, greater 0.6-0.8 substantial, and greater 0.8 almost perfect agreement. The precision of the area under the receiver operating characteristic curve (AuROC) method was used to assess optimal COVID-PSS cutoff scores. The AuROC of greater 0.90 were considered as excellent, 0.80-0.89 good, 0.70-0.79 fair, less than 0.70 poor, and less than 0.60 fails.[29] Sensitivity and specificity with the corresponding 95% confidence intervals (CIs) were also estimated. The optimal κ value together with the AuROC performance was adopted as the best banding for the final COVID-PSS.

The severity and psychosocial effects of the COVID-19 pandemic were defined for a practical application using the AuROC curves plots of three banding systems: no/minimal-, moderate-, and high-social stigma towards COVID-19 infection. To construct the AuROC curves and banding the specific tools for the anchor-based approach, the NRS—11-points the global fear of COVID-19 and the perceived dangerousness to COVID-19 was classified into no/minimal (0-3 points), moderate (4-6 points), and severe (7-10 points). Likewise, the Bogardus social distance scale was classified as no/minimal (1.0), moderate (2.0-3.4), and high (4.0-7.0). Based on the practicability indices, the final COVID-PSS cutoff scores were rounded to zero decimal places. The AuROC analyses of the dichotomization points were determined by using the entire cohort for each cutoff score. For instance, to determine the cutoff for high-social stigma towards COVID-19 infection, the results from severe/high effect of anchor questions were analyzed against all others.

Table S1 Characteristics of Included and Excluded Participants

Variable	Included (n=4,004)	Excluded (n=318)	*P* Value
Age, year (mean ± SD; range)	29.1 ± 10.8; (18 – 79)	29.4 ± 7.5; (18 – 59)	0.622
Sexual identity			
Male	1,231 (30.7)	80 (25.2)	0.093
Female	2,619 (65.4)	227 (71.4)	
Others	154 (3.9)	11 (3.5)	
Marital status			
Single	3,208 (80.1)	239 (75.2)	0.087
Married/domestic partnership	693 (17.3)	67 (21.1)	
Divorced/widowed/separated	103 (2.6)	12 (3.4)	
Education level			
Illiterate/primary school/junior high school	127 (3.2)	8 (2.5)	0.067
Senior high school/diploma/high vocational	1,893 (47.3)	131 (41.2)	
Bachelor's degree/higher education	1,984 (49.6)	179 (56.3)	
Religion			
Irreligion	375 (9.4)	29 (9.1)	0.885
Buddhist/Christian/Muslim/Others	3,629 (90.6)	289 (90.9)	
Occupation			
Unemployed/retired	391 (9.8)	28 (8.8)	0.176
Employed	2,024 (50.5)	178 (56.0)	
College student	1,589 (39.7)	112 (35.2)	
Living status			
Alone	576 (14.4)	54 (17.0)	0.077
With family	3,164 (79.0)	235 (73.9)	
With others	264 (6.6)	29 (9.1)	
Person income, Baht/month			
≤10,000	1,905 (47.6)	141 (44.3)	0.254
10,001 – 20,000	1,054 (26.3)	81 (25.5)	
>20,000	1,045 (26.1)	96 (30.2)	
History of mental illness	359 (9.0)	36 (11.3)	0.161
History of Chronic NCD[†]	599 (15.0)	42 (13.2)	0.397
Quarantine status			
Never	1,781 (44.5)	149 (46.9)	0.687
Past	1,575 (39.3)	118 (37.1)	
Current	648 (16.2)	51 (16.0)	

Data are expressed as the frequency (percentage) of patients, unless otherwise indicated.

[†]To includes diabetes mellitus, hypertension, dyslipidemia, stroke and heart disease, chronic kidney disease, chronic lung disease, and cancer.

Abbreviations: COVID-19, coronavirus disease-2019; SD, standard deviation.

Table S2 Descriptive Statistics and Item-Total Correlations: 30-Item Pilot COVID-PSS (n=4,004)

Item	Mean (SD)	Median (Min-Max)	Ceiling Effect (%)	Floor Effect (%)	Skewness	Kurtosis	Corrected ITC
Q1	2.5 (1.2)	2 (1 – 5)	6.7%	24.8%	0.37	2.30	0.30
Q2	2.2 (1.1)	2 (1 – 5)	4.7%	32.6%	0.67	2.67	0.46
Q3	1.9 (1.0)	2 (1 – 5)	2.0%	45.9%	0.99	3.35	0.50
Q4	3.1 (1.3)	3 (1 – 5)	16.3%	13.2%	-0.10	2.00	0.38
Q5	2.8 (1.3)	3 (1 – 5)	12.1%	18.8%	0.11	2.01	0.44
Q6	1.8 (1.1)	1 (1 – 5)	3.0%	54.8%	1.23	3.67	0.64
Q7	1.7 (0.9)	1 (1 – 5)	1.3%	56.9%	1.34	4.36	0.51
Q8	2.7 (1.3)	3 (1 – 5)	11.2%	20.4%	0.23	1.06	0.50
Q9	1.9 (1.1)	2 (1 – 5)	3.3%	50.0%	1.11	3.46	0.62
Q10	2.0 (1.1)	2 (1 – 5)	3.5%	42.1%	0.98	3.35	0.63
Q11	1.4 (0.8)	1 (1 – 5)	1.0%	71.4%	2.07	7.29	0.66
Q12	1.5 (0.9)	1 (1 – 5)	1.6%	67.2%	1.80	5.83	0.62
Q13	2.6 (1.2)	3 (1 – 5)	10.1%	16.8%	0.24	2.24	0.46
Q14	2.3 (1.1)	2 (1 – 5)	4.4%	29.5%	0.56	2.57	0.51
Q15	1.4 (0.8)	1 (1 – 5)	0.7%	74.4%	2.12	7.35	0.62
Q16	1.3 (0.8)	1 (1 – 5)	1.3%	**80.6%**	2.66	10.14	0.39
Q17	1.3 (0.8)	1 (1 – 5)	1.0%	78.8%	2.46	9.02	0.41
Q18	2.3 (1.4)	2 (1 – 5)	9.4%	43.0%	0.62	2.09	0.21
Q19	1.8 (1.2)	1 (1 – 5)	5.0%	57.7%	1.40	3.97	0.26
Q20	2.3 (1.3)	2 (1 – 5)	9.4%	38.2%	0.68	2.28	0.20
Q21	1.9 (1.1)	2 (1 – 5)	2.6%	47.6%	0.99	3.18	0.26
Q22	2.5 (1.1)	3 (1 – 5)	4.1%	23.6%	0.20	2.33	0.17
Q23	2.7 (1.2)	3 (1 – 5)	8.6%	22.4%	0.18	2.14	0.25
Q24	1.5 (0.9)	1 (1 – 5)	1.6%	68.3%	1.90	6.41	0.47
Q25	2.0 (1.1)	2 (1 – 5)	4.9%	40.7%	0.96	3.28	0.37
Q26	2.2 (1.3)	2 (1 – 5)	10.5%	40.2%	0.81	2.50	0.29
Q27	2.6 (1.2)	3 (1 – 5)	6.9%	21.4%	0.34	2.38	0.40
Q28	1.9 (1.1)	1 (1 – 5)	4.0%	51.1%	1.21	3.71	0.50
Q29	1.3 (0.7)	1 (1 – 5)	0.8%	**82.3%**	2.87	11.94	0.51
Q30	1.2 (0.6)	1 (1 – 5)	1.0%	**86.4%**	3.40	15.53	0.46

Noted: Boldfaced items indicate findings of floor effect or ceiling effect of >80%.

Abbreviations: COVID-PSS, coronavirus disease 2019-public stigma scale; ITC, item-total correlation; SD, standard deviation.

Table S3 Exploratory Factor Analysis of the 15-Item Prototype COVID-PSS (n=2,002)

Item	Description of Item	Factor Loadings†			Communality Value
		Factor 1	Factor 2	Factor 3	
Q1		**0.66**	0.01	-0.17	0.40
Q2		**0.74**	0.16	-0.18	0.62
Q4		**0.88**	-0.23	0.12	0.69
Q5		**0.79**	-0.07	0.11	0.64
Q6		0.21	**0.61**	0.14	0.54
Q7		0.24	**0.62**	-0.11	0.40
Q8		0.17	0.08	**0.66**	0.55
Q9		0.10	**0.61**	0.18	0.58
Q10		0.17	**0.65**	0.07	0.57
Q11		-0.14	**0.91**	0.02	0.73
Q12		-0.05	**0.85**	-0.06	0.65
Q13		-0.04	0.01	**0.87**	0.75
Q14		-0.05	0.10	**0.79**	0.67
Q15		-0.17	**0.88**	0.01	0.66
Q27		0.02	-0.07	**0.78**	0.59
Percentage of the variance		26.2	32.5	23.3	Total variance 82.0

†The extraction method was principle component analysis, with the rotation method by oblique, promax rotation. Items load on the assigned factor loadings >0.6 are highlighted.
Abbreviations: COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S4 Confirmatory Factor Analysis of the Prototype COVID-PSS (n=2,002)

Factor	No. of items	Threshold for acceptable fit					Model fit
		CFI (>0.9)	TLI (>0.9)	RMSEA (<0.1 [90% CI])	SRMR (<0.1)	R-Squared (>0.30)	
Stereotype	4 items (Q1, Q2, Q4, Q5)	0.883	0.650	0.252 (0.226 – 0.278)	0.061	Q1=0.19, otherwise >0.30	Unacceptable
	3 items (Q2, Q4, Q5)	1.000	1.000	<0.001 (<0.001 – <0.001)	<0.001	All >0.30	Acceptable/Good
Prejudice	7 items (Q6, Q7, Q9, Q10, Q11, Q12, Q15)	0.944	0.916	0.108; 0.098 - 0.118	0.035	All >0.30	Unacceptable
	3 items (Q6, Q9, Q10)	1.000	1.000	<0.001; <0.001 – <0.001	<0.001	All >0.30	Acceptable/Good
Fear	4 items (Q8, Q13, Q14, Q27)	0.993	0.980	0.068; 0.043 – 0.096	0.013	All >0.30	Acceptable/Good
Three-dimensional model	15 items (Q1, Q2, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q27)	0.879	0.853	0.094; 0.091 – 0.097	0.065	Q1=0.22 otherwise >0.30	Unacceptable
	10 items (Q2, Q4, Q5, Q6, Q8, Q9, Q10, Q13, Q14, Q27)	0.931	0.903	0.091; 0.084 – 0.098	0.054	All >0.30	Acceptable

Abbreviations: CFI, comparative-fit index; CI, confidence interval; COVID-PSS coronavirus disease 2019-public stigma scale; RMSEA, root mean square error of approximation; SRMR, standardized root mean squared residual; TLI, Tucker-Lewis Index.

Table S5 Results of Nonparametric Item Response Theory Analysis of the Final 10-Item COVI-PSS (n=4,004)

Item	Loevinger's H Coefficients (H^s)†	Z-statistics	*P*-Value	Monotonicity Assumption (Criterion <80)
Subscale: Stereotype				
Item 1: (Q2)	0.50	41.31	<0.001	-10
Item 2: (Q4)	0.59	49.71	<0.001	-15
Item 3: (Q5)	0.58	48.18	<0.001	-14
Subscale: Prejudice				
Item 4: (Q6)	0.55	47.03	<0.001	-13
Item 5: (Q9)	0.56	48.84	<0.001	-13
Item 6: (Q10)	0.53	45.34	<0.001	34
Subscale: Fear				
Item 7: (Q8)	0.48	49.68	<0.001	9
Item 8: (Q13)	0.61	62.71	<0.001	1
Item 9: (Q14)	0.58	58.28	<0.001	-14
Item 10: (Q27)	0.51	52.40	<0.001	3

†Loevinger's H Coefficients indicates that, if H^s <0.3, the scale has poor scalability properties; 0.3 ≤ H^s <0.4, the scale is weak; 0.4 ≤ H^s <0.5, the scale is medium; and H^s ≥0.5, the scale is strong.
Abbreviations: COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S6 Correlation Among the Final 10-Item COVID-PSS Subscales (n=4,004)[†]

COVID-PSS Subscales	Mean (SD)	Median (Min-Max)	Correlation (95% CI)		
			Stereotype	Prejudice	Fear
Stereotype	8.2 (3.0)	8 (3 – 15)	1.00		
Prejudice	5.7 (2.7)	5 (3 – 15)	0.53 (0.51 – 0.55)	1.00	
Fear	10.4 (3.8)	10 (4 – 20)	0.35 (0.32 – 0.38)	0.52 (0.50 – 0.54)	1.00

[†]Spearman rank correlation test, all *P*-value <0.001.

Abbreviations: CI, confidence interval; COVID-PSS, coronavirus disease 2019-public stigma scale; SD, standard deviation.

Table S7 Multiple Lineal Regression Analyses Examining Association of the Final 10-Item COVID-PSS with Fear of COVID-19, Perceived Risk of COVID-19 Infection, and Social Distance Scale (n=4,004)[†]

COVID-PSS	Global Fear of COVID-19			Perceived risk of COVID-19 Infection			Social Distance Scale		
	Coefficient ß (95% CI)	*P*-Value	R^2	Coefficient ß (95% CI)	*P*-Value	R^2	Coefficient ß (95% CI)	*P*-Value	R^2
Subscale: stereotype	0.18 (0.16 – 0.20)	<0.001	0.12	0.27 (0.25 – 0.29)	<0.001	0.16	0.07 (0.06 – 0.08)	<0.001	0.06
Subscale: prejudice	0.32 (0.30 – 0.34)	<0.001	0.23	0.47 (0.45 – 0.49)	<0.001	0.33	0.18 (0.17 – 0.20)	<0.001	0.20
Subscale: fear	0.41 (0.40 – 0.41)	<0.001	0.71	0.52 (0.52 – 0.53)	<0.001	0.84	0.17 (0.16 – 0.18)	<0.001	0.36
Summary score	0.17 (0.16 – 0.17)	<0.001	0.49	0.23 (0.22 – 0.24)	<0.001	0.65	0.08 (0.07 – 0.08)	<0.001	0.29

[†]Adjusted for age, sexuality identity, marital status, education level, religion, occupation, living status, personal income, history of mental illness, history of chronic non-communicable disease, quarantine status.

Abbreviations: CI, confidence interval; COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S8 Number of Participants with Each COVID-PSS Score and Corresponding to Anchor-Based Questions: Global Fear of COVID-19

COVID-PSS Score	Participant Total	Global Fear of COVID-19					
		No. of Participant			Mean (SD)	Median (min-max)	Mode
		No/minimal (0-3 Points)	Moderate (4-6 Points)	Severe (7-10 Points)			
10	90	26	64	0	4.2 (1.4)	4 (2 – 6)	4
11	55	19	29	7	4.4 (1.6)	4 (2 – 7)	4
12	62	15	42	5	4.5 (1.4)	4 (1 – 7)	4
13	67	11	51	5	4.6 (1.4)	5 (1 – 7)	4
14	94	22	66	6	4.6 (1.5)	5 (1 – 8)	4
15	124	17	86	21	5.1 (1.4)	5 (2 – 8)	5
16	149	18	100	31	5.2 (1.4)	5 (2 – 8)	5
17	161	19	113	29	5.2 (1.4)	5 (1 – 8)	5
18	181	22	111	48	5.4 (1.4)	6 (2 – 9)	6
19	206	5	142	59	5.9 (1.3)	6 (3 – 9)	6
20	196	10	123	63	5.9 (1.4)	6 (2 – 9)	6
21	197	5	120	72	6.1 (1.4)	6 (2 – 10)	6
22	221	3	125	93	6.3 (1.5)	6 (2 – 10)	6
23	177	2	98	77	6.2 (1.3)	6 (3 – 10)	7
24	197	2	82	113	6.6 (1.4)	7 (3 – 10)	7
25	170	2	64	104	6.9 (1.4)	7 (3 – 10)	7
26	160	0	47	113	7.1 (1.4)	7 (4 – 10)	7
27	161	0	49	112	7.3 (1.4)	7 (4 – 10)	7
28	179	1	47	131	7.2 (1.4)	7 (3 – 10)	7
29	188	1	43	144	7.5 (1.4)	8 (3 – 10)	8
30	192	0	45	147	7.4 (1.3)	7 (4 – 10)	7
31	110	0	10	100	8.0 (1.2)	8 (4 – 10)	9
32	107	0	10	97	8.1 (1.3)	8 (4 – 10)	8
33	89	0	12	77	8.0 (1.3)	8 (4 – 10)	9
34	86	0	4	82	8.4 (1.1)	8 (6 – 10)	9
35	57	0	3	54	8.6 (1.1)	9 (6 – 10)	9
36	64	0	3	61	8.5 (1.1)	9 (5 – 10)	9
37	49	0	2	47	8.6 (1.0)	9 (6 – 10)	9
38	45	0	0	45	9.0 (0.8)	9 (8 – 10)	9
39	35	0	4	31	8.8 (1.3)	9 (5 – 10)	9
40	41	0	3	38	8.9 (1.3)	9 (4 – 10)	9
41	21	0	0	21	9.1 (0.8)	9 (7 – 10)	9
42	20	0	0	20	8.8 (1.0)	9 (7 – 10)	9
43	8	0	0	8	9.4 (0.5)	9 (9 – 10)	9
44	13	0	0	13	9.6 (0.5)	10 (9 – 10)	10
45	4	0	0	4	9.5 (0.6)	9 (9 – 10)	9
46	13	0	0	13	9.1 (0.8)	9 (8 – 10)	9
47	5	0	0	5	9.2 (0.4)	9 (9 – 10)	9
48	5	0	0	5	8.6 (0.5)	9 (8 – 9)	9
49	NA	NA	NA	NA	NA	NA	NA
50	5	0	0	5	9.4 (0.5)	9 (9 – 10)	9

Abbreviations: COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale; NA, not applicable.

Table S8 Number of Participants with Each COVID-PSS Score and Corresponding to Anchor-Based Questions: Perceived Dangerousness to COVID-19 (Continued)

COVID-PSS Score	Participant Total	Perceived Risk of COVID-19 Infection					
		No. of Participant			Mean (SD)	Median (min-max)	Mode
		No/minimal (0-3 Points)	Moderate (4-6 Points)	Severe (7-10 Points)			
10	90	90	0	0	2 (NA)	2 (2 – 2)	2
11	55	55	0	0	2.2 (0.4)	2 (2 – 3)	2
12	62	58	4	0	2.4 (0.6)	2 (2 – 4)	2
13	67	48	19	0	3.0 (0.9)	3 (2 – 5)	3
14	94	65	29	0	3.0 (1.0)	3 (2 – 6)	2
15	124	66	57	1	3.5 (1.1)	3 (2 – 7)	3
16	149	78	68	3	3.5 (1.2)	3 (2 – 8)	4
17	161	69	92	0	3.7 (1.2)	4 (2 – 6)	4
18	181	55	116	10	4.1 (1.4)	4 (2 – 10)	4
19	206	48	146	12	4.3 (1.3)	4 (2 – 7)	4
20	196	36	143	17	4.6 (1.4)	4 (2 – 10)	4
21	197	22	155	20	4.9 (1.3)	5 (2 – 9)	5
22	221	23	172	26	5.0 (1.4)	5 (2 – 10)	5
23	177	9	130	38	5.5 (1.5)	5 (2 – 10)	5
24	197	16	140	41	5.5 (1.6)	5 (2 – 10)	5
25	170	17	104	49	5.6 (1.6)	6 (2 – 10)	5
26	160	5	95	60	6.1 (1.4)	6 (2 – 10)	6
27	161	2	86	73	6.4 (1.4)	6 (2 – 10)	6
28	179	0	100	79	6.4 (1.4)	6 (4 – 10)	6
29	188	2	80	106	6.8 (1.4)	7 (3 – 10)	7
30	192	1	112	79	6.5 (1.1)	6 (3 – 10)	6
31	110	0	41	69	7.0 (1.3)	7 (4 – 10)	8
32	107	0	29	78	7.4 (1.4)	7 (4 – 10)	8
33	89	2	31	56	7.1 (1.6)	7 (3 – 10)	7
34	86	0	25	61	7.6 (1.4)	8 (5 – 10)	6
35	57	0	6	51	8.1 (1.3)	8 (5 – 10)	6
36	64	0	9	55	8.2 (1.3)	8 (5 – 10)	8
37	49	0	4	45	8.3 (1.2)	8 (5 – 10)	8
38	45	0	2	43	8.7 (1.2)	8 (6 – 10)	10
39	35	0	0	35	9.1 (0.9)	9 (7 – 10)	10
40	41	0	1	40	8.7 (1.1)	9 (6 – 10)	10
41	21	0	0	21	9.2 (1.0)	10 (7 – 10)	10
42	20	0	0	20	9.4 (0.9)	10 (8 – 10)	10
43	8	0	0	8	9.6 (0.5)	10 (9 – 10)	10
44	13	0	0	13	9.8 (0.6)	10 (8 – 10)	10
45	4	0	0	4	10 (NA)	10 (10 – 10)	10
46	13	0	1	12	9.4 (1.3)	10 (6 – 10)	10
47	5	0	0	5	9.2 (1.1)	10 (8 – 10)	10
48	5	0	0	5	9.6 (0.5)	10 (9 – 10)	10
49	NA	NA	NA	NA	NA	NA	NA
50	5	0	0	5	10 (NA)	10 (10 – 10)	10

Abbreviations: COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale; NA, not applicable.

Table S8 Number of Participants with Each COVID-PSS Score and Corresponding to Anchor-Based Questions: Social Distance Scale (Continued)

COVID-PSS Score	Participant Total	Social Distance Scale					
		No. of Participant			Mean (SD)	Median (min-max)	Mode
		No/Low (1 Points)	Moderate (2-3 Points)	High (4-7 Points)			
10	90	44	45	1	1.7 (0.8)	2 (1 – 4)	1
11	55	17	37	1	1.9 (0.7)	2 (1 – 4)	2
12	62	21	38	3	1.8 (0.7)	2 (1 – 4)	2
13	67	16	47	4	2.0 (0.8)	2 (1 – 5)	2
14	94	23	64	7	2.0 (0.8)	2 (1 – 4)	2
15	124	19	99	6	2.1 (0.7)	2 (1 – 4)	2
16	149	27	116	6	2.1 (0.7)	2 (1 – 4)	2
17	161	31	122	8	2.1 (0.8)	2 (1 – 4)	2
18	181	24	139	18	2.3 (0.8)	2 (1 – 5)	2
19	206	10	172	24	2.5 (0.8)	2 (1 – 5)	2
20	196	15	163	18	2.4 (0.8)	2 (1 – 5)	2
21	197	15	148	34	2.6 (0.9)	3 (1 – 6)	2
22	221	15	158	48	2.7 (0.9)	3 (1 – 5)	2
23	177	20	121	36	2.6 (1.0)	2 (1 – 5)	2
24	197	8	134	55	2.8 (0.9)	3 (1 – 5)	2
25	170	2	128	40	2.9 (0.9)	3 (1 – 6)	2
26	160	4	107	49	3.0 (0.9)	3 (1 – 5)	3
27	161	3	99	59	3.0 (0.9)	3 (1 – 6)	4
28	179	6	111	62	3.0 (1.0)	3 (1 – 7)	2
29	188	5	127	56	3.0 (1.0)	3 (1 – 7)	3
30	192	4	77	111	3.4 (1.0)	4 (1 – 6)	4
31	110	4	59	47	3.2 (1.1)	3 (1 – 6)	3
32	107	2	47	58	3.6 (1.1)	4 (1 – 6)	4
33	89	0	49	40	3.4 (1.1)	3 (2 – 7)	3/2
34	86	5	44	37	3.3 (1.2)	3 (1 – 6)	3
35	57	0	25	32	3.6 (1.1)	4 (2 – 6)	4
36	64	1	32	31	3.3 (0.8)	3 (1 – 5)	4
37	49	0	24	25	3.6 (1.0)	4 (2 – 6)	3/4
38	45	0	13	32	4.0 (1.1)	4 (2 – 6)	4
39	35	0	11	24	3.8 (0.9)	4 (2 – 6)	4
40	41	1	18	22	3.8 (1.3)	4 (1 – 6)	3
41	21	0	4	17	4.2 (1.1)	4 (2 – 7)	4
42	20	1	8	11	3.8 (1.3)	4 (1 – 7)	3
43	8	0	1	3	4.2 (0.7)	4 (3 – 5)	4
44	13	0	0	13	5.1 (0.9)	5 (4 – 7)	5
45	4	0	0	4	5.0 (NA)	5 (5 – 5)	5
46	13	0	2	11	4.6 (1.0)	5 (3 – 6)	4/5
47	5	0	3	2	3.6 (0.9)	3 (3 – 5)	3
48	5	0	0	5	5.0 (NA)	5 (5 – 5)	5
49	NA	NA	NA	NA	NA	NA	NA
50	5	0	0	5	5.6 (0.9)	6 (4 – 6)	6

Abbreviations: COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale; NA, not applicable.

Table S9 Proposed Sets of COVID-PSS Severity Bands

Possible COVID-PSS Bandings†	Cutoff Scores			Kappa Coefficient of Agreement with the Anchor-Based Questions (95% CI)		
	No/minimal	Moderate	High	Global Fear of COVID-19	Perceived Risk of COVID-19 Infection	Social Distance Scale
Set A	≤14	15-25	≥26	0.40 (0.37 – 0.42)	0.45 (0.42 – 0.47)	0.28 (0.25 – 0.30)
Set B	≤14	15-26	≥27	0.37 (0.35 – 0.39)	0.46 (0.43 – 0.48)	0.29 (0.26 – 0.31)
Set C	≤14	15-27	≥28	0.35 (0.32 – 0.37)	0.46 (0.43 – 0.48)	0.28 (0.26 – 0.31)
Set D	≤14	15-28	≥29	0.32 (0.29 – 0.34)	0.46 (0.43 – 0.48)	0.28 (0.26 – 0.31)
Set E	≤14	15-29	≥30	0.28 (0.26 – 0.30)	0.44 (0.41 – 0.46)	0.29 (0.26 – 0.32)
Set F	≤15	16-25	≥26	0.38 (0.36 – 0.40)	0.46 (0.44 – 0.48)	0.27 (0.24 – 0.29)
Set G	≤15	16-26	≥27	0.35 (0.33 – 0.38)	0.47 (0.44 – 0.49)	0.27 (0.24 – 0.30)
Set H	≤15	16-27	≥28	0.33 (0.31 – 0.35)	0.47 (0.44 – 0.49)	0.27 (0.24 – 0.30)
Set I	≤15	16-28	≥29	0.30 (0.28 – 0.32)	0.47 (0.44 – 0.49)	0.27 (0.24 – 0.30)
Set J	≤15	16-29	≥30	0.26 (0.24 – 0.29)	0.45 (0.42 – 0.48)	0.28 (0.25 – 0.31)
Set K	≤16	17-25	≥26	0.36 (0.34 – 0.38)	0.47 (0.45 – 0.50)	0.25 (0.23 – 0.28)
Set L	≤16	17-26	≥27	0.34 (0.31 – 0.36)	0.48 (0.46 – 0.51)	0.26 (0.23 – 0.28)
Set M	≤16	17-27	≥28	0.31 (0.29 – 0.34)	0.48 (0.46 – 0.51)	0.26 (0.23 – 0.28)
Set N	≤16	17-28	≥29	0.28 (0.26 – 0.31)	0.48 (0.46 – 0.51)	0.26 (0.23 – 0.28)
Set O	≤16	17-29	≥30	0.25 (0.23 – 0.27)	0.46 (0.44 – 0.49)	0.27 (0.24 – 0.29)
Set P	≤17	18-25	≥26	0.34 (0.31 – 0.36)	0.48 (0.45 – 0.50)	0.25 (0.22 – 0.27)
Set Q	≤17	19-26	≥27	0.31 (0.29 – 0.34)	0.48 (0.46 – 0.51)	0.25 (0.22 – 0.27)
Set R	≤17	19-27	≥28	0.29 (0.27 – 0.31)	0.48 (0.46 – 0.51)	0.25 (0.22 – 0.27)
Set S	≤17	19-28	≥29	0.26 (0.24 – 0.29)	0.48 (0.46 – 0.51)	0.25 (0.22 – 0.27)
Set T	≤17	19-29	≥30	0.23 (0.21 – 0.25)	0.46 (0.44 – 0.49)	0.25 (0.23 – 0.28)
Set U	**≤18**	**19-25**	**≥26**	**0.32 (0.30 – 0.34)**	**0.46 (0.44 – 0.49)**	**0.23 (0.21 – 0.25)**
Set V	≤18	19-26	≥27	0.30 (0.27 – 0.32)	0.47 (0.45 – 0.49)	0.23 (0.21 – 0.26)
Set W	≤18	19-27	≥28	0.28 (0.25 – 0.30)	0.47 (0.45 – 0.50)	0.23 (0.21 – 0.26)
Set X	≤18	19-28	≥29	0.25 (0.23 – 0.27)	0.47 (0.45 – 0.50)	0.23 (0.20 – 0.25)
Set Y	≤18	19-29	≥30	0.22 (0.19 – 0.24)	0.45 (0.43 – 0.48)	0.24 (0.21 – 0.26)

†The final COVID-PSS severity band is highlighted.

Abbreviations: CI, confidence intervals; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S10 Possible Set of COVID-PSS Scores and Interpretation Using Participant-Based Anchors

Possible COVID-PSS Bandings†	Cutoff Scores			Impact on Global Fear of COVID-19: AuROC (95% CI)		
	No/minimal	Moderate	High	No/minimal (0-3 Points)	Moderate (4-6 Points)	Severe (7-10 Points)
Set A	≤14	15-25	≥26	0.70 (0.66 – 0.73)	0.67 (0.65 – 0.68)	0.75 (0.74 – 0.76)
Set B	≤14	15-26	≥27	0.70 (0.66 – 0.73)	0.66 (0.64 – 0.67)	0.74 (0.72 – 0.75)
Set C	≤14	15-27	≥28	0.70 (0.66 – 0.73)	0.65 (0.63 – 0.66)	0.72 (0.71 – 0.74)
Set D	≤14	15-28	≥29	0.70 (0.66 – 0.73)	0.63 (0.62 – 0.64)	0.70 (0.69 – 0.72)
Set E	≤14	15-29	≥30	0.70 (0.66 – 0.73)	0.61 (0.60 – 0.62)	0.68 (0.67 – 0.69)
Set F	≤15	16-25	≥26	0.72 (0.69 – 0.76)	0.65 (0.63 – 0.66)	0.75 (0.74 – 0.76)
Set G	≤15	16-26	≥27	0.72 (0.69 – 0.76)	0.64 (0.62 – 0.65)	0.74 (0.72 – 0.75)
Set H	≤15	16-27	≥28	0.72 (0.69 – 0.76)	0.63 (0.61 – 0.64)	0.72 (0.71 – 0.74)
Set I	≤15	16-28	≥29	0.72 (0.69 – 0.76)	0.61 (0.60 – 0.63)	0.70 (0.69 – 0.72)
Set J	≤15	16-29	≥30	0.72 (0.69 – 0.76)	0.59 (0.58 – 0.61)	0.68 (0.67 – 0.69)
Set K	≤16	17-25	≥26	0.75 (0.72 – 0.79)	0.63 (0.62 – 0.65)	0.75 (0.74 – 0.76)
Set L	≤16	17-26	≥27	0.75 (0.72 – 0.79)	0.62 (0.60 – 0.63)	0.74 (0.72 – 0.75)
Set M	≤16	17-27	≥28	0.75 (0.72 – 0.79)	0.61 (0.59 – 0.62)	0.72 (0.71 – 0.74)
Set N	≤16	17-28	≥29	0.75 (0.72 – 0.79)	0.59 (0.58 – 0.61)	0.70 (0.69 – 0.72)
Set O	≤16	17-29	≥30	0.75 (0.72 – 0.79)	0.58 (0.56 – 0.59)	0.68 (0.67 – 0.69)
Set P	≤17	18-25	≥26	0.78 (0.75 – 0.81)	0.61 (0.59 – 0.63)	0.75 (0.74 – 0.76)
Set Q	≤17	19-26	≥27	0.78 (0.75 – 0.81)	0.60 (0.58 – 0.61)	0.74 (0.72 – 0.75)
Set R	≤17	19-27	≥28	0.78 (0.75 – 0.81)	0.59 (0.57 – 0.60)	0.72 (0.71 – 0.74)
Set S	≤17	19-28	≥29	0.78 (0.75 – 0.81)	0.57 (0.56 – 0.59)	0.70 (0.69 – 0.72)
Set T	≤17	19-29	≥30	0.78 (0.75 – 0.81)	0.55 (0.54 – 0.57)	0.68 (0.67 – 0.69)
Set U	**≤18**	**19-25**	**≥26**	**0.82 (0.79 – 0.84)**	**0.59 (0.57 – 0.60)**	**0.75 (0.74 – 0.76)**
Set V	≤18	19-26	≥27	0.82 (0.79 – 0.84)	0.58 (0.56 – 0.59)	0.74 (0.72 – 0.75)
Set W	≤18	19-27	≥28	0.82 (0.79 – 0.84)	0.57 (0.55 – 0.58)	0.72 (0.71 – 0.74)
Set X	≤18	19-28	≥29	0.82 (0.79 – 0.84)	0.55 (0.54 – 0.57)	0.70 (0.69 – 0.72)
Set Y	≤18	19-29	≥30	0.82 (0.79 – 0.84)	0.54 (0.52 – 0.55)	0.68 (0.67 – 0.69)

†The final COVID-PSS severity band is highlighted.

Abbreviations: AuROC, area under receiver operating characteristic curve; CIs, confidence intervals; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S10 Possible Set of COVID-PSS Scores and Interpretation Using Participant-Based Anchors (Continued)

Possible COVID-PSS Bandings†	Cutoff Scores			Impact on Perceived Risk of COVID-19 Infection: AuROC (95% CI)		
	No/minimal	Moderate	High	No/minimal (0-3 Points)	Moderate (4-6 Points)	Severe (7-10 Points)
Set A	≤14	15-25	≥26	0.70 (0.68 – 0.72)	0.67 (0.65 – 0.68)	0.80 (0.78 – 0.81)
Set B	≤14	15-26	≥27	0.70 (0.68 – 0.72)	0.68 (0.66 – 0.69)	0.80 (0.78 – 0.81)
Set C	≤14	15-27	≥28	0.70 (0.68 – 0.72)	0.68 (0.66 – 0.69)	0.78 (0.76 – 0.79)
Set D	≤14	15-28	≥29	0.70 (0.68 – 0.72)	0.68 (0.67 – 0.70)	0.76 (0.75 – 0.78)
Set E	≤14	15-29	≥30	0.70 (0.68 – 0.72)	0.68 (0.66 – 0.69)	0.74 (0.72 – 0.75)
Set F	≤15	16-25	≥26	0.73 (0.71 – 0.75)	0.67 (0.66 – 0.68)	0.79 (0.78 – 0.81)
Set G	≤15	16-26	≥27	0.73 (0.71 – 0.75)	0.68 (0.66 – 0.69)	0.79 (0.78 – 0.81)
Set H	≤15	16-27	≥28	0.73 (0.71 – 0.75)	0.68 (0.67 – 0.70)	0.78 (0.76 – 0.79)
Set I	≤15	16-28	≥29	0.73 (0.71 – 0.75)	0.69 (0.67 – 0.70)	0.76 (0.75 – 0.78)
Set J	≤15	16-29	≥30	0.73 (0.71 – 0.75)	0.68 (0.67 – 0.69)	0.74 (0.72 – 0.75)
Set K	≤16	17-25	≥26	0.77 (0.75 – 0.79)	0.67 (0.66 – 0.68)	0.80 (0.78 – 0.81)
Set L	≤16	17-26	≥27	0.77 (0.75 – 0.79)	0.68 (0.67 – 0.70)	0.79 (0.78 – 0.81)
Set M	≤16	17-27	≥28	0.77 (0.75 – 0.79)	0.68 (0.67 – 0.70)	0.78 (0.76 – 0.79)
Set N	≤16	17-28	≥29	0.77 (0.75 – 0.79)	0.69 (0.67 – 0.70)	0.76 (0.75 – 0.78)
Set O	≤16	17-29	≥30	0.77 (0.75 – 0.79)	0.68 (0.67 – 0.70)	0.74 (0.72 – 0.75)
Set P	≤17	18-25	≥26	0.80 (0.79 – 0.82)	0.67 (0.65 – 0.68)	0.80 (0.78 – 0.81)
Set Q	≤17	19-26	≥27	0.80 (0.78 – 0.82)	0.68 (0.66 – 0.69)	0.79 (0.78 – 0.81)
Set R	≤17	19-27	≥28	0.80 (0.79 – 0.82)	0.68 (0.66 – 0.69)	0.78 (0.76 – 0.79)
Set S	≤17	19-28	≥29	0.80 (0.79 – 0.82)	0.68 (0.67 – 0.70)	0.76 (0.75 – 0.78)
Set T	≤17	19-29	≥30	0.80 (0.79 – 0.82)	0.68 (0.66 – 0.69)	0.74 (0.72 – 0.75)
Set U	**≤18**	**19-25**	**≥26**	**0.82 (0.80 – 0.84)**	**0.65 (0.64 – 0.67)**	**0.80 (0.78 – 0.81)**
Set V	≤18	19-26	≥27	0.82 (0.80 – 0.84)	0.66 (0.65 – 0.68)	0.79 (0.78 – 0.81)
Set W	≤18	19-27	≥28	0.82 (0.80 – 0.84)	0.67 (0.65 – 0.68)	0.78 (0.76 – 0.79)
Set X	≤18	19-28	≥29	0.82 (0.80 – 0.84)	0.67 (0.66 – 0.69)	0.76 (0.75 – 0.78)
Set Y	≤18	19-29	≥30	0.82 (0.80 – 0.84)	0.66 (0.65 – 0.68)	0.74 (0.72 – 0.75)

†The final COVID-PSS severity band is highlighted.

Abbreviations: AuROC, area under receiver operating characteristic curve; CIs, confidence intervals; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

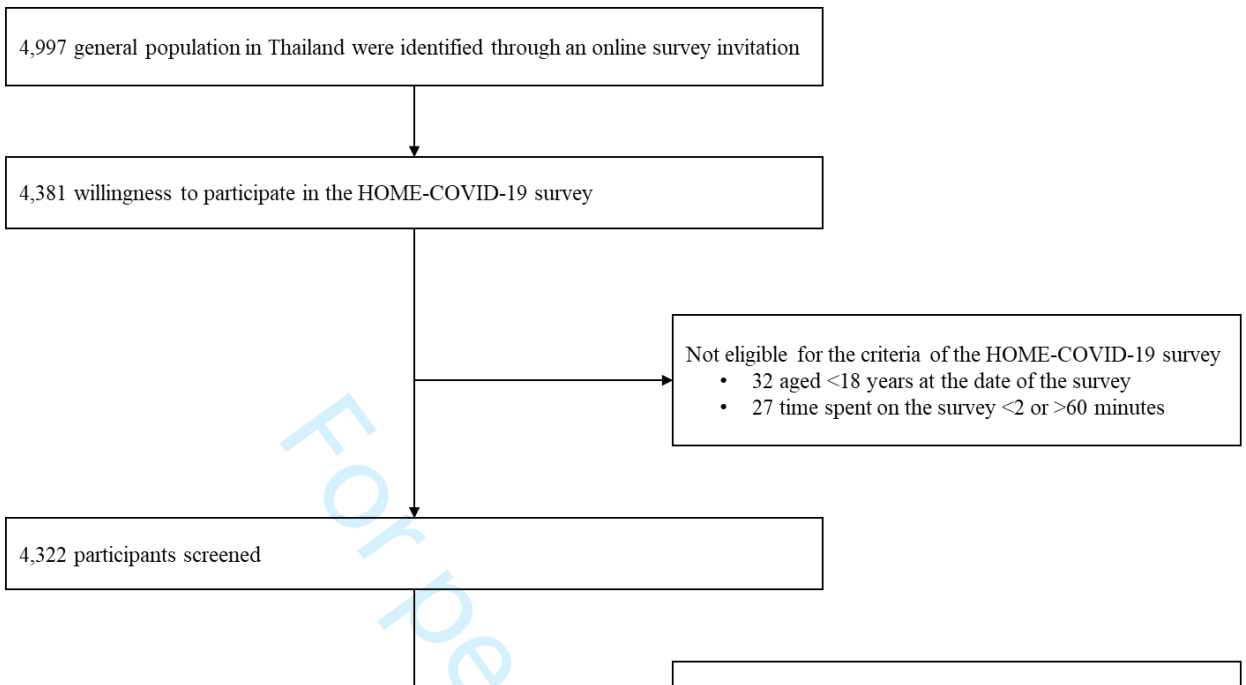
Table S10 Possible Set of COVID-PSS Scores and Interpretation Using Participant-Based Anchors (Continued)

Possible COVID-PSS Bandings†	Cutoff Scores			Impact on Social Distance Scale: AuROC (95% CI)		
	No/minimal	Moderate	High	No/Low (1 Point)	Moderate (2-3 Points)	High (4-7 Points)
Set A	≤14	15-25	≥26	0.57 (0.56 – 0.58)	0.44 (0.42 – 0.45)	0.75 (0.73 – 0.78)
Set B	≤14	15-26	≥27	0.58 (0.56 – 0.58)	0.45 (0.43 – 0.46)	0.75 (0.73 – 0.78)
Set C	≤14	15-27	≥28	0.57 (0.56 – 0.58)	0.46 (0.45 – 0.48)	0.77 (0.74 – 0.79)
Set D	≤14	15-28	≥29	0.57 (0.56 – 0.58)	0.47 (0.46 – 0.49)	0.77 (0.74 – 0.79)
Set E	≤14	15-29	≥30	0.57 (0.56 – 0.58)	0.48 (0.47 – 0.50)	0.76 (0.74 – 0.79)
Set F	≤15	16-25	≥26	0.59 (0.58 – 0.60)	0.45 (0.44 – 0.47)	0.75 (0.73 – 0.78)
Set G	≤15	16-26	≥27	0.59 (0.58 – 0.60)	0.46 (0.45 – 0.48)	0.75 (0.73 – 0.78)
Set H	≤15	16-27	≥28	0.59 (0.58 – 0.60)	0.48 (0.46 – 0.49)	0.77 (0.74 – 0.79)
Set I	≤15	16-28	≥29	0.59 (0.58 – 0.60)	0.49 (0.47 – 0.50)	0.77 (0.74 – 0.79)
Set J	≤15	16-29	≥30	0.59 (0.58 – 0.60)	0.50 (0.48 – 0.51)	0.76 (0.74 – 0.79)
Set K	≤16	17-25	≥26	0.61 (0.59 – 0.62)	0.47 (0.45 – 0.48)	0.75 (0.73 – 0.78)
Set L	≤16	17-26	≥27	0.61 (0.59 – 0.62)	0.48 (0.46 – 0.50)	0.75 (0.73 – 0.78)
Set M	≤16	17-27	≥28	0.61 (0.59 – 0.62)	0.49 (0.48 – 0.51)	0.77 (0.74 – 0.79)
Set N	≤16	17-28	≥29	0.61 (0.59 – 0.62)	0.50 (0.49 – 0.52)	0.77 (0.74 – 0.79)
Set O	≤16	17-29	≥30	0.61 (0.59 – 0.62)	0.51 (0.50 – 0.53)	0.76 (0.74 – 0.79)
Set P	≤17	18-25	≥26	0.63 (0.62 – 0.64)	0.49 (0.47 – 0.50)	0.75 (0.73 – 0.78)
Set Q	≤17	19-26	≥27	0.63 (0.62 – 0.64)	0.50 (0.48 – 0.51)	0.75 (0.73 – 0.78)
Set R	≤17	19-27	≥28	0.63 (0.62 – 0.64)	0.51 (0.50 – 0.53)	0.77 (0.74 – 0.79)
Set S	≤17	19-28	≥29	0.63 (0.62 – 0.64)	0.52 (0.51 – 0.54)	0.77 (0.74 – 0.79)
Set T	≤17	19-29	≥30	0.63 (0.62 – 0.64)	0.53 (0.52 – 0.55)	0.76 (0.74 – 0.79)
Set U	**≤18**	**19-25**	**≥26**	**0.65 (0.64 – 0.66)**	**0.50 (0.49 – 0.52)**	**0.75 (0.73 – 0.78)**
Set V	≤18	19-26	≥27	0.65 (0.64 – 0.66)	0.51 (0.50 – 0.53)	0.75 (0.73 – 0.77)
Set W	≤18	19-27	≥28	0.65 (0.64 – 0.66)	0.53 (0.51 – 0.54)	0.77 (0.74 – 0.79)
Set X	≤18	19-28	≥29	0.65 (0.64 – 0.66)	0.54 (0.52 – 0.55)	0.77 (0.74 – 0.79)
Set Y	≤18	19-29	≥30	0.65 (0.64 – 0.66)	0.54 (0.53 – 0.56)	0.76 (0.74 – 0.79)

†The final COVID-PSS severity band is highlighted.

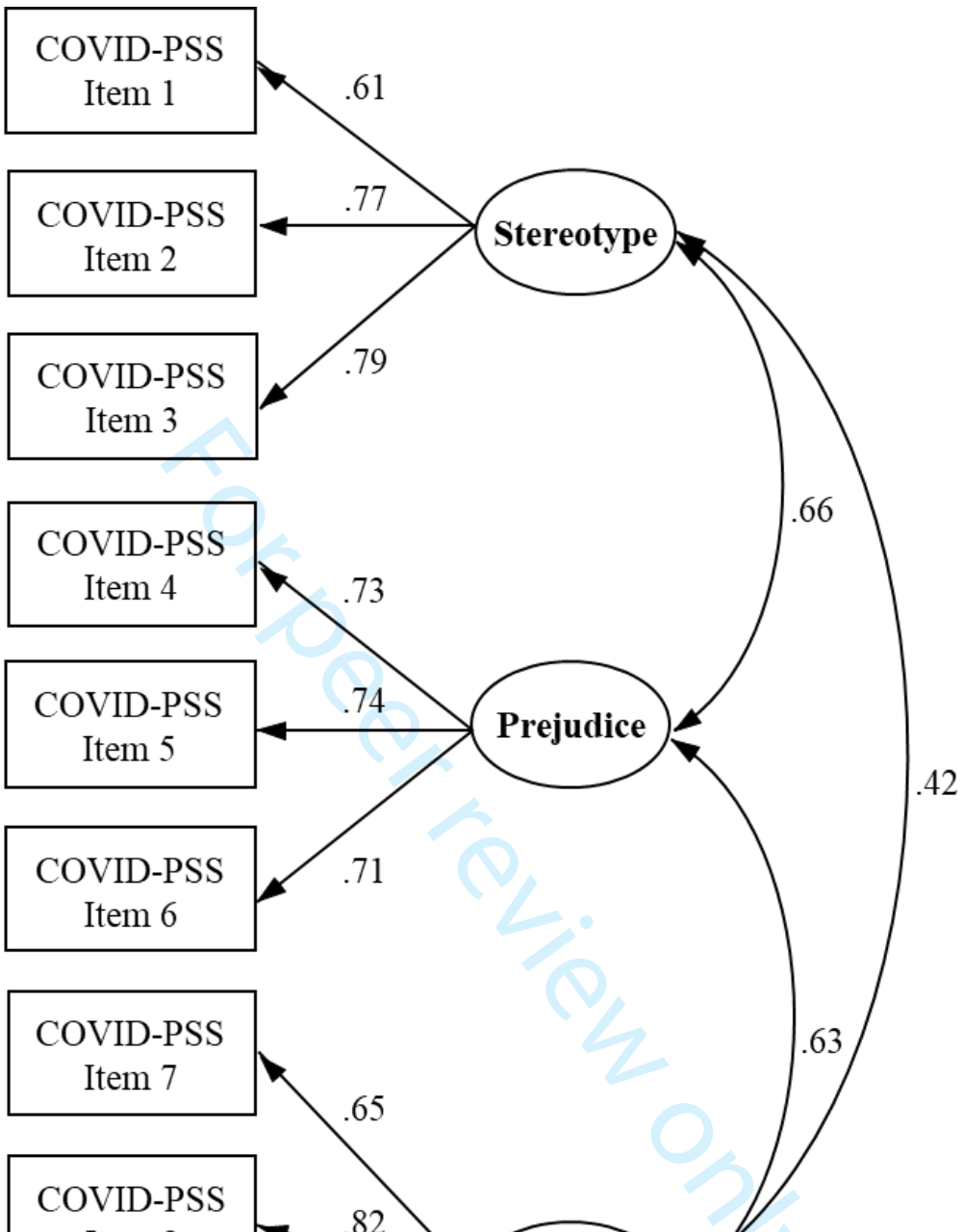
Abbreviations: AuROC, area under receiver operating characteristic curve; CIs, confidence intervals; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Figure S1 Flowchart on the Selection of Eligible Participants



Abbreviation: HOME-COVID-19, The Health Outcomes and Mental Health Care Evaluation Survey Research Group-Coronavirus disease 2019

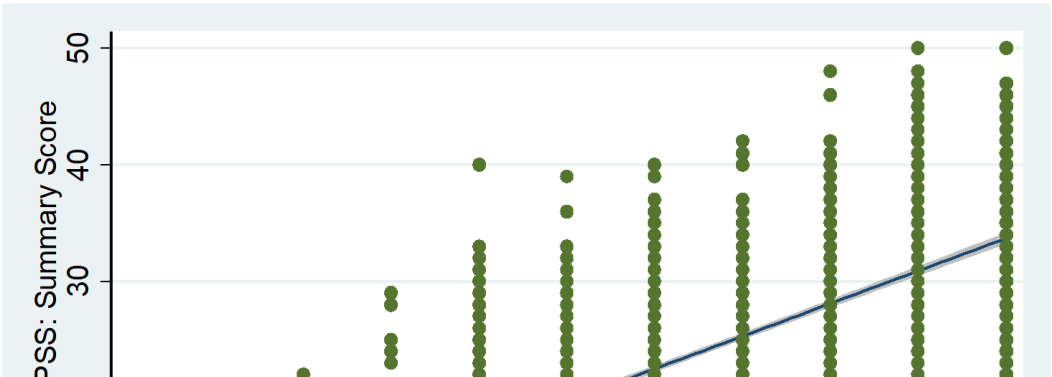
Figure S2 Three-Factor Model of the COVID-PSS



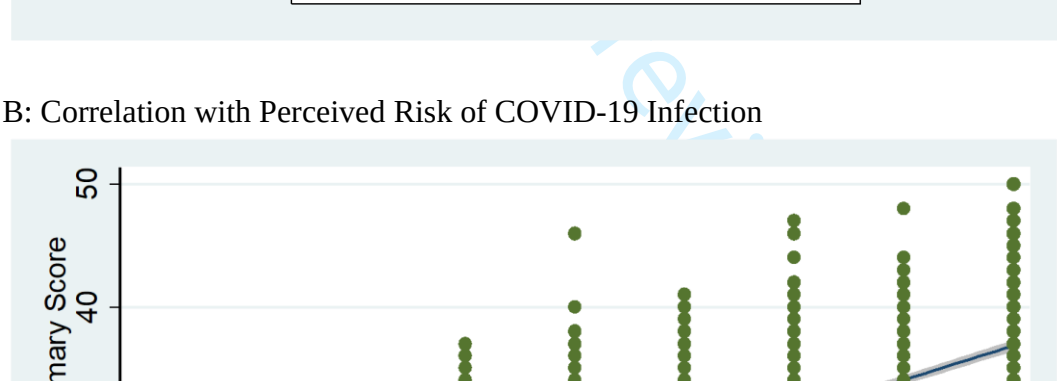
Abbreviation: COVID-PSS, coronavirus disease-2019-public stigma scale

Figure S3 Correlations Between Measures of the Psychosocial-Related to COVID-19 and the COVID-PSS Scores

A: Correlation with Fear of COVID-19



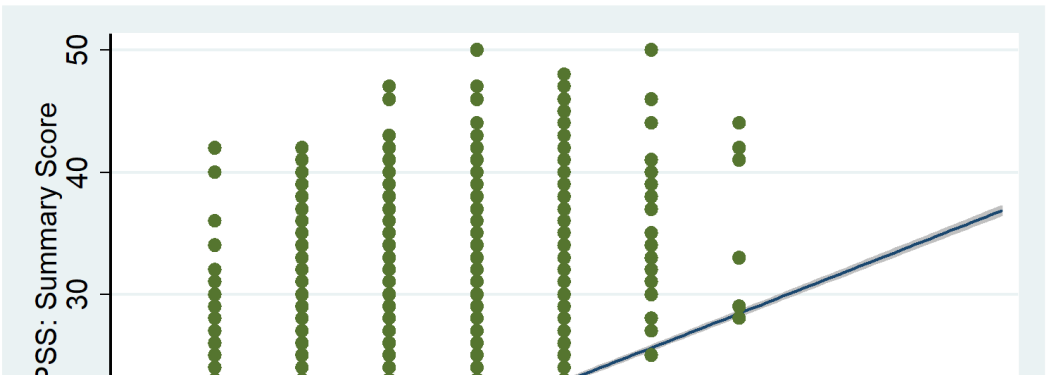
B: Correlation with Perceived Risk of COVID-19 Infection



Abbreviations: COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Figure S3 Correlations Between Measures of the Psychosocial-Related to COVID-19 and the COVID-PSS Scores (Continued)

C: Correlation with Social Distance Scale



Appendix I: The 30-Item Pilot Questionnaire

คำชี้แจง กรุณาตอบข้อคำถามในแต่ละข้อต่อไปนี้ว่าท่านมีความคิดเห็นต่อข้อคำถามนั้น มากน้อยเพียงใด โดยทำเครื่องหมาย ✓ ลงในช่อง ที่ตรงกับความรู้สึกเกิดขึ้นกับท่านมากที่สุด

ความคิดเห็นที่ตรงกับท่านมากที่สุด	1	หมายถึง	เห็นด้วยน้อยที่สุด
	2	หมายถึง	เห็นด้วยน้อย
	3	หมายถึง	เห็นด้วยปานกลาง
	4	หมายถึง	เห็นด้วยมาก
	5	หมายถึง	เห็นด้วยมากที่สุด

ข้อคำถาม		ความคิดเห็นที่ตรงกับท่านมากที่สุด				
		1	2	3	4	5
Q1	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ภูมิต้านทานไม่ดี	☐	☐	☐	☐	☐
Q2	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่ใส่ใจการดูแลสุขภาพ	☐	☐	☐	☐	☐
Q3	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ดื่มแอลกอฮอล์	☐	☐	☐	☐	☐
Q4	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่ค่อยสนใจและปฏิบัติตามคำแนะนำของผู้เชี่ยวชาญ	☐	☐	☐	☐	☐
Q5	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ชอบกิน/เที่ยว สังสรรค์	☐	☐	☐	☐	☐
Q6	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นตัวเชื้อโรค	☐	☐	☐	☐	☐
Q7	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนไม่มีความรู้ ขาดการศึกษา	☐	☐	☐	☐	☐
Q8	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นอันตรายต่อผู้อื่น	☐	☐	☐	☐	☐
Q9	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นภาระต่อครอบครัวและสังคม	☐	☐	☐	☐	☐
Q10	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่รับผิดชอบต่อสังคม	☐	☐	☐	☐	☐
Q11	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 น่ารังเกียจ	☐	☐	☐	☐	☐
Q12	คนที่ติดเชื้อไวรัสโควิด-19 ควรจะละอายใจ	☐	☐	☐	☐	☐

Appendix I: The 30-Item Pilot Questionnaire (Continued)

คำชี้แจง กรุณาตอบข้อคำถามในแต่ละข้อต่อไปนี้ว่าท่านมีความคิดเห็นต่อข้อคำถามนั้น มากน้อยเพียงใด โดยทำเครื่องหมาย ✓ ลงในช่อง ที่ตรงกับความรู้สึกเกิดขึ้นกับท่านมากที่สุด

ความคิดเห็นที่ตรงกับท่านมากที่สุด	1	หมายถึง	เห็นด้วยน้อยที่สุด
	2	หมายถึง	เห็นด้วยน้อย
	3	หมายถึง	เห็นด้วยปานกลาง
	4	หมายถึง	เห็นด้วยมาก
	5	หมายถึง	เห็นด้วยมากที่สุด

ข้อคำถาม		ความคิดเห็นที่ตรงกับท่านมากที่สุด				
		1	2	3	4	5
Q13	ฉันรู้สึกกลัวคนที่ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q14	ฉันรู้สึกกลัวคนที่มีความเสี่ยงที่จะติดเชื้อไวรัสโควิด-19 แม้ว่าเขาจะยังไม่ได้ติดเชื้อก็ตาม	☐	☐	☐	☐	☐
Q15	ฉันรู้สึกโกรธคนที่ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q16	ถ้าฉันติดเชื้อไวรัสโควิด-19 ฉันจะไม่เปิดเผยสิ่งนี้กับใคร	☐	☐	☐	☐	☐
Q17	ฉันคิดว่าจะปิดบังคนรอบข้าง หากมีคนในครอบครัวติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q18	ฉันกลัวว่าจะถูกเลือกปฏิบัติ หากคนในครอบครัวติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q19	ถ้าฉันติดเชื้อไวรัสโควิด-19 ฉันจะบอกเพื่อนให้เพื่อนทราบ	☐	☐	☐	☐	☐
Q20	หากคนในครอบครัวของฉันติดเชื้อไวรัสโควิด-19 ฉันจะเข้าไปดูแลอย่างดี	☐	☐	☐	☐	☐
Q21	ฉันรู้สึกสงสารคนที่ติดเชื้อไวรัสโควิด-19 ทุกคน	☐	☐	☐	☐	☐
Q22	ผู้คนมักจะดูแลและเห็นอกเห็นใจคนที่ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q23	ฉันอยากจะเข้าไปช่วยคนที่ติดเชื้อไวรัสโควิด-19 หากทำได้	☐	☐	☐	☐	☐

Appendix I: The 30-Item Pilot Questionnaire (Continued)

คำชี้แจง กรุณาตอบข้อคำถามในแต่ละข้อต่อไปนี้ว่าท่านมีความคิดเห็นต่อข้อคำถามนั้น มากน้อยเพียงใด โดยทำเครื่องหมาย ✓ ลงในช่อง ที่ตรงกับความรู้สึกเกิดขึ้นกับท่านมากที่สุด

ความคิดเห็นที่ตรงกับท่านมากที่สุด	1	หมายถึง	เห็นด้วยน้อยที่สุด
	2	หมายถึง	เห็นด้วยน้อย
	3	หมายถึง	เห็นด้วยปานกลาง
	4	หมายถึง	เห็นด้วยมาก
	5	หมายถึง	เห็นด้วยมากที่สุด

ข้อคำถาม		ความคิดเห็นที่ตรงกับท่านมากที่สุด				
		1	2	3	4	5
Q24	คนที่ติดเชื้อไวรัสโควิด-19 น่าจะมีความผิดทางกฎหมายด้วย เพราะทำให้คนอื่นพลอยเดือดร้อน	☐	☐	☐	☐	☐
Q25	รัฐบาลน่าจะเอาทรัพยากรทั้งบุคคล และเครื่องมือ มาทุ่มเทกับคนที่ยังไม่ติดเชื้อดีจะกว่า	☐	☐	☐	☐	☐
Q26	รัฐบาลควรจะประกาศรายชื่อผู้ติดเชื้อไวรัสโควิด-19 และคนในครอบครัวทั้งหมด เพื่อให้ประชาชนรับทราบและไม่เข้าใกล้บุคคลเหล่านี้	☐	☐	☐	☐	☐
Q27	ฉันรู้สึกกลัวว่าจะติดเชื้อไวรัสโควิด-19 ได้ ถ้าอาศัยอยู่ในชุมชนเดียวกับผู้ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q28	คนที่ติดเชื้อไวรัสโควิด-19 น่าจะเอาไปกักตัวไว้ที่เกาะใดเกาะหนึ่งต่างหาก ไม่ควรมาอยู่ในชุมชน	☐	☐	☐	☐	☐
Q29	คนที่ติดเชื้อไวรัสโควิด-19 ควรถูกขับไล่ออกจากชุมชน	☐	☐	☐	☐	☐
Q30	คนที่ติดเชื้อไวรัสโควิด-19 ควรถูกปฏิเสธรับเข้าทำงาน หรือควรถูกให้ออกจากงาน	☐	☐	☐	☐	☐

Appendix II: The Final 10-Item COVID-PSS (Validated Thai Version)

คำชี้แจง กรุณาตอบข้อคำถามในแต่ละข้อต่อไปนี้ว่าท่านมีความคิดเห็นต่อข้อคำถามนั้น มากน้อยเพียงใด โดยทำเครื่องหมาย ✓ ลงในช่อง ที่ตรงกับความรู้สึกเกิดขึ้นกับท่านมากที่สุด

ความคิดเห็นที่ตรงกับท่านมากที่สุด	1	หมายถึง	เห็นด้วยน้อยที่สุด
	2	หมายถึง	เห็นด้วยน้อย
	3	หมายถึง	เห็นด้วยปานกลาง
	4	หมายถึง	เห็นด้วยมาก
	5	หมายถึง	เห็นด้วยมากที่สุด

ข้อคำถาม	ความคิดเห็นที่ตรงกับท่านมากที่สุด				
	1	2	3	4	5
❶ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่ใส่ใจการดูแลสุขภาพ	☐	☐	☐	☐	☐
❷ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่ค่อยสนใจและปฏิบัติตามคำแนะนำของผู้เชี่ยวชาญ	☐	☐	☐	☐	☐
❸ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ชอบกิน/เที่ยว สังสรรค์	☐	☐	☐	☐	☐
❹ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นตัวเชื้อโรค	☐	☐	☐	☐	☐
❺ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นภาระต่อครอบครัวและสังคม	☐	☐	☐	☐	☐
❻ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่รับผิดชอบต่อสังคม	☐	☐	☐	☐	☐
❼ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นอันตรายต่อผู้อื่น	☐	☐	☐	☐	☐
❽ ฉันรู้สึกกลัวคนที่ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
❾ ฉันรู้สึกกลัวคนที่มีความเสี่ยงที่จะติดเชื้อไวรัสโควิด-19 แม้ว่าเขาจะยังไม่ได้ติดเชื้อก็ตาม	☐	☐	☐	☐	☐
❿ ฉันรู้สึกกลัวว่าจะติดเชื้อไวรัสโควิด-19 ได้ ถ้าอาศัยอยู่ในชุมชนเดียวกับผู้ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐

Appendix III: The Final 10-Item COVID-PSS (Non-Validated English Version)

Instruction: Please answer each of the following questions for the degree you think of that question by marking ✓ in the box which best fits your feelings.

Best fit your opinion	1	meaning	Strongly disagree
	2	meaning	Slightly agree
	3	meaning	Moderately agree
	4	meaning	Mostly agree
	5	meaning	Strongly agree

Question	Best fit your opinion				
	1	2	3	4	5
❶ Most people infected with COVID-19 do not take care of their health.	☐	☐	☐	☐	☐
❷ Most people infected with COVID-19 do not follow expert medical advice.	☐	☐	☐	☐	☐
❸ Most people infected with COVID-19 like to party or socialize often.	☐	☐	☐	☐	☐
❹ Most people infected with COVID-19 are contaminated with germs.	☐	☐	☐	☐	☐
❺ Most people infected with COVID-19 are a burden to their families and society.	☐	☐	☐	☐	☐
❻ Most people infected with COVID-19 are socially irresponsible.	☐	☐	☐	☐	☐
❼ Most people infected with COVID-19 are a danger to other people.	☐	☐	☐	☐	☐
❽ I fear people infected with COVID-19.	☐	☐	☐	☐	☐
❾ I fear people who are at risk of COVID-19 infection even if they have not yet been infected yet.	☐	☐	☐	☐	☐
❿ I fear being infected with COVID-19 if I live a community with people who are infected with COVID-19.	☐	☐	☐	☐	☐

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STROBE Statement—Checklist of items that Should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page#
Title and abstract	1	*(a)* Indicate the study's design with a commonly used term in the title or the abstract	3
		(b) Provide in the abstract on informative and balanced summary of what was done and what was found	3
Introduction			
Background/ rational	2	Explain the scientific background and rationale for the investigation being reported	6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6, 7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	*(a)* Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7, 8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9, 10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	9-11
		(b) Describe any methods used to examine subgroups and interactions	NA
		(c) Explain how missing data were addressed	9
		(d) if applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
Results			
Participants	13*	*(a)* Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed	11, 12, Figure 1, Figure S1
		(b) Indicate number of participants with missing data for each variable of interest	NA

STROBE Statement—Checklist of items that Should be included in reports of ***cross-sectional studies*** (Continued)

	Item No	Recommendation	Page#
Results			
Participants	13*	*(c)* Consider use of a flow diagram	Figure 1, Figure S1
Descriptive data	14*	*(a)* Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table1
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	Table 2-4
Main results	16	*(a)* Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 3
		(b) Report category boundaries when continuous variables were categorized	Table 4
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarize key results with reference to study objectives	14
Limitations	19	Discussion limitations of the study, taking into account sources of potential bias or imprecision. Discussion both direction and magnitude of any potential bias	15, 16
Interpretation	20	Give a cautions overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16
Generalizability	21	Discuss the generalizability (external validity) of the study results	15, 16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for exposed and unexposed groups

Abbreviation: NA, not applicable.

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Coronavirus Disease 2019-Public Stigma Scale (COVID-PSS): Development, Validation, Psychometric Analysis, and Interpretation

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Running Title: Coronavirus Disease 2019-Public Stigma Scale

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Abstract

Objective: Amid the coronavirus disease-2019 (COVID-19) pandemic, social stigma towards COVID-19 infection has become a major component of public discourse and social phenomena. As such, we aimed to develop and validate the COVID-19-Public Stigma Scale (COVID-PSS).

Design and setting: National-based survey cross-sectional study during the lockdown in Thailand.

Participants: We invited the 4004 adult public to complete a set of measurement tools, including the COVID-PSS, global fear of COVID-19, perceived risk of COVID-19 infection, Bogardus social distance scale, pain intensity, and insomnia severity index.

Methods: Factor structure dimensionality was constructed and reaffirmed with model fit by exploratory and confirmatory factor analyses and non-parametric item responses theory (IRT) analysis. Psychometric properties for validity and reliability were tested. An anchor-based approach was performed for classifying the proper cut-off scores.

Results: After factor analysis, IRT analysis, and test for model fit, we created the final 10-item COVID-PSS with a three-factor structure: stereotype, prejudice, and fear. Face and content validity were established through the public's and experts' perspectives. The COVID-PSS was significantly correlated (Spearman rank [95% confidence intervals) with the global fear of COVID-19 (0.68 [0.66 to 0.70]), perceived risk of COVID-19 infection (0.79 [0.77 to 0.80]), and the Bogardus social distance scale (0.50 [0.48 to 0.53]), indicating good convergent validity. The correlation statistics between the COVID-PSS and the pain intensity and insomnia severity index were <0.2, supporting the discriminant validity. The reliability of the COVID-PSS was satisfactory, with good internal consistency (Cronbach's α of 0.85 [0.84 to 0.86]) and test-retest reproducibility (intraclass correlation of 0.94 [0.86 to 0.96]). The

proposed cut-off scores were as follows: no/minimal (≤18), moderate (19-25), and high (≥26) public stigma towards COVID-19 infection.

Conclusions: The COVID-PSS is practical and suitable for measuring stigma towards COVID-19 in a public health survey. However, cross-cultural adaptation may be needed.

Keywords: Coronavirus, COVID-19, instrument, psychometric properties, public stigma.

Strengths and limitations of this study

- The COVID-PSS was generated based on a qualitative and quantitative approach via a multi-stage survey design.
- Sophisticated and comprehensive methods verified the dimensionality of the final COVID-PSS.
- However, cross-cultural adaptation and longitudinal studies are needed.

INTRODUCTION

Since the wide spread of the coronavirus disease-2019 (COVID-19) worldwide, scholars have reported its social impacts and psychological consequences.[1 2] With the COVID-19 outbreak, social stigma, xenophobia, and discrimination have become major components of the public discourse and social phenomena, as the so-called COVID-19 effects.[3 4] Social reactions, including negative emotion, feeling of fear, perception of danger, social sanctions, and antagonism, towards specific high-risk groups have been noted at both national and international levels.[5 6] However, reports addressing the psychological impact of and responses to COVID-19 in terms of public stigma have been limited.

Amid the COVID-19 pandemic, there is a need for a validated instrument for measuring public stigma towards COVID-19 infection that encompasses these unique reactions. The development and use of a standardised scale will provide a better understanding of the stigmas toward COVID-19 and track the public responses to the COVID-19 pandemic. Thus, we aimed to develop and validate the COVID-19-Public Stigma Scale (COVID-PSS), a simple and practicable measurement tool that can be incorporated into research and public health surveys. To maximise the appropriate interventions and minimise stigma, we aimed to establish the validity, reliability, and interpretation of the COVID-PSS by classifying severity cut-off scores corresponding to the psychosocial impact of the COVID-19 pandemic on the daily lives of people; the scores reflected the participants' values and perspectives.

METHODS

Study design and participants

For the national-based public survey—the Health Outcomes and Mental Health Care Evaluation Survey: Under the Pandemic Situation of COVID-19 (HOME-COVID-19)[7], adult

respondents were invited to complete a set of measurement tools for mental and psychosocial problems, including public stigma towards COVID-19 infection during the lockdown in Thailand. Details of the survey protocol are described elsewhere. In brief, an online questionnaire survey via the SurveyMonkey® (https://www.surveymonkey.com) that limits one-time participation per unique internet protocol address was adopted to minimise face-to-face interaction, per the physical distancing strategy. Convenience and snowball sampling strategies were employed for participant recruitment through social media networks via links QR codes, including public websites, Twitter, Facebook, Instagram, and LINE applications.

Participants were eligible for this study if they were Thai who were older than 18 years on the date of the survey, could read and communicate in the Thai language, and gave their online informed consent, which was embedded on the first page of the questionnaire. Ethics approval was obtained from the Committee of Research Ethics of the Faculty of Public Health (ET010/2020) and Faculty of Pharmacy (23/2563), Chiang Mai University.

Procedures

Figure 1 presents the series of phases and methods used in the study. Details of the methodology used for this study are described in online supplement (eMethods). Briefly, phase I involved item generation. We conducted a comprehensive literature review of relevant sources on public stigma to COVID-19, including the various paradigms of perceived public stigma towards persons with mental illness[8-12], infectious diseases (HIV, Ebola virus, leprosy, severe acute respiratory syndrome)[13-17], indigenous identity (minority groups)[18], disability (intellectual disabilities)[19], and addictive behaviours (gambling, alcohol use disorder).[20 21] With a sample of the 30 general population, we used a combination of structured and non-structured in-depth interviews to explore the perceived public stigma to COVID-19 infection. The candidate items were selected based on cultural norms and

relevance to the COVID-19 pandemic, focusing on the public's experience. The initial item bank was identified to yield the 42-item predefined questionnaire.

Phase II was the development of the pilot questionnaire. We asked a panel of experts to comment on the 42-item predefined questionnaire to determine the importance of the items and subsequently reduced it to the 30-item pilot questionnaire. The items were rated on a five-point Likert scale, which allowed for greater variation in response; a higher score indicated higher social stigma. Another sample of 30 respondents was invited to complete the 30-item pilot COVID-PSS to evaluate such dimensions as face and content validity. Based on public and expert views, the 30-item pilot COVID-PSS was reworded/substituted (Supplementary Appendix S1).

In phase III, involving the refinement of the questionnaire, we recruited a sample from the public through various social media platforms. During Wave I of the HOME-COVID-19 survey in Thailand (21 April to 4 May 2020)[7], a total of 4004 participants completed the 30-item pilot COVID-PSS. We used a 1:1 ratio of participants to enable a random analysis of instrument dimensionality using exploratory factor analysis (EFA) and test for scale structure using confirmatory factor analysis (CFA). In addition, non-parametric item responses theory (IRT) was performed to analyse the unidimensional set of items of the subscales of the COVID-PSS.

In phase IV, psychometric analysis, validity and reliability were tested to verify the psychometric properties of the final COVID-PSS. Participants were asked to complete the items on global fear of COVID-19 using a numerical rating scale (NRS) of 0-10 points, perceived risk of COVID-19 infection using an NRS of 0-10 points, the Bogardus social distance scale using a rank order system of 1-7 points[22], pain intensity using an NRS of 0-10 points[9], and items on the insomnia severity index.[23] Test-retest reliability was then analysed

based on a convenience subset of 409 participants who completed the final COVID-PSS a second time, approximately three to five days after their first survey.

Finally, for phase V, meaningful interpretation, we used an anchor-based approach to establish an interpretation of the final COVID-PSS by classifying severity cut-off scores such that they directly reflected the participants' values and perspectives.[24 25]

Statistical analyses

Per the rule of thumb, 10-15 cases per candidate item are required.[26] Thus, the required number of participants in this study ranged from 300-450. To obtain a stable factor structure, enable non-parametric IRT and psychometric analyses, and compensate for missing responses of 30%, we calculated a minimum target of 585 as required per sub-cohort (EFA and CFA cohorts), for a total of at least 1170 participants needed in this study.

All statistical analyses were analysed using STATA 14.0 (StataCorp LP). The confidence intervals (CIs) of the correlation statistics were calculated by the bootstrap resampling method to address the level of significance. *P* values <0.05 were considered statistically significant, using two-tailed tests. Missing values were imputed with a multiple imputation method. However, items or participants with high levels of missing data (>20%) were excluded from the analyses. To describe the study population and results of all test assessments, we analysed standard descriptive statistics, using measures of central tendency and variability for the continuous variables, and frequency and percentage for the categorical variables. Item scores were summarised descriptively, with the normality of score distribution assessed by skewness and kurtosis tests. Items that demonstrated a floor or ceiling effect of >80% were removed.

The Kaiser-Meyer-Olkin measure and Bartlett test of sphericity were performed to ensure the appropriate use of factor analysis. For the EFA cohort, we performed an EFA by a

principal factor extraction method, with the factor obliquely rotated using the promax criterion. Eigenvalues greater >1.0 and the scree plot with the number of factors that explained >5% of the variance were used to define the number of factors retained.[27 28] The parallel analysis was also performed to confirm the optimal threshold for the number of factors or subscale components. To develop a practical and concise measurement tool, we considered items as acceptable, and thus retained items, if the loading coefficient was >0.6. The item characteristics were reviewed by a panel of experts designated by the search team to determine item inclusion or exclusion. We then analysed scale structure using CFA (CFA cohort) with the maximum likelihood estimation. A CFA was conducted to confirm how correctly a hypothesised model matched the factor structure by EFA, as described above. To determine the appropriateness of the tested model, we tested the fit indices, including the root mean square error of approximation, standardised root mean squared residual, comparative-fit index, and Tucker-Lewis index.[29-32] Moreover, the coefficient of determination (R-squared) and item-scale correlations (standardised factor loading) were estimated to establish the acceptability of the final structure of the COVID-PSS. The unidimensional set of items of the COVID-PSS was identified and model fit assessed via EFA and CFA, respectively. Subsequently, we implemented the non-parametric IRT analysis to establish the unidimensionality of the set of items with respect to the relation between latent traits and responses to the items.[33] Taken together, the final decision for the final COVID-PSS items was theoretically based on all psychometric performances.

Face and content validity were ensured through the comprehensive development of the questionnaire by literature review, public interviews, and expert review. Convergent validity was evaluated using Spearman's correlation coefficients between the final COVID-PSS and other instruments, including the global fear of COVID-19, perceived risk of COVID-19 infection, and Bogardus social distance scale. Convergent validity was recognised

if the correlation value was >0.4. Multiple linear regression was also performed to confirm the linearity of these findings. To establish the discriminant validity, we estimated the bivariate correlation between the final COVID-PSS and the pain intensity scale and insomnia severity index. We hypothesised a non-significant to fair correlation for the COVID-PSS scores and the specific tools (correlation statistic, 0.0-0.2). Cronbach's α coefficient was calculated to determine internal consistency reliability, with a value of ≥0.70 indicating acceptable reliability.[34] Test-retest reliability was assessed by the intraclass correlation coefficients (ICCs) between the first and second surveys (three to five days later), which a value of ≥0.8 or higher indicating acceptable reproducibility.

The final COVID-PSS was used to measure the degree of social stigma towards COVID-19 infection against three sets of anchor questions, including the global fear of COVID-19, perceived risk of COVID-19 infection, and Bogardus social distance scale. The proposed banding for the final COVID-PSS scores was divided using the mean, median, and mode of the anchor-based questions. The kappa (κ) coefficient of the agreement and area under the receiver operating characteristic curve (AuROC) were calculated to assess optimal COVID-PSS cut-off scores. Effects of covariates on the AuROC values based on the proposed COVID-PSS cut-off scores were explored using the participant characteristics. Sensitivity and specificity with the corresponding 95% CIs were also estimated.[35]

Patients and public involvement

The public was engaged in the expert group during the in-depth interview that performed an item generation process of the COVID-PSS, and they also participated in the pilot testing and refinement of the questionnaire. However, the public was not involved in the study design and conceptualised of the present study.

RESULTS

Among the 4322 participants screened in the first wave of the HOME-COVID-19 survey, 318 (7.4%) participants with non-completed questionnaires were excluded (Supplementary, Figure S1). However, no significant difference was found between those who completed the survey and those with partial responses (Supplementary, Table S1). As such, only the complete cases were accepted and considered in our analysis. A total of 4004 participants who completed the instruments test were eligible for this study. We found no difference in characteristics after we randomly split the study population into a 1:1 ratio for the EFA (n = 2002) and CFA (n = 2002) cohorts. Overall, the participants had a mean age ± standard deviation of 29.1 ± 10.8 years. Among the participants, 65.4% were women. The participants' characteristics are described in Table 1.

According to the item analysis, three items of the 30-item pilot questionnaire (Q16, Q29, Q30) were removed owing to floor effects exceeding 80% (Supplementary, Table S2). Based on the statistical criterion and clinical judgment of the panel experts, the factor analysis of the EFA cohort identified 15 candidate items (Q1, Q2, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q27) with factor loading more than 0.6, and parallel analysis that encompassed the three potential factors (Supplementary, Figure S2). The 15-item prototype of the COVID-PSS explained 82.0% of the variance (Supplementary, Table S3). For the CFA cohort, the unidimensionality of each factor (subscale) and the overall three-dimensional model were then evaluated and reevaluated by examining the modification indices. The CFA affirmed three unidimensional sets of items (subscale) with acceptable fit indices. Results of the CFAs of evaluated and re-evaluated models are illustrated in Supplementary, Table S4. The information criteria indices favoured reducing the sets of 15 candidate items to a 10-item refinement, supporting the three-dimensional model. The first factor had three items (Q2, Q4, Q5); factor 2 had three items (Q6, Q9, Q10), and factor 3 had

four items (Q8, Q13, Q14, Q27). The correlated factors model of the 10-item COVID-PSS is presented in Supplementary, Figure S3. A non-parametric IRT analysis also supported the 10-item tool with a three factor structure in terms of unidimensionality, local independence, and monotonicity (Supplementary, Table S5). The final decision of the 10-item COVID-PSS captured three retained factors, namely, stereotype, prejudice, and fear (Table 2). The final validated Thai and non-validated English version of the 10-item COVID-PSS are provided in Supplementary, Appendix S2 and S3, respectively.

The face and content validity of the final 10-item COVID-PSS were established through comprehensive item bank generation, public and expert review, as well as factor analysis. The correlation among the final 10-item COVID-PSS subscales ranged from 0.35-0.53 (Supplementary, Table S6). The psychometric properties of the final 10-item COVID-PSS are presented in Table 3. As expected, the final 10-item PSS and its subscales were all markedly positively correlated with the sets of the psychosocial impact of COVID-19 on daily life, including global fear, perceived risk, and social distance (P <0.001 for all). Furthermore, multiple linear regression also demonstrated these findings in terms of linearity; a one-unit increase in the sets of the psychosocial impact of COVID-19 scores substantially predicted an increase in the final 10-item COVID-PSS and its subscales (adjusted R-squared range from 0.06-0.84, P <0.001 for all, Supplementary Table S7 and Figure S4). With respect to the correlation statistics, the pattern of correlations between the final 10-item COVID-PSS and the specific tools (pain intensity scale and insomnia severity index) was in line with the aforementioned hypothesis (Spearman's correlation <0.2, Table 3), which indicated appropriate discriminant validity. The reliability of the final 10-item COVID-PSS was satisfactory, with Cronbach's α of the subscales and the summary score ranging from 0.76-0.85, and the test-retest of subsample with the ICCs ranging from 0.90-0.94 (Table 3).

The distribution of the final 10-item COVID-PSS scores characterised by the anchor-based questions (global fear of COVID-19, perceived risk of COVID-19 infection, and the Bogardus social distance scale) are provided in Supplementary, Table S8. The proposed sets of the 10-item COVID-PSS severity bands were classified into no/minimal-, moderate-, and high-stigma towards COVID-19 infection. The set U of the possible banding was preferred as the optimal 10-item COVID-PSS cut-off scores based on the κ coefficient (Supplementary, Table S9) and AuROC (Supplementary, Table S10). The categorised scores were proposed as no/minimal (≤18), moderate (19-25), and high (≥26), reflecting public values and perspectives on the anchors-based questions. The AuROC demonstrated the following ranges: no/minimal (0.65-0.82), moderate (0.50-0.65), and high (0.75-0.80). With respect to the discrimination, however, the anchor-based questions on the social distance scale provided the lowest AuROC, sensitivity, and specificity compared with the others (Table 4). Moreover, the AuROC values based on the proposed severity banding seem to have significant effects both positive and negative by the participant characteristics, particularly age of participants, sexual identity, marital status, religion, and quarantine status (P<0.05; Supplementary, Table S11).

DISCUSSION

During the early months of the COVID-19 pandemic, there was no validated measurement tool for evaluating and tracking the social stigma towards the COVID-19 infection among the public. In response to this unprecedented occurrence, we developed, validated, and investigated the psychometric properties of the COVID-PSS in the Thai public. To verify public significance and utility, we also established a banding system for the COVID-PSS (no/minimal, moderate, or high) through assigning meaning to the public's values and perspectives in terms of psychosocial responses to the COVID-19 pandemic.

The COVID-PSS was developed under a comprehensive and multidimensional approach that held a conceptual model of measurement using EFA and CFA. Non-parametric IRT also reaffirmed the fundamental assumptions (unidimensionality, local independence, and monotonicity) of the dimensional model. The final 10-item COVID-PSS consisted of three dimensions of public stigma towards the COVID-19 infection, namely, stereotype, prejudice, and fear. Factor 1 had three items related to the general public stereotype towards COVID-19 infection; Factor 2 had three items related to the prejudice for people infected with COVID-19; and Factor 3 had four items related to the fear of the COVID-19 outbreak.

Considering the absence of a reference standard, it is theoretically coherent that more participants with greater COVID-PSS scores will yield a higher degree on the psychosocial responses to the COVID-19 pandemic—feeling of fear, perceived risk, and social distance (Supplementary, Table S7). Theoretically, feeling of fear and perceived dangerousness of the pandemics are directly associated with transmission rate, widespread infodemic (rapidly and invisibly), and mortality rate.[17] We postulated that individuals with high levels of fear or perceived dangerousness of the COVID-19 pandemic could respond irrationally, created, and perpetuated stigma-related COVID-19 infection in the community. However, the Bogardus social distance scale revealed the lowest correlation (0.50 [95% CI, 0.48 to 0.53], Table 3) among the set of convergent validity testing. As the COVID-19 pandemic is an emerging and acute infectious disease, resulting in the degree of affective social distance may differ from the previous report among chronic infectious diseases.

Moreover, all positively and substantially correlated subscales of the 10-item COVID-PSS and the sets of the psychosocial impact of the COVID-19 scores also reflected the conceptualisation of the measurement tool. The 10-item COVID-PSS showed acceptable reliability with respect to internal consistency and test-retest reliability (reproducibility).

Removal of any item did not change our findings in terms of the Cronbach's α coefficient, indicating the robustness of the internal consistency and cohesion of the scale.

In establishing the optimal cut-off scores, our findings revealed that the cut-off scores by the AuROC methods were acceptable in terms of the theoretical and practical merits of the external anchor-based questions, particularly with the perceived risk of COVID-19 infection scale. The proposed cut-off scores were ideal for dividing participants who experienced no/minimal or high stigma towards COVID-19 infection. However, discrimination among the moderate groups was poor. Taken together with validity, reliability, and public utility, we hypothesised that the COVID-PSS will be suitable to capture the social stigma towards the COVID-19 pandemic and the impact on psychosocial responses in the Thai public.

Our study was performed with a comprehensive method. An initial item bank was generated via a qualitative approach to obtain the public's values and perspectives, which reflect the cultural norms. This approach is recognised as a cornerstone to developing psychometric measurement tools.[34] Meanwhile, a sophisticated quantitative approach verified a conceptual factorial structure (construct validity) via EFA. CFA and non-parametric IRT also reaffirmed the three dimensionality of the final 10-item COVID-PSS.

However, the limitations of this study must be noted. Although the conceptual factorial structure and psychometric properties, along with the adequate sample size, give an acceptable performance scale, external validation studies including the appropriateness of the 10-item COVID-PSS scores in different countries and settings are warranted to establish the generalisability of the measurement tool. Moreover, the 10-item COVID-PSS was developed and validated only in the general population; validation in other specific groups, such as healthcare workers, minorities, and vulnerable groups, would be needed. This measurement tool, nonetheless, is intended to be broadly used in all aspects of the general population to quantify the social stigma towards the COVID-19 pandemic. Lastly, this study was conducted

among the social media networks community as per the physical distancing strategy during the pandemic, selection bias owing to limit participants who can access the Internet and nonresponse effects must be stated.

To our knowledge, the COVID-PSS is the first tool that aimed to quantify the public stigma towards the COVID-19 infection in a nationwide community. The 10-item COVID-PSS could be incorporated in public health surveys as a part of clinical and intervention research. In terms of practicability and feasibility, this scale is easy to use by the general population; it can be answered in five to ten minutes. Furthermore, the proposed cut-off scores for severity banding of the COVID-PSS can help in targeted population interventions, as well as inform the decision-making process for the government and public health officials to minimise stigma. Indeed, the scale can be used to determine and maximise the effectiveness of interventions. Nonetheless, the confirmed cases in a community, cultural norms, degree of public fear, degree of media-related consumption regarding the COVID-19 outbreak, government management strategies, and public resilient coping towards the disaster or infectious outbreak may not be uniform across countries and over time. As such, cross-cultural adaptation and longitudinal studies are needed to evaluate and track the public stigma towards COVID-19 with respect to long-term effects. Further studies should enhance the translation of the scale, and the responsiveness validity should be investigated to assess the long-term consequences of the public stigma towards the COVID-19 pandemic.

CONCLUSION

The final COVID-PSS consisted 10 items and captured a three-dimensional structure: stereotype, prejudice, and fear. The 10-item COVID-PSS for evaluating and tracking public social stigma towards the COVID-19 infection is a practical scale and illustrates satisfactory

psychometric properties for validity, reliability, and public utility. This scale could be used and incorporated in public health surveys alongside clinical and intervention research.

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Contributors

RA, YR, CP, WB, S. Nanta, and WC helped to finalise the study protocol and recruit study participants. PK helped to translate the questionnaire from the Thai version to a non-validated English version of the instrument. KT, NW, and TW helped to design the study, interpret the study results, and commented on the previous version of the manuscript. S. Nochaiwong and CR were responsible for the statistical analyses and approved the final manuscript. S. Nochaiwong designed the study, and was responsible for the conduct of the study, and drafted the first version of the manuscript. All authors approved the final draft of the manuscript. S. Nochaiwong is the supervisor of the study.

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Competing interests

All authors declare no competing interests. All the researchers involved performed this study in the context of their research.

Patient and public involvement

Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication

Not required.

Ethics approval

The study was approved by the Committee of Research Ethics of the Faculty of Public Health (ET010/2020) and Faculty of Pharmacy (23/2563), Chiang Mai University.

Data availability statement

Data will be shared upon reasonable request and with permission according to the Health Outcomes and Mental Health Care Evaluation Survey Research Group (HOME-Survey) data release policy.

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Figure legends

Figure 1 Methods for the Development, Validation, Psychometric Analysis, and Interpretation of the COVID-PSS

Abbreviations: AuROC, area under the receiver operating characteristic; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale; CFA, confirmatory factor analysis; EFA, exploratory factor analysis; IRT, item response theory.

Table 1 Participant Characteristics

Characteristics	**Overall (n=4004)**	**EFA cohort (n=2002)**	**CFA cohort (n=2002)**	***P* Value**
Age, year (mean ± SD; range)	29.1 ± 10.8; (18 – 79)	29.1 ± 11.0; (18 – 73)	29.0 ± 10.7; (18 – 79)	0.712
Sexual identity				
Male	1231 (30.7)	632 (31.6)	599 (29.9)	0.269
Female	2619 (65.4)	1301 (65.0)	1318 (65.8)	
Others	154 (3.9)	69 (3.4)	85 (4.3)	
Marital status				
Single	3208 (80.1)	1601 (80.0)	1607 (80.3)	0.549
Married/domestic partnership	693 (17.3)	344 (17.2)	349 (17.4)	
Divorced/widowed/separated	103 (2.6)	57 (2.8)	46 (2.3)	
Education level				
Illiterate/primary school/junior high school	127 (3.2)	58 (2.9)	69 (3.4)	0.593
Senior high school/diploma/high vocational	1893 (47.3)	953 (47.6)	940 (47.0)	
Bachelor's degree/higher education	1984 (49.6)	991 (49.5)	993 (49.6)	
Religion				
Irreligion	375 (9.4)	176 (8.8)	199 (9.9)	0.233
Buddhist/Christian/Muslim/Others	3629 (90.6)	1826 (91.2)	1803 (90.1)	
Occupation				
Unemployed/retired	391 (9.8)	198 (9.9)	193 (9.6)	0.960
Employed	2024 (50.5)	1009 (50.4)	1015 (50.7)	
College student	1589 (39.7)	795 (39.7)	794 (39.7)	
Living status				
Alone	576 (14.4)	279 (13.9)	297 (14.8)	0.624
With family	3164 (79.0)	1586 (79.2)	1578 (78.8)	
With others	264 (6.6)	137 (6.8)	127 (6.3)	
Person income, Baht/month				
≤10000	1905 (47.6)	956 (47.7)	949 (47.4)	0.974
10001 – 20000	1054 (26.3)	526 (26.3)	528 (26.4)	
>20000	1045 (26.1)	520 (6.0)	525 (22.2)	
History of mental illness	359 (9.0)	187 (9.3)	172 (8.6)	0.439
History of chronic NCD†	599 (15.0)	303 (15.1)	296 (14.8)	0.790
Quarantine status				
Never	1781 (44.5)	879 (43.9)	902 (45.0)	0.206
Past	1575 (39.3)	813 (40.6)	762 (38.1)	
Current	648 (16.2)	310 (15.5)	338 (16.9)	
Fear of COVID-19, (mean ± SD; range)	6.7 ± 1.8 (1 – 10)	6.6 ± 1.8 (1 – 10)	6.6 ± 1.8 (1 – 10)	0.945
Perceived risk of COVID-19 infection, (mean ± SD; range)	5.5 ± 2.2 (2 – 10)	5.5 ± 2.1 (2 – 10)	5.5 ± 2.2 (2 – 10)	0.367
Bogardus social distance scale, (mean ± SD; range)	2.8 ± 1.1 (1 – 7)	2.8 ± 1.1 (1 – 7)	2.8 ± 1.1 (1 – 7)	0.111
Pain intensity scale	3.5 ± 2.8 (0 – 10)	3.5 ± 2.8 (0 – 10)	3.5 ± 2.8 (0 – 10)	0.959

Insomnia severity index	8.7 ± 5.5 (0 – 28)	8.6 ± 5.5 (0 – 28)	8.7 ± 5.5 (0 – 28)	0.444

Data are expressed as the frequency (percentage) of patients, unless otherwise indicated.
†To includes diabetes mellitus, hypertension, dyslipidemia, stroke and heart disease, chronic kidney disease, chronic lung disease, and cancer.
Abbreviations: CFA, confirmatory factor analysis; COVID-19, coronavirus disease-2019; EFA, exploratory factor analysis; NCD, non-communicable diseases; SD, standard deviation.

Table 2 The Final 10-Item COVID-PSS (n=4004)†

Item	Scoring structure	Mean ± SD; median (range)	Standardised factor loadings (95% CI)‡			R-squared
			Stereotype	Prejudice	Fear	
Item 1: Most people infected with COVID-19 do not take care of their health. (Q2)	1-2-3-4-5	2.2 ± 1.1; 2 (1-5)	0.61 (0.55-0.64)	..	..	0.37
Item 2: Most people infected with COVID-19 do not follow expert medical advice. (Q4)	1-2-3-4-5	3.1 ± 1.3; 3 (1-5)	0.77 (0.75-0.79)	..	..	0.60
Item 3: Most people infected with COVID-19 like to party or socialize often. (Q5)	1-2-3-4-5	2.8 ± 1.3; 3 (1-5)	0.79 (0.77-0.80)	..	..	0.62
Item 4: Most people infected with COVID-19 are contaminated with germs. (Q6)	1-2-3-4-5	1.8 ± 1.1; 1 (1-5)	..	0.73 (0.71-0.75)	..	0.54
Item 5: Most people infected with COVID-19 are a burden to their families and society. (Q9)	1-2-3-4-5	1.9 ± 1.1; 2 (1-5)	..	0.75 (0.73-0.77)	..	0.54
Item 6: Most people infected with COVID-19 are socially irresponsible. (Q10)	1-2-3-4-5	2.0 ± 1.1; 2 (1-5)	..	0.72 (0.70-0.74)	..	0.50
Item 7: Most people infected with COVID-19 are a danger to other people. (Q8)	1-2-3-4-5	2.7 ± 1.3; 3 (1-5)	..	..	0.65 (0.63-0.67)	0.42
Item 8: I fear people infected with COVID-19. (Q13)	1-2-3-4-5	2.6 ± 1.2; 3 (1-5)	..	..	0.82 (0.81-0.84)	0.68
Item 9: I fear people who are at risk of COVID-19 infection even if they have not been infected yet. (Q14)	1-2-3-4-5	2.3 ± 1.1; 2 (1-5)	..	..	0.77 (0.75-0.78)	0.59
Item 10: I fear being infected with COVID-19 if I live in a community with people who are infected with COVID-19. (Q27)	1-2-3-4-5	2.6 ± 1.2; 3 (1-5)	..	..	0.64 (0.62-0.66)	0.41
Overall	Possible range 10-50	24.2 ± 7.6; 24 (10-50)	..	..	..	0.98

†The final COVID-PSS items are expressed as a non-validated English version.

‡Based on standardised confirmatory factor analysis.

Abbreviations: CI, confidence interval; COVID-PSS coronavirus disease 2019-public stigma scale; SD, standard deviation.

Table 3 Psychometric Properties of the Final 10-Item COVID-PSS (n=4004)

Psychometric Properties	COVID-PSS Correlation (95% CI)			
	Subscale: Stereotype	Subscale: Prejudice	Subscale: Fear	Summary Score
Validity				
Face and content validity	Satisfactory with comprehensive item generation process and expert review (three epidemiologist, two psychiatrists, one social scientist, two hospital directors, and in-depth interviews with thirty general population)			
Convergent Validity				
With global fear of COVID-19	0.28 (0.25 to 0.30)*	0.44 (0.41 to 0.46)*	0.84 (0.83 to 0.85)*	0.68 (0.66 to 0.70)*
With perceived risk of COVID-19 infection	0.37 (0.34 to 0.40)*	0.54 (0.51 to 0.56)*	0.92 (0.91 to 0.92)*	0.79 (0.77 to 0.80)*
With the Bogardus social distance scale	0.20 (0.17 to 0.23)*	0.42 (0.39 to 0.44)*	0.57 (0.54 to 0.59)*	0.50 (0.48 to 0.53)*
Discriminant Validity				
With pain intensity	-0.01 (-0.04 to 0.02)***	0.01 (-0.02 to 0.04)***	0.08 (0.05 to 0.11)*	0.04 (0.01 to 0.07)**
With insomnia severity index	-0.03 (-0.06 to 0.00)***	0.05 (0.02 to 0.08)**	0.09 (0.06 to 0.12)*	0.05 (0.02 to 0.08)**
Reliability				
Internal consistency: Cronbach's α	0.76 (0.75 to 0.78)	0.77 (0.75 to 0.79)	0.80 (0.79 to 0.82)	0.85 (0.84 to 0.86)
Reproducibility: intraclass correlation†	0.90 (0.76 to 0.95)	0.94 (0.93 to 0.95)	0.93 (0.88 to 0.96)	0.94 (0.86 to 0.96)

Noted: Spearman's rho correlation test, *P-values <0·001; **P-values <0·05; ***P-values >0·05.

†Based on the sub-cohort for test-retest n=409.

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease-2019; COVID-PSS, coronavirus disease-2019-public stigma scale.

Table 4 Public Meaningful and Interpretation of the 10-Item COVID-PSS Using Participant-Based Anchors

COVID-PSS cut-off scores	No. of participant (%)	Impact on psychological-related to COVID-19								
		Fear of COVID-19			Perceived risk of COVID-19 infection			Bogardus social distance scale		
		Sensitivity (95% CI)	Specificity (95% CI)	AuROC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	AuROC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	AuROC (95% CI)
No/minimal (18 or lower)	983 (24.6)	84.5% (78.7-89.2)	78.6% (77.3-79.9)	0.82 (0.79-0.84)	76.1% (73.0-79.1)	87.7% (86.5-88.8)	0.82 (0.80-0.84)	40.5% (38.2-42.7)	89.2% (87.8-90.5)	0.65 (0.64-0.66)
Moderate (19 to 25)	1364 (34.1)	44.4% (42.0-46.8)	73.5% (71.7-75.3)	0.59 (0.57-0.60)	49.6% (47.4-51.8)	81.4% (79.6-83.0)	0.65 (0.64-0.67)	34.2% (32.0-36.3)	66.0% (64.0-68.1)	0.50 (0.49-0.52)
High (26 or higher)	1657 (41.4)	65.2% (63.1-67.2)	85.0% (83.4-86.6)	0.75 (0.74-0.76)	82.5% (80.3-84.6)	77.1% (75.4-78.6)	0.80 (0.78-0.81)	89.2% (84.4-92.9)	61.5% (60.0-63.1)	0.75 (0.73-0.78)

Abbreviations: AuROC, area under the receiver operating characteristic; CI, confidence interval; COVID-19, coronavirus disease-2019; COVID-PSS, coronavirus disease-2019-public stigma scale.

Phase I: Item Generation

- Comprehensive literature review of relevant sources on public stigma to COVID-19
- In-depth interviews with 30 general population

Phase II: Development of the Pilot Questionnaire

- 30-item pilot questions created through public interview and experts review
- Face and content validity

Phase III: Refinement of the Questionnaire

- Items refined by a panel of experts and item analysis
- EFA: 15-item prototype with three factors
- CFA: 10-item with a three-dimensional model
- Nonparametric IRT analysis: 10-item with three factors, respect to the fundamental assumptions (unidimensionality, local independence, and monotonicity)

Phase IV: Psychometric Analysis

- Validity: face, content, convergent, and discriminant
- Reliability: internal consistency and test-retest reproducibility

Phase V: Meaningful Interpretation

- Anchor-based methods: banding and cutoff was assessed by using the kappa coefficient agreement and the AuROC analysis

Final Instrument

- The final 10-item COVID-PSS with three factors structure: stereotype, prejudice, and fear
- The proposed scores were 18 or lower (no minimal), 19 to 25 (moderate), 26 or higher (high)

Online Supplementary Materials

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Supplementary Online Content

eMethods

Study Procedures

A detailed series of studies phases for the development and validation of the coronavirus disease 2019—public stigma scale (COVID-PSS) instrument is provided as follows:

Phase I: Item generation

In process of item selection, content and comprehensive literature review with relevant sources of public stigma to coronavirus disease-2019 (COVID-19) were identified, including the classic theories of Goffman, 1963[1]; labeling theory—Scheff, 1966[2]; community attitudes toward the mentally ill—Taylor and Dear, 1981[3]; an attribution model of public discrimination towards the person with mental illness—Corrigan et al, 2003[4]; and conceptualization of the stigma creation process—Link et al, 2004.[5]

In addition, various paradigms—perceived public stigma across (i) infectious disease (human immunodeficiency viruses [HIV][6,7], Ebola virus[8], leprosy[9], severe acute respiratory syndrome [SARS][10]); (ii) identity and disability (minority groups[11], intellectual disabilities[12]); and (iii) addictive behaviors (gambling, alcohol use disorder[13]) were also reviewed. Of these commonly included dimensional were fear/dangerousness, moral judgment, and personal perception (beliefs/attitudes, anger, and blame).

To explored perceived public stigma to COVID-19 infection, the 30-general public was interviewed using a combination of structured and non-structured in-depth interviews. The candidate items were selected based on cultural norms, relevance to COVID-19 pandemic, and focusing on the public experiences. The initial item bank was identified to yield the 42-item predefined questionnaire.

Phase II: Development of the pilot questionnaire

The 42-item predefined was given to three epidemiologists, two psychiatrists, one social scientist, and two general practitioners for comment on ease of understanding, appropriateness of language, and redundancy. The experts also provided feedback and rated each item in order to importance, and reduced to the 30-item pilot COVID-PSS questionnaire. A five-point Likert scale per theorised items was used as it allowed for greater variation in response. A higher score indicated a higher social stigma to COVID-19 infection. An additional 30-general public was invited to complete the pilot 30-item COVID-PSS in this phase to evaluate such dimensions as a face and content validity. There were subsequently interviewed to address the following: the readability of the overall questionnaire, the clarity of the directions and the items/response choices, the comprehension of the questionnaire, and other opinions regarding each item. The 30-item pilot COVID-PSS was reworded or substituted based on recommendations from the public and experts interview (appendix p 10).

Phase III: Refinement of the questionnaire

With respect to the physical distancing strategy and minimize face-to-face interaction, we developed an online questionnaire via the SurveyMonkey® (https://www.surveymonkey.com) that limits one-time participation per unique internet protocol (IP) address. A convenience and snowball sampling strategy will be applied to recruit the general population through various social media networks including public websites, Facebook, LINE, Twitter, and Instagram. Participants had completed a set of questionnaires, including sociodemographic characteristics (age, sex, educational level, marital status, religion, occupation/profession status, the region of residence, living status, number of a household family member, monthly income, job/income loss related to COVID-19 outbreak, financial problems, reimbursement schemes, comorbidities, media exposure, working from home information, quarantine/isolation information, willingness to quarantine during COVID-19 outbreak) and instruments regarding the mental health and psychosocial question, COVID-PSS, as well as the specific tools for verifying the psychometric properties of the COVID-PSS.

During the Wave-I of the Health Outcomes and Mental Health Care Evaluation Survey: Under the Pandemic Situation of COVID-19 (HOME-COVID-19) survey in Thailand (April 21 – May 4, 2020)[14], a total of 4,004 general populations had completed a pilot 30-items COVID-PSS. At this phase, a 1:1 ratio of participants has randomly analyzed dimensionality of the instrument and test for scale structure using exploratory factor analysis (EFA cohort: n=2,002) and confirmatory factor analysis (CFA cohort: n=2,002), respectively. In addition, the nonparametric item responses theory (IRT) was performed to analyze the unidimensional item sets of The COVID-PSS.

Phase IV: Psychometric validation

The validity and reliability were performed to verify the psychometric properties of the final COVID-PSS. The participants were asked to complete the set of convergent validity and anchor-based questions and divergent validity tools as follows:

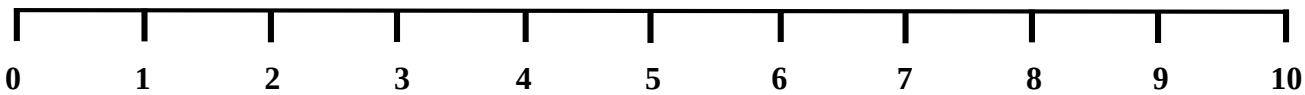
Convergent validity and anchor-based tools

(i) Global fear of COVID-19

Participants were asked to rate their maximum of feeling fear of COVID-19 by using a numerical rating scale (NRS) as it easy to complete and appropriate for all groups of participants. The global fear of COVID-19 scale of 0 to 10 points, with 0 beings “no fear” and 10 being the “extremely large fear”. Participants choose the number that best describes their feeling of fear of COVID-19.

Directions: Please circle your response.

Overall, how do you rate your feeling of fear of COVID-19 infection?



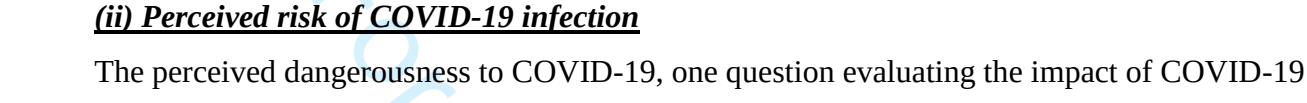
No fear **Extremely large fear**

(ii) Perceived risk of COVID-19 infection

The perceived dangerousness to COVID-19, one question evaluating the impact of COVID-19 pandemic on overall perceived dangerousness in daily life. It consists of 11-point NRS, which 0 stands for "no dangerousness" and 10 stands for "extremely dangerousness".

Directions: Please circle your response.

Overall, how dangerous would you feel about the COVID-19 infection in daily life?



No dangerousness **Extremely dangerousness**

(iii) The Bogardus social distance scale

The Bogardus social distance scale is the cumulative scale—Guttman scale. It has been used to measure varying degrees of closeness in people towards other members of diverse social, ethnic, or racial groups.[15] Participants were asked to rank order system 1-7 points that they would be willing to admit a member of the group in question. The seven statements are as follows:

Would you be willing to marry a member of the COVID-19 infected group?	(1.0)
Would you be willing to have a member of the COVID-19 infected group as your close personal friend?	(2.0)
Would you be willing to have a member of the COVID-19 infected group as your neighbor?	(3.0)

Would you be willing to have a member of the COVID-19 infected group as your colleague at work?	(4.0)
Would you be willing to have a member of the COVID-19 infected group as a citizen of your country?	(5.0)
Would you be willing to have a member of the COVID-19 infected group visit your country as a non-citizen?	(6.0)
Would you be willing to have a member of the COVID-19 infected group be excluded from associating with your country in any way?	(7.0)

Discriminant validity tools

(i) Pain intensity

In relation to pain intensity, it is well established that a measured by an 11-points NRS (0-10) is applicable for unidimensional assessment pain intensity through evidence from the social sciences, notably census and surveys, public opinion polls, and pre- and post-marketing research.[16] Participants were asked to rate their current pain intensity, with 0 indicate for "no pain" and 10 indicate for "pain as bad as can imagine".

(ii) Insomnia severity index (ISI)

The ISI is a self-report instrument that recalls the insomnia severity over the last past month. It consists of a 7-item with including the severity of sleep onset, sleep maintenance, and early morning awakening problems, sleeps dissatisfaction, interference of sleep difficulties with daytime functioning, noticeability of sleep problems by others, and distress caused by the sleep difficulties. A 5-point Likert scale to rate each item, yielding a total score ranging from 0 to 28 (higher scores indicating the severity of sleep problems).[17,18]

Furthermore, test-retest reliability was then analysed on the basis of a convenience subset of 409 participants who completed the final COVID-PSS a second time, approximately three-five days after the first entry.

Phase V: Meaningful interpretation

The anchor-based methods were used to establish an interpretation of the final COVID-PSS by classifying severity cutoff scores, which has been recognized as the optimal approach to defined the meaning of scale as it directly measures the participants' values and perspectives.[19,20]

Statistical analyses

Item analysis

Item scores were summarized descriptively with the normality of score distribution assessed by the skewness and kurtosis tests. To ensure that the scales captured the full range of potential response

within the population and change over time, items that demonstrated a floor or ceiling effect of greater than 80% were removed.

Exploratory factor analysis (EFA)

To ensure an appropriate use of factor analysis, the Kaiser-Meyer-Olkin (KMO) measure and the Bartlett test of sphericity were performed, whereby the KMO values greater than 0.8 and *P*-value of Bartlett test less than 0.05 are suggested for sampling adequacy and the suitability of the data for factor analysis, respectively. For the EFA cohort (n=2,002), we performed an EFA by a principal factor extraction method to construct a factorial structure and increase the relevance of items. Prior communalities were estimated and the factor was obliquely rotated using the promax criterion to allow for factor covariation, and items were treated as continuous variables.

The eigenvalues greater than 1.0 and the scree plot with the number of factors that explained more than 5% of the variance was used to define the number of factors retained.[21,22] The parallel analysis was also performed to confirm the optimal threshold for the number of factors or subscale components. To develop a practical and concise measurement tool, items were considered acceptable and retained if the loading coefficient was greater than 0.6. Item complexity was ascribed to the factor for which the loading coefficient was the highest. The item characteristics were reviewed by the panel experts of the research team to determine item inclusion or exclusion. The included items were named under the relevant factors structure on the basis of their content. Each unidimensional set of items was identified by the EFA, then the CFA was used to assess a model fit using the separate dataset (CFA cohort) in the next step.

Confirmatory factor analysis (CFA)

For the CFA cohort (n=2,002), we then analyzed scale structure using CFA with the maximum likelihood estimation and by treating items as continuous variables. A CFA was tested how correctly a hypothesized model according to the factor structure by EFA as described above. The fit indices (which take into account total sample size) including the root mean square error of approximation (RMSEA) less than 0.100[23,24], standardized root mean squared residual (SRMR) less than 0.100[23,24], comparative-fit index (CFI) greater than 0.900[25], and non-normed fit index/Tucker-Lewis Index (TLI) greater than 0.900[26], were tested to determine the appropriateness of the tested model. The RMSEA is a parsimony index that assesses the fit between the hypothesized model and the population covariance matrix.

The CFI and TLI are incremental fit indices that evaluated the independence model with the hypothesized model. Meanwhile, the SRMR is the residual-based indices of the difference between a sample and hypothesized variance-covariance matrices. We chose to examine fit indices owing to when the sample size is large, a χ^2 test for model fit is often significant (model is a poor fit), even

when the model is, in practice, a good fit. Moreover, the coefficient of determination (R-squared) and item-scale correlations (standardized factor loading), should be at least 0.30 and 0.40, respectively to establish acceptance of the final structure of the COVID-PSS. Thereafter, the model was reevaluated by examining the modification indices.

Nonparametric item response theory (IRT) analysis

Once the unidimensional set of items of the COVID-PSS was identified and assessed model fit by the EFA and CFA, respectively. With regard to the relationship between the latent trait and the responses to the items, we, therefore, implemented the nonparametric IRT analysis to evaluate the fundamental assumptions, including unidimensionality, local independence, and monotonicity. Unidimensionality implies that responses to items are explained by a common latent trait. Local independence implies that responses to items are independent and all the relationships between the items are explained by the latent trait. In other words, local independence implies that a strong redundancy among the items does not indicate. Monotonicity is a key assumption that allows validating the score as an ordinal measure of the latent trait.[27]

The traces of the items, Loevinger's H coefficients (H^s: if H^s less than 0.3, the scale has poor scalability properties; $0.3 \leq H^s < 0.4$, the scale is weak; $0.4 \leq H^s < 0.5$, the scale is medium; and H^s 0.5 or more, the scale is strong) and monotonicity assumption criterion (should be less than 80) were tested to determine the fundamental of nonparametric IRT assumption as described above.[27] Taken together with the CFA, the final decision for the final COVID-PSS items were based on a theoretically of all psychometric performance.

Validity

Face and content validity

Face and content validity are quantitative measures that are present whether the COVID-PSS appears to assess the issues relevant to the social stigma toward the COVID-19 infection. This form of validity was conducted through the comprehensive development of the questionnaire by literature reviews, public interviews, and expert reviews.

Convergent validity

Convergent validity describes the degree to which the proposed assessment converges with other relevant measures. This validity was evaluated using Spearman's correlation coefficients between the final COVID-PSS and other instruments as mentioned above, namely—the global fear of COVID-19, perceived dangerousness to COVID-19, and the Bogardus social distance scale. The correlation statistics were interpreted as slight (0 to 0.2), fair (>0.2 to 0.4), moderate (>0.4 to 0.6), substantial (>0.6 to 0.8), and almost perfect (>0.8). Thus, a moderate correlation value was recognized if the convergent validity was greater than 0.4.

On the basis of the psychosocial effects of the COVID-19 pandemic and impact on public daily life, we postulated that the final COVID-PSS was more substantially converge with the global fear of COVID-19, perceived dangerousness to COVID-19, and the Bogardus social distance scale than other instruments. Additionally, multiple linear regression was used to confirm the linearity of the association between the COVID-PSS summary scores as well as its' subscale and the global fear of COVID-19, perceived dangerousness to COVID-19, and the Bogardus social distance scale.

Discriminant validity

With regard to discriminant validity, non-significant, or slight correlation statistic (0 to 0.2) was expected between the final COVID-PSS and specific tools. To establish the discriminant validity, we estimated the bivariate correlation between the final COVID-PSS and the pain intensity scale, and the ISI. We hypothesised there would be non-significant to fair correlation for the COVID-PSS scores and the pain intensity scale and the ISI scale.

Reliability

An internal consistency (Cronbach's α coefficient) was calculated for each factor of the final COVID-PSS as well as the entire of the COVID-PSS instrument to determine internal consistency reliability and the degree to which every item in a scale measures the same construct. The values of at least 0.70 indicated acceptable reliability of the questionnaire. The item-total correlations between 0.20 and 0.80 were also considerable acceptable.[28]

Test-retest reliability was assessed by the intraclass correlation coefficients (ICCs) between the first and second entry (3-5 days later), in which indicated as slight (≤0.2), fair (>0.2 to 0.4), moderate (>0.4 to 0.6), substantial (>0.6 to 0.8), and almost perfect (>0.8).

Anchor-based methods

The final COVID-PSS was used to measure the degree of social stigma toward the COVID-19 infection against three sets of participant-assessed anchor questions, including the global fear of COVID-19, perceived dangerousness to COVID-19, and the Bogardus social distance scale. The proposed banding for the final COVID-PSS scores was divided using the mean, median, and mode of the anchor-based questions. The kappa (κ) coefficient of the agreement was calculated for each set of possible severity strata. The κ coefficient of 0-0.2 was indicated as slight agreement, greater 0.2-0.4 fair, greater 0.4-0.6 moderate, greater 0.6-0.8 substantial, and greater 0.8 almost perfect agreement. The precision of the area under the receiver operating characteristic curve (AuROC) method was used to assess optimal COVID-PSS cutoff scores. The AuROC of greater than 0.90 were considered as excellent, 0.80-0.89 good, 0.70-0.79 fair, less than 0.70 poor, and less than 0.60 fails.[29] Sensitivity and specificity with the corresponding 95% confidence intervals (CIs) were also estimated. The optimal κ

value together with the AuROC performance was adopted as the best banding for the final COVID-PSS. Effects of covariates on the AuROC values based on the proposed COVID-PSS cut-off scores were explored using the participant characteristics.

The severity and psychosocial effects of the COVID-19 pandemic were defined for a practical application using the AuROC curves plots of three banding systems: no/minimal-, moderate-, and high-social stigma towards COVID-19 infection. To construct the AuROC curves and banding the specific tools for the anchor-based approach, the NRS—11-points the global fear of COVID-19 and the perceived dangerousness to COVID-19 was classified into no/minimal (0-3 points), moderate (4-6 points), and severe (7-10 points). Likewise, the Bogardus social distance scale was classified as no/minimal (1.0), moderate (2.0-3.4), and high (4.0-7.0). Based on the practicability indices, the final COVID-PSS cutoff scores were rounded to zero decimal places. The AuROC analyses of the dichotomization points were determined by using the entire cohort for each cutoff score. For instance, to determine the cutoff for high-social stigma towards COVID-19 infection, the results from severe/high effect of anchor questions were analyzed against all others.

Table S1 Characteristics of Included and Excluded Participants

Variable	Included (n=4,004)	Excluded (n=318)	*P* Value
Age, year (mean ± SD; range)	29.1 ± 10.8; (18 – 79)	29.4 ± 7.5; (18 – 59)	0.622
Sexual identity			
Male	1,231 (30.7)	80 (25.2)	0.093
Female	2,619 (65.4)	227 (71.4)	
Others	154 (3.9)	11 (3.5)	
Marital status			
Single	3,208 (80.1)	239 (75.2)	0.087
Married/domestic partnership	693 (17.3)	67 (21.1)	
Divorced/widowed/separated	103 (2.6)	12 (3.4)	
Education level			
Illiterate/primary school/junior high school	127 (3.2)	8 (2.5)	0.067
Senior high school/diploma/high vocational	1,893 (47.3)	131 (41.2)	
Bachelor's degree/higher education	1,984 (49.6)	179 (56.3)	
Religion			
Irreligion	375 (9.4)	29 (9.1)	0.885
Buddhist/Christian/Muslim/Others	3,629 (90.6)	289 (90.9)	
Occupation			
Unemployed/retired	391 (9.8)	28 (8.8)	0.176
Employed	2,024 (50.5)	178 (56.0)	
College student	1,589 (39.7)	112 (35.2)	
Living status			
Alone	576 (14.4)	54 (17.0)	0.077
With family	3,164 (79.0)	235 (73.9)	
With others	264 (6.6)	29 (9.1)	
Person income, Baht/month			
≤10,000	1,905 (47.6)	141 (44.3)	0.254
10,001 – 20,000	1,054 (26.3)	81 (25.5)	
>20,000	1,045 (26.1)	96 (30.2)	
History of mental illness	359 (9.0)	36 (11.3)	0.161
History of Chronic NCD†	599 (15.0)	42 (13.2)	0.397
Quarantine status			
Never	1,781 (44.5)	149 (46.9)	0.687
Past	1,575 (39.3)	118 (37.1)	
Current	648 (16.2)	51 (16.0)	

Data are expressed as the frequency (percentage) of patients, unless otherwise indicated.

†To includes diabetes mellitus, hypertension, dyslipidemia, stroke and heart disease, chronic kidney disease, chronic lung disease, and cancer.

Abbreviations: COVID-19, coronavirus disease-2019; SD, standard deviation.

Table S2 Descriptive Statistics and Item-Total Correlations: 30-Item Pilot COVID-PSS (n=4,004)

Item	Mean (SD)	Median (Min-Max)	Ceiling Effect (%)	Floor Effect (%)	Skewness	Kurtosis	Corrected ITC
Q1	2.5 (1.2)	2 (1 – 5)	6.7%	24.8%	0.37	2.30	0.30
Q2	2.2 (1.1)	2 (1 – 5)	4.7%	32.6%	0.67	2.67	0.46
Q3	1.9 (1.0)	2 (1 – 5)	2.0%	45.9%	0.99	3.35	0.50
Q4	3.1 (1.3)	3 (1 – 5)	16.3%	13.2%	-0.10	2.00	0.38
Q5	2.8 (1.3)	3 (1 – 5)	12.1%	18.8%	0.11	2.01	0.44
Q6	1.8 (1.1)	1 (1 – 5)	3.0%	54.8%	1.23	3.67	0.64
Q7	1.7 (0.9)	1 (1 – 5)	1.3%	56.9%	1.34	4.36	0.51
Q8	2.7 (1.3)	3 (1 – 5)	11.2%	20.4%	0.23	1.06	0.50
Q9	1.9 (1.1)	2 (1 – 5)	3.3%	50.0%	1.11	3.46	0.62
Q10	2.0 (1.1)	2 (1 – 5)	3.5%	42.1%	0.98	3.35	0.63
Q11	1.4 (0.8)	1 (1 – 5)	1.0%	71.4%	2.07	7.29	0.66
Q12	1.5 (0.9)	1 (1 – 5)	1.6%	67.2%	1.80	5.83	0.62
Q13	2.6 (1.2)	3 (1 – 5)	10.1%	16.8%	0.24	2.24	0.46
Q14	2.3 (1.1)	2 (1 – 5)	4.4%	29.5%	0.56	2.57	0.51
Q15	1.4 (0.8)	1 (1 – 5)	0.7%	74.4%	2.12	7.35	0.62
Q16	1.3 (0.8)	1 (1 – 5)	1.3%	**80.6%**	2.66	10.14	0.39
Q17	1.3 (0.8)	1 (1 – 5)	1.0%	78.8%	2.46	9.02	0.41
Q18	2.3 (1.4)	2 (1 – 5)	9.4%	43.0%	0.62	2.09	0.21
Q19	1.8 (1.2)	1 (1 – 5)	5.0%	57.7%	1.40	3.97	0.26
Q20	2.3 (1.3)	2 (1 – 5)	9.4%	38.2%	0.68	2.28	0.20
Q21	1.9 (1.1)	2 (1 – 5)	2.6%	47.6%	0.99	3.18	0.26
Q22	2.5 (1.1)	3 (1 – 5)	4.1%	23.6%	0.20	2.33	0.17
Q23	2.7 (1.2)	3 (1 – 5)	8.6%	22.4%	0.18	2.14	0.25
Q24	1.5 (0.9)	1 (1 – 5)	1.6%	68.3%	1.90	6.41	0.47
Q25	2.0 (1.1)	2 (1 – 5)	4.9%	40.7%	0.96	3.28	0.37
Q26	2.2 (1.3)	2 (1 – 5)	10.5%	40.2%	0.81	2.50	0.29
Q27	2.6 (1.2)	3 (1 – 5)	6.9%	21.4%	0.34	2.38	0.40
Q28	1.9 (1.1)	1 (1 – 5)	4.0%	51.1%	1.21	3.71	0.50
Q29	1.3 (0.7)	1 (1 – 5)	0.8%	**82.3%**	2.87	11.94	0.51
Q30	1.2 (0.6)	1 (1 – 5)	1.0%	**86.4%**	3.40	15.53	0.46

Noted: Boldfaced items indicate findings of floor effect or ceiling effect of >80%.

Abbreviations: COVID-PSS, coronavirus disease 2019-public stigma scale; ITC, item-total correlation; SD, standard deviation.

Table S3 Exploratory Factor Analysis of the 15-Item Prototype COVID-PSS (n=2,002)

Item	Description of Item	Factor Loadings†			Communality Value
		Factor 1	Factor 2	Factor 3	
Q1		**0.66**	0.01	-0.17	0.40
Q2		**0.74**	0.16	-0.18	0.62
Q4		**0.88**	-0.23	0.12	0.69
Q5		**0.79**	-0.07	0.11	0.64
Q6		0.21	**0.61**	0.14	0.54
Q7		0.24	**0.62**	-0.11	0.40
Q8		0.17	0.08	**0.66**	0.55
Q9		0.10	**0.61**	0.18	0.58
Q10		0.17	**0.65**	0.07	0.57
Q11		-0.14	**0.91**	0.02	0.73
Q12		-0.05	**0.85**	-0.06	0.65
Q13		-0.04	0.01	**0.87**	0.75
Q14		-0.05	0.10	**0.79**	0.67
Q15		-0.17	**0.88**	0.01	0.66
Q27		0.02	-0.07	**0.78**	0.59
Percentage of the variance		26.2	32.5	23.3	Total variance 82.0

†The extraction method was principle component analysis, with the rotation method by oblique, promax rotation. Items load on the assigned factor loadings >0.6 are highlighted.

Abbreviations: COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S4 Confirmatory Factor Analysis of the Prototype COVID-PSS (n=2,002)

Factor	No. of items	Threshold for acceptable fit					Model fit
		CFI (>0.9)	TLI (>0.9)	RMSEA (<0.1 [90% CI])	SRMR (<0.1)	R-Squared (>0.30)	
Stereotype	4 items (Q1, Q2, Q4, Q5)	0.883	0.650	0.252 (0.226 – 0.278)	0.061	Q1=0.19, otherwise >0.30	Unacceptable
	3 items (Q2, Q4, Q5)	1.000	1.000	<0.001 (<0.001 – <0.001)	<0.001	All >0.30	Acceptable/Good
Prejudice	7 items (Q6, Q7, Q9, Q10, Q11, Q12, Q15)	0.944	0.916	0.108; 0.098 - 0.118	0.035	All >0.30	Unacceptable
	3 items (Q6, Q9, Q10)	1.000	1.000	<0.001; <0.001 – <0.001	<0.001	All >0.30	Acceptable/Good
Fear	4 items (Q8, Q13, Q14, Q27)	0.993	0.980	0.068; 0.043 – 0.096	0.013	All >0.30	Acceptable/Good
Three-dimensional model	15 items (Q1, Q2, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q27)	0.879	0.853	0.094; 0.091 – 0.097	0.065	Q1=0.22 otherwise >0.30	Unacceptable
	10 items (Q2, Q4, Q5, Q6, Q8, Q9, Q10, Q13, Q14, Q27)	0.931	0.903	0.091; 0.084 – 0.098	0.054	All >0.30	Acceptable

Abbreviations: CFI, comparative-fit index; CI, confidence interval; COVID-PSS coronavirus disease 2019-public stigma scale; RMSEA, root mean square error of approximation; SRMR, standardized root mean squared residual; TLI, Tucker-Lewis Index.

Table S5 Results of Nonparametric Item Response Theory Analysis of the Final 10-Item COVI-PSS (n=4,004)

Item	Loevinger's H Coefficients (H^s)†	Z-statistics	*P*-Value	Monotonicity Assumption (Criterion <80)
Subscale: Stereotype				
Item 1: (Q2)	0.50	41.31	<0.001	-10
Item 2: (Q4)	0.59	49.71	<0.001	-15
Item 3: (Q5)	0.58	48.18	<0.001	-14
Subscale: Prejudice				
Item 4: (Q6)	0.55	47.03	<0.001	-13
Item 5: (Q9)	0.56	48.84	<0.001	-13
Item 6: (Q10)	0.53	45.34	<0.001	34
Subscale: Fear				
Item 7: (Q8)	0.48	49.68	<0.001	9
Item 8: (Q13)	0.61	62.71	<0.001	1
Item 9: (Q14)	0.58	58.28	<0.001	-14
Item 10: (Q27)	0.51	52.40	<0.001	3

†Loevinger's H Coefficients indicates that, if H^s <0.3, the scale has poor scalability properties; 0.3 ≤ H^s <0.4, the scale is weak; 0.4 ≤ H^s <0.5, the scale is medium; and H^s ≥0.5, the scale is strong.
Abbreviations: COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S6 Correlation Among the Final 10-Item COVID-PSS Subscales (n=4,004)[†]

COVID-PSS Subscales	Mean (SD)	Median (Min-Max)	Correlation (95% CI)		
			Stereotype	Prejudice	Fear
Stereotype	8.2 (3.0)	8 (3 – 15)	1.00		
Prejudice	5.7 (2.7)	5 (3 – 15)	0.53 (0.51 – 0.55)	1.00	
Fear	10.4 (3.8)	10 (4 – 20)	0.35 (0.32 – 0.38)	0.52 (0.50 – 0.54)	1.00

[†]Spearman rank correlation test, all *P*-value <0.001.

Abbreviations: CI, confidence interval; COVID-PSS, coronavirus disease 2019-public stigma scale; SD, standard deviation.

Table S7 Multiple Lineal Regression Analyses Examining Association of the Final 10-Item COVID-PSS with Fear of COVID-19, Perceived Risk of COVID-19 Infection, and Social Distance Scale (n=4,004)[†]

COVID-PSS	Global Fear of COVID-19			Perceived risk of COVID-19 Infection			Social Distance Scale		
	Coefficient ß (95% CI)	*P*-Value	R^2	Coefficient ß (95% CI)	*P*-Value	R^2	Coefficient ß (95% CI)	*P*-Value	R^2
Subscale: stereotype	0.18 (0.16 – 0.20)	<0.001	0.12	0.27 (0.25 – 0.29)	<0.001	0.16	0.07 (0.06 – 0.08)	<0.001	0.06
Subscale: prejudice	0.32 (0.30 – 0.34)	<0.001	0.23	0.47 (0.45 – 0.49)	<0.001	0.33	0.18 (0.17 – 0.20)	<0.001	0.20
Subscale: fear	0.41 (0.40 – 0.41)	<0.001	0.71	0.52 (0.52 – 0.53)	<0.001	0.84	0.17 (0.16 – 0.18)	<0.001	0.36
Summary score	0.17 (0.16 – 0.17)	<0.001	0.49	0.23 (0.22 – 0.24)	<0.001	0.65	0.08 (0.07 – 0.08)	<0.001	0.29

[†]Adjusted for age, sexuality identity, marital status, education level, religion, occupation, living status, personal income, history of mental illness, history of chronic non-communicable disease, quarantine status.

Abbreviations: CI, confidence interval; COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S8 Number of Participants with Each COVID-PSS Score and Corresponding to Anchor-Based Questions: Global Fear of COVID-19

COVID-PSS Score	Participant Total	Global Fear of COVID-19					
		No. of Participant			Mean (SD)	Median (min-max)	Mode
		No/minimal (0-3 Points)	Moderate (4-6 Points)	Severe (7-10 Points)			
10	90	26	64	0	4.2 (1.4)	4 (2 – 6)	4
11	55	19	29	7	4.4 (1.6)	4 (2 – 7)	4
12	62	15	42	5	4.5 (1.4)	4 (1 – 7)	4
13	67	11	51	5	4.6 (1.4)	5 (1 – 7)	4
14	94	22	66	6	4.6 (1.5)	5 (1 – 8)	4
15	124	17	86	21	5.1 (1.4)	5 (2 – 8)	5
16	149	18	100	31	5.2 (1.4)	5 (2 – 8)	5
17	161	19	113	29	5.2 (1.4)	5 (1 – 8)	5
18	181	22	111	48	5.4 (1.4)	6 (2 – 9)	6
19	206	5	142	59	5.9 (1.3)	6 (3 – 9)	6
20	196	10	123	63	5.9 (1.4)	6 (2 – 9)	6
21	197	5	120	72	6.1 (1.4)	6 (2 – 10)	6
22	221	3	125	93	6.3 (1.5)	6 (2 – 10)	6
23	177	2	98	77	6.2 (1.3)	6 (3 – 10)	7
24	197	2	82	113	6.6 (1.4)	7 (3 – 10)	7
25	170	2	64	104	6.9 (1.4)	7 (3 – 10)	7
26	160	0	47	113	7.1 (1.4)	7 (4 – 10)	7
27	161	0	49	112	7.3 (1.4)	7 (4 – 10)	7
28	179	1	47	131	7.2 (1.4)	7 (3 – 10)	7
29	188	1	43	144	7.5 (1.4)	8 (3 – 10)	8
30	192	0	45	147	7.4 (1.3)	7 (4 – 10)	7
31	110	0	10	100	8.0 (1.2)	8 (4 – 10)	9
32	107	0	10	97	8.1 (1.3)	8 (4 – 10)	8
33	89	0	12	77	8.0 (1.3)	8 (4 – 10)	9
34	86	0	4	82	8.4 (1.1)	8 (6 – 10)	9
35	57	0	3	54	8.6 (1.1)	9 (6 – 10)	9
36	64	0	3	61	8.5 (1.1)	9 (5 – 10)	9
37	49	0	2	47	8.6 (1.0)	9 (6 – 10)	9
38	45	0	0	45	9.0 (0.8)	9 (8 – 10)	9
39	35	0	4	31	8.8 (1.3)	9 (5 – 10)	9
40	41	0	3	38	8.9 (1.3)	9 (4 – 10)	9
41	21	0	0	21	9.1 (0.8)	9 (7 – 10)	9
42	20	0	0	20	8.8 (1.0)	9 (7 – 10)	9
43	8	0	0	8	9.4 (0.5)	9 (9 – 10)	9
44	13	0	0	13	9.6 (0.5)	10 (9 – 10)	10
45	4	0	0	4	9.5 (0.6)	9 (9 – 10)	9
46	13	0	0	13	9.1 (0.8)	9 (8 – 10)	9
47	5	0	0	5	9.2 (0.4)	9 (9 – 10)	9
48	5	0	0	5	8.6 (0.5)	9 (8 – 9)	9
49	NA	NA	NA	NA	NA	NA	NA
50	5	0	0	5	9.4 (0.5)	9 (9 – 10)	9

Abbreviations: COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale; NA, not applicable.

Table S8 Number of Participants with Each COVID-PSS Score and Corresponding to Anchor-Based Questions: Perceived Dangerousness to COVID-19 (Continued)

COVID-PSS Score	Participant Total	Perceived Risk of COVID-19 Infection					
		No. of Participant			Mean (SD)	Median (min-max)	Mode
		No/minimal (0-3 Points)	Moderate (4-6 Points)	Severe (7-10 Points)			
10	90	90	0	0	2 (NA)	2 (2 – 2)	2
11	55	55	0	0	2.2 (0.4)	2 (2 – 3)	2
12	62	58	4	0	2.4 (0.6)	2 (2 – 4)	2
13	67	48	19	0	3.0 (0.9)	3 (2 – 5)	3
14	94	65	29	0	3.0 (1.0)	3 (2 – 6)	2
15	124	66	57	1	3.5 (1.1)	3 (2 – 7)	3
16	149	78	68	3	3.5 (1.2)	3 (2 – 8)	4
17	161	69	92	0	3.7 (1.2)	4 (2 – 6)	4
18	181	55	116	10	4.1 (1.4)	4 (2 – 10)	4
19	206	48	146	12	4.3 (1.3)	4 (2 – 7)	4
20	196	36	143	17	4.6 (1.4)	4 (2 – 10)	4
21	197	22	155	20	4.9 (1.3)	5 (2 – 9)	5
22	221	23	172	26	5.0 (1.4)	5 (2 – 10)	5
23	177	9	130	38	5.5 (1.5)	5 (2 – 10)	5
24	197	16	140	41	5.5 (1.6)	5 (2 – 10)	5
25	170	17	104	49	5.6 (1.6)	6 (2 – 10)	5
26	160	5	95	60	6.1 (1.4)	6 (2 – 10)	6
27	161	2	86	73	6.4 (1.4)	6 (2 – 10)	6
28	179	0	100	79	6.4 (1.4)	6 (4 – 10)	6
29	188	2	80	106	6.8 (1.4)	7 (3 – 10)	7
30	192	1	112	79	6.5 (1.1)	6 (3 – 10)	6
31	110	0	41	69	7.0 (1.3)	7 (4 – 10)	8
32	107	0	29	78	7.4 (1.4)	7 (4 – 10)	8
33	89	2	31	56	7.1 (1.6)	7 (3 – 10)	7
34	86	0	25	61	7.6 (1.4)	8 (5 – 10)	6
35	57	0	6	51	8.1 (1.3)	8 (5 – 10)	6
36	64	0	9	55	8.2 (1.3)	8 (5 – 10)	8
37	49	0	4	45	8.3 (1.2)	8 (5 – 10)	8
38	45	0	2	43	8.7 (1.2)	8 (6 – 10)	10
39	35	0	0	35	9.1 (0.9)	9 (7 – 10)	10
40	41	0	1	40	8.7 (1.1)	9 (6 – 10)	10
41	21	0	0	21	9.2 (1.0)	10 (7 – 10)	10
42	20	0	0	20	9.4 (0.9)	10 (8 – 10)	10
43	8	0	0	8	9.6 (0.5)	10 (9 – 10)	10
44	13	0	0	13	9.8 (0.6)	10 (8 – 10)	10
45	4	0	0	4	10 (NA)	10 (10 – 10)	10
46	13	0	1	12	9.4 (1.3)	10 (6 – 10)	10
47	5	0	0	5	9.2 (1.1)	10 (8 – 10)	10
48	5	0	0	5	9.6 (0.5)	10 (9 – 10)	10
49	NA	NA	NA	NA	NA	NA	NA
50	5	0	0	5	10 (NA)	10 (10 – 10)	10

Abbreviations: COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale; NA, not applicable.

Table S8 Number of Participants with Each COVID-PSS Score and Corresponding to Anchor-Based Questions: Social Distance Scale (Continued)

COVID-PSS Score	Participant Total	Social Distance Scale					
		No. of Participant			Mean (SD)	Median (min-max)	Mode
		No/Low (1 Points)	Moderate (2-3 Points)	High (4-7 Points)			
10	90	44	45	1	1.7 (0.8)	2 (1 – 4)	1
11	55	17	37	1	1.9 (0.7)	2 (1 – 4)	2
12	62	21	38	3	1.8 (0.7)	2 (1 – 4)	2
13	67	16	47	4	2.0 (0.8)	2 (1 – 5)	2
14	94	23	64	7	2.0 (0.8)	2 (1 – 4)	2
15	124	19	99	6	2.1 (0.7)	2 (1 – 4)	2
16	149	27	116	6	2.1 (0.7)	2 (1 – 4)	2
17	161	31	122	8	2.1 (0.8)	2 (1 – 4)	2
18	181	24	139	18	2.3 (0.8)	2 (1 – 5)	2
19	206	10	172	24	2.5 (0.8)	2 (1 – 5)	2
20	196	15	163	18	2.4 (0.8)	2 (1 – 5)	2
21	197	15	148	34	2.6 (0.9)	3 (1 – 6)	2
22	221	15	158	48	2.7 (0.9)	3 (1 – 5)	2
23	177	20	121	36	2.6 (1.0)	2 (1 – 5)	2
24	197	8	134	55	2.8 (0.9)	3 (1 – 5)	2
25	170	2	128	40	2.9 (0.9)	3 (1 – 6)	2
26	160	4	107	49	3.0 (0.9)	3 (1 – 5)	3
27	161	3	99	59	3.0 (0.9)	3 (1 – 6)	4
28	179	6	111	62	3.0 (1.0)	3 (1 – 7)	2
29	188	5	127	56	3.0 (1.0)	3 (1 – 7)	3
30	192	4	77	111	3.4 (1.0)	4 (1 – 6)	4
31	110	4	59	47	3.2 (1.1)	3 (1 – 6)	3
32	107	2	47	58	3.6 (1.1)	4 (1 – 6)	4
33	89	0	49	40	3.4 (1.1)	3 (2 – 7)	3/2
34	86	5	44	37	3.3 (1.2)	3 (1 – 6)	3
35	57	0	25	32	3.6 (1.1)	4 (2 – 6)	4
36	64	1	32	31	3.3 (0.8)	3 (1 – 5)	4
37	49	0	24	25	3.6 (1.0)	4 (2 – 6)	3/4
38	45	0	13	32	4.0 (1.1)	4 (2 – 6)	4
39	35	0	11	24	3.8 (0.9)	4 (2 – 6)	4
40	41	1	18	22	3.8 (1.3)	4 (1 – 6)	3
41	21	0	4	17	4.2 (1.1)	4 (2 – 7)	4
42	20	1	8	11	3.8 (1.3)	4 (1 – 7)	3
43	8	0	1	3	4.2 (0.7)	4 (3 – 5)	4
44	13	0	0	13	5.1 (0.9)	5 (4 – 7)	5
45	4	0	0	4	5.0 (NA)	5 (5 – 5)	5
46	13	0	2	11	4.6 (1.0)	5 (3 – 6)	4/5
47	5	0	3	2	3.6 (0.9)	3 (3 – 5)	3
48	5	0	0	5	5.0 (NA)	5 (5 – 5)	5
49	NA	NA	NA	NA	NA	NA	NA
50	5	0	0	5	5.6 (0.9)	6 (4 – 6)	6

Abbreviations: COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale; NA, not applicable.

Table S9 Proposed Sets of COVID-PSS Severity Bands

Possible COVID-PSS Bandings†	Cutoff Scores			Kappa Coefficient of Agreement with the Anchor-Based Questions (95% CI)		
	No/minimal	Moderate	High	Global Fear of COVID-19	Perceived Risk of COVID-19 Infection	Social Distance Scale
Set A	≤14	15-25	≥26	0.40 (0.37 – 0.42)	0.45 (0.42 – 0.47)	0.28 (0.25 – 0.30)
Set B	≤14	15-26	≥27	0.37 (0.35 – 0.39)	0.46 (0.43 – 0.48)	0.29 (0.26 – 0.31)
Set C	≤14	15-27	≥28	0.35 (0.32 – 0.37)	0.46 (0.43 – 0.48)	0.28 (0.26 – 0.31)
Set D	≤14	15-28	≥29	0.32 (0.29 – 0.34)	0.46 (0.43 – 0.48)	0.28 (0.26 – 0.31)
Set E	≤14	15-29	≥30	0.28 (0.26 – 0.30)	0.44 (0.41 – 0.46)	0.29 (0.26 – 0.32)
Set F	≤15	16-25	≥26	0.38 (0.36 – 0.40)	0.46 (0.44 – 0.48)	0.27 (0.24 – 0.29)
Set G	≤15	16-26	≥27	0.35 (0.33 – 0.38)	0.47 (0.44 – 0.49)	0.27 (0.24 – 0.30)
Set H	≤15	16-27	≥28	0.33 (0.31 – 0.35)	0.47 (0.44 – 0.49)	0.27 (0.24 – 0.30)
Set I	≤15	16-28	≥29	0.30 (0.28 – 0.32)	0.47 (0.44 – 0.49)	0.27 (0.24 – 0.30)
Set J	≤15	16-29	≥30	0.26 (0.24 – 0.29)	0.45 (0.42 – 0.48)	0.28 (0.25 – 0.31)
Set K	≤16	17-25	≥26	0.36 (0.34 – 0.38)	0.47 (0.45 – 0.50)	0.25 (0.23 – 0.28)
Set L	≤16	17-26	≥27	0.34 (0.31 – 0.36)	0.48 (0.46 – 0.51)	0.26 (0.23 – 0.28)
Set M	≤16	17-27	≥28	0.31 (0.29 – 0.34)	0.48 (0.46 – 0.51)	0.26 (0.23 – 0.28)
Set N	≤16	17-28	≥29	0.28 (0.26 – 0.31)	0.48 (0.46 – 0.51)	0.26 (0.23 – 0.28)
Set O	≤16	17-29	≥30	0.25 (0.23 – 0.27)	0.46 (0.44 – 0.49)	0.27 (0.24 – 0.29)
Set P	≤17	18-25	≥26	0.34 (0.31 – 0.36)	0.48 (0.45 – 0.50)	0.25 (0.22 – 0.27)
Set Q	≤17	19-26	≥27	0.31 (0.29 – 0.34)	0.48 (0.46 – 0.51)	0.25 (0.22 – 0.27)
Set R	≤17	19-27	≥28	0.29 (0.27 – 0.31)	0.48 (0.46 – 0.51)	0.25 (0.22 – 0.27)
Set S	≤17	19-28	≥29	0.26 (0.24 – 0.29)	0.48 (0.46 – 0.51)	0.25 (0.22 – 0.27)
Set T	≤17	19-29	≥30	0.23 (0.21 – 0.25)	0.46 (0.44 – 0.49)	0.25 (0.23 – 0.28)
Set U	**≤18**	**19-25**	**≥26**	**0.32 (0.30 – 0.34)**	**0.46 (0.44 – 0.49)**	**0.23 (0.21 – 0.25)**
Set V	≤18	19-26	≥27	0.30 (0.27 – 0.32)	0.47 (0.45 – 0.49)	0.23 (0.21 – 0.26)
Set W	≤18	19-27	≥28	0.28 (0.25 – 0.30)	0.47 (0.45 – 0.50)	0.23 (0.21 – 0.26)
Set X	≤18	19-28	≥29	0.25 (0.23 – 0.27)	0.47 (0.45 – 0.50)	0.23 (0.20 – 0.25)
Set Y	≤18	19-29	≥30	0.22 (0.19 – 0.24)	0.45 (0.43 – 0.48)	0.24 (0.21 – 0.26)

†The final COVID-PSS severity band is highlighted.

Abbreviations: CI, confidence intervals; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S10 Possible Set of COVID-PSS Scores and Interpretation Using Participant-Based Anchors

Possible COVID-PSS Bandings†	Cutoff Scores			Impact on Global Fear of COVID-19: AuROC (95% CI)		
	No/minimal	Moderate	High	No/minimal (0-3 Points)	Moderate (4-6 Points)	Severe (7-10 Points)
Set A	≤14	15-25	≥26	0.70 (0.66 – 0.73)	0.67 (0.65 – 0.68)	0.75 (0.74 – 0.76)
Set B	≤14	15-26	≥27	0.70 (0.66 – 0.73)	0.66 (0.64 – 0.67)	0.74 (0.72 – 0.75)
Set C	≤14	15-27	≥28	0.70 (0.66 – 0.73)	0.65 (0.63 – 0.66)	0.72 (0.71 – 0.74)
Set D	≤14	15-28	≥29	0.70 (0.66 – 0.73)	0.63 (0.62 – 0.64)	0.70 (0.69 – 0.72)
Set E	≤14	15-29	≥30	0.70 (0.66 – 0.73)	0.61 (0.60 – 0.62)	0.68 (0.67 – 0.69)
Set F	≤15	16-25	≥26	0.72 (0.69 – 0.76)	0.65 (0.63 – 0.66)	0.75 (0.74 – 0.76)
Set G	≤15	16-26	≥27	0.72 (0.69 – 0.76)	0.64 (0.62 – 0.65)	0.74 (0.72 – 0.75)
Set H	≤15	16-27	≥28	0.72 (0.69 – 0.76)	0.63 (0.61 – 0.64)	0.72 (0.71 – 0.74)
Set I	≤15	16-28	≥29	0.72 (0.69 – 0.76)	0.61 (0.60 – 0.63)	0.70 (0.69 – 0.72)
Set J	≤15	16-29	≥30	0.72 (0.69 – 0.76)	0.59 (0.58 – 0.61)	0.68 (0.67 – 0.69)
Set K	≤16	17-25	≥26	0.75 (0.72 – 0.79)	0.63 (0.62 – 0.65)	0.75 (0.74 – 0.76)
Set L	≤16	17-26	≥27	0.75 (0.72 – 0.79)	0.62 (0.60 – 0.63)	0.74 (0.72 – 0.75)
Set M	≤16	17-27	≥28	0.75 (0.72 – 0.79)	0.61 (0.59 – 0.62)	0.72 (0.71 – 0.74)
Set N	≤16	17-28	≥29	0.75 (0.72 – 0.79)	0.59 (0.58 – 0.60)	0.70 (0.69 – 0.72)
Set O	≤16	17-29	≥30	0.75 (0.72 – 0.79)	0.58 (0.56 – 0.59)	0.68 (0.67 – 0.69)
Set P	≤17	18-25	≥26	0.78 (0.75 – 0.81)	0.61 (0.59 – 0.62)	0.75 (0.74 – 0.76)
Set Q	≤17	19-26	≥27	0.78 (0.75 – 0.81)	0.60 (0.58 – 0.61)	0.74 (0.72 – 0.75)
Set R	≤17	19-27	≥28	0.78 (0.75 – 0.81)	0.59 (0.57 – 0.60)	0.72 (0.71 – 0.74)
Set S	≤17	19-28	≥29	0.78 (0.75 – 0.81)	0.57 (0.56 – 0.59)	0.70 (0.69 – 0.72)
Set T	≤17	19-29	≥30	0.78 (0.75 – 0.81)	0.55 (0.54 – 0.57)	0.68 (0.67 – 0.69)
Set U	**≤18**	**19-25**	**≥26**	**0.82 (0.79 – 0.84)**	**0.59 (0.57 – 0.60)**	**0.75 (0.74 – 0.76)**
Set V	≤18	19-26	≥27	0.82 (0.79 – 0.84)	0.58 (0.56 – 0.59)	0.74 (0.72 – 0.75)
Set W	≤18	19-27	≥28	0.82 (0.79 – 0.84)	0.57 (0.55 – 0.58)	0.72 (0.71 – 0.74)
Set X	≤18	19-28	≥29	0.82 (0.79 – 0.84)	0.55 (0.54 – 0.57)	0.70 (0.69 – 0.72)
Set Y	≤18	19-29	≥30	0.82 (0.79 – 0.84)	0.54 (0.52 – 0.55)	0.68 (0.67 – 0.69)

†The final COVID-PSS severity band is highlighted.

Abbreviations: AuROC, area under receiver operating characteristic curve; CIs, confidence intervals; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S10 Possible Set of COVID-PSS Scores and Interpretation Using Participant-Based Anchors (Continued)

Possible COVID-PSS Bandings†	Cutoff Scores			Impact on Perceived Risk of COVID-19 Infection: AuROC (95% CI)		
	No/minimal	Moderate	High	No/minimal (0-3 Points)	Moderate (4-6 Points)	Severe (7-10 Points)
Set A	≤14	15-25	≥26	0.70 (0.68 – 0.72)	0.67 (0.65 – 0.68)	0.80 (0.78 – 0.81)
Set B	≤14	15-26	≥27	0.70 (0.68 – 0.72)	0.68 (0.66 – 0.69)	0.80 (0.78 – 0.81)
Set C	≤14	15-27	≥28	0.70 (0.68 – 0.72)	0.68 (0.66 – 0.69)	0.78 (0.76 – 0.79)
Set D	≤14	15-28	≥29	0.70 (0.68 – 0.72)	0.68 (0.67 – 0.70)	0.76 (0.75 – 0.78)
Set E	≤14	15-29	≥30	0.70 (0.68 – 0.72)	0.68 (0.66 – 0.69)	0.74 (0.72 – 0.75)
Set F	≤15	16-25	≥26	0.73 (0.71 – 0.75)	0.67 (0.66 – 0.68)	0.79 (0.78 – 0.81)
Set G	≤15	16-26	≥27	0.73 (0.71 – 0.75)	0.68 (0.66 – 0.69)	0.79 (0.78 – 0.81)
Set H	≤15	16-27	≥28	0.73 (0.71 – 0.75)	0.68 (0.67 – 0.70)	0.78 (0.76 – 0.79)
Set I	≤15	16-28	≥29	0.73 (0.71 – 0.75)	0.69 (0.67 – 0.70)	0.76 (0.75 – 0.78)
Set J	≤15	16-29	≥30	0.73 (0.71 – 0.75)	0.68 (0.67 – 0.69)	0.74 (0.72 – 0.75)
Set K	≤16	17-25	≥26	0.77 (0.75 – 0.79)	0.67 (0.66 – 0.68)	0.80 (0.78 – 0.81)
Set L	≤16	17-26	≥27	0.77 (0.75 – 0.79)	0.68 (0.67 – 0.70)	0.79 (0.78 – 0.81)
Set M	≤16	17-27	≥28	0.77 (0.75 – 0.79)	0.68 (0.67 – 0.70)	0.78 (0.76 – 0.79)
Set N	≤16	17-28	≥29	0.77 (0.75 – 0.79)	0.69 (0.67 – 0.70)	0.76 (0.75 – 0.78)
Set O	≤16	17-29	≥30	0.77 (0.75 – 0.79)	0.68 (0.67 – 0.70)	0.74 (0.72 – 0.75)
Set P	≤17	18-25	≥26	0.80 (0.79 – 0.82)	0.67 (0.65 – 0.68)	0.80 (0.78 – 0.81)
Set Q	≤17	19-26	≥27	0.80 (0.78 – 0.82)	0.68 (0.66 – 0.69)	0.79 (0.78 – 0.81)
Set R	≤17	19-27	≥28	0.80 (0.79 – 0.82)	0.68 (0.66 – 0.69)	0.78 (0.76 – 0.79)
Set S	≤17	19-28	≥29	0.80 (0.79 – 0.82)	0.68 (0.67 – 0.70)	0.76 (0.75 – 0.78)
Set T	≤17	19-29	≥30	0.80 (0.79 – 0.82)	0.68 (0.66 – 0.69)	0.74 (0.72 – 0.75)
Set U	**≤18**	**19-25**	**≥26**	**0.82 (0.80 – 0.84)**	**0.65 (0.64 – 0.67)**	**0.80 (0.78 – 0.81)**
Set V	≤18	19-26	≥27	0.82 (0.80 – 0.84)	0.66 (0.65 – 0.68)	0.79 (0.78 – 0.81)
Set W	≤18	19-27	≥28	0.82 (0.80 – 0.84)	0.67 (0.65 – 0.68)	0.78 (0.76 – 0.79)
Set X	≤18	19-28	≥29	0.82 (0.80 – 0.84)	0.67 (0.66 – 0.69)	0.76 (0.75 – 0.78)
Set Y	≤18	19-29	≥30	0.82 (0.80 – 0.84)	0.66 (0.65 – 0.68)	0.74 (0.72 – 0.75)

†The final COVID-PSS severity band is highlighted.

Abbreviations: AuROC, area under receiver operating characteristic curve; CIs, confidence intervals; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S10 Possible Set of COVID-PSS Scores and Interpretation Using Participant-Based Anchors (Continued)

Possible COVID-PSS Bandings†	Cutoff Scores			Impact on Social Distance Scale: AuROC (95% CI)		
	No/minimal	Moderate	High	No/Low (1 Point)	Moderate (2-3 Points)	High (4-7 Points)
Set A	≤14	15-25	≥26	0.57 (0.56 – 0.58)	0.44 (0.42 – 0.45)	0.75 (0.73 – 0.78)
Set B	≤14	15-26	≥27	0.58 (0.56 – 0.58)	0.45 (0.43 – 0.46)	0.75 (0.73 – 0.78)
Set C	≤14	15-27	≥28	0.57 (0.56 – 0.58)	0.46 (0.45 – 0.48)	0.77 (0.74 – 0.79)
Set D	≤14	15-28	≥29	0.57 (0.56 – 0.58)	0.47 (0.46 – 0.49)	0.77 (0.74 – 0.79)
Set E	≤14	15-29	≥30	0.57 (0.56 – 0.58)	0.48 (0.47 – 0.50)	0.76 (0.74 – 0.79)
Set F	≤15	16-25	≥26	0.59 (0.58 – 0.60)	0.45 (0.44 – 0.47)	0.75 (0.73 – 0.78)
Set G	≤15	16-26	≥27	0.59 (0.58 – 0.60)	0.46 (0.45 – 0.48)	0.75 (0.73 – 0.78)
Set H	≤15	16-27	≥28	0.59 (0.58 – 0.60)	0.48 (0.46 – 0.49)	0.77 (0.74 – 0.79)
Set I	≤15	16-28	≥29	0.59 (0.58 – 0.60)	0.49 (0.47 – 0.50)	0.77 (0.74 – 0.79)
Set J	≤15	16-29	≥30	0.59 (0.58 – 0.60)	0.50 (0.48 – 0.51)	0.76 (0.74 – 0.79)
Set K	≤16	17-25	≥26	0.61 (0.59 – 0.62)	0.47 (0.45 – 0.48)	0.75 (0.73 – 0.78)
Set L	≤16	17-26	≥27	0.61 (0.59 – 0.62)	0.48 (0.46 – 0.50)	0.75 (0.73 – 0.78)
Set M	≤16	17-27	≥28	0.61 (0.59 – 0.62)	0.49 (0.48 – 0.51)	0.77 (0.74 – 0.79)
Set N	≤16	17-28	≥29	0.61 (0.59 – 0.62)	0.50 (0.49 – 0.52)	0.77 (0.74 – 0.79)
Set O	≤16	17-29	≥30	0.61 (0.59 – 0.62)	0.51 (0.50 – 0.53)	0.76 (0.74 – 0.79)
Set P	≤17	18-25	≥26	0.63 (0.62 – 0.64)	0.49 (0.47 – 0.50)	0.75 (0.73 – 0.78)
Set Q	≤17	19-26	≥27	0.63 (0.62 – 0.64)	0.50 (0.48 – 0.51)	0.75 (0.73 – 0.78)
Set R	≤17	19-27	≥28	0.63 (0.62 – 0.64)	0.51 (0.50 – 0.53)	0.77 (0.74 – 0.79)
Set S	≤17	19-28	≥29	0.63 (0.62 – 0.64)	0.52 (0.51 – 0.54)	0.77 (0.74 – 0.79)
Set T	≤17	19-29	≥30	0.63 (0.62 – 0.64)	0.53 (0.52 – 0.55)	0.76 (0.74 – 0.79)
Set U	**≤18**	**19-25**	**≥26**	**0.65 (0.64 – 0.66)**	**0.50 (0.49 – 0.52)**	**0.75 (0.73 – 0.78)**
Set V	≤18	19-26	≥27	0.65 (0.64 – 0.66)	0.51 (0.50 – 0.53)	0.75 (0.73 – 0.77)
Set W	≤18	19-27	≥28	0.65 (0.64 – 0.66)	0.53 (0.51 – 0.54)	0.77 (0.74 – 0.79)
Set X	≤18	19-28	≥29	0.65 (0.64 – 0.66)	0.54 (0.52 – 0.55)	0.77 (0.74 – 0.79)
Set Y	≤18	19-29	≥30	0.65 (0.64 – 0.66)	0.54 (0.53 – 0.56)	0.76 (0.74 – 0.79)

†The final COVID-PSS severity band is highlighted.

Abbreviations: AuROC, area under receiver operating characteristic curve; CIs, confidence intervals; COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Table S11 Effect of covariates on the final set of the 10-item COVID-PSS cut-off scores: Global Fear of COVID-19

Variables	No/minimal (0-3 Points)		Moderate (4-6 Points)		Severe (7-10 Points)	
	Coefficient (95% CI)	*P* Value	Coefficient (95% CI)	*P* Value	Coefficient (95% CI)	*P* Value
No/minimal-stigma towards COVID-19 infection (18 points or lower)						
Age	**-0.05 (-0.07 to -0.03)**	**<0.001**	-0.00 (-0.01 to 0.00)	0.261	-0.00 (-0.01 to 0.00)	0.261
Sexual identity	-0.17 (-0.42 to 0.08)	0.183	**0.12 (0.08 to 0.16)**	**<0.001**	**0.25 (0.16 to 0.34)**	**<0.001**
Marital status	-0.35 (-0.76 to 0.06)	0.091	-0.05 (-0.12 to 0.01)	0.089	-0.12 (-0.25 to 0.02)	0.090
Education level	-0.34 (-0.69 to 0.01)	0.055	0.04 (-0.01 to 0.09)	0.101	0.09 (-0.02 to 0.20)	0.101
Religion	0.12 (-0.27 to 0.50)	0.553	**0.09 (0.02 to 0.16)**	**0.015**	**0.19 (0.04 to 0.34)**	**0.015**
Occupation	0.09 (-0.18 to 0.35)	0.518	0.01 (-0.04 to 0.05)	0.814	0.01 (-0.08 to 0.10)	0.814
Living status	-0.06 (-0.26 to 0.14)	0.558	0.02 (-0.01 to 0.05)	0.242	0.04 (-0.03 to 0.11)	0.243
Personal income, Baht/month	0.06 (-0.17 to 0.30)	0.603	-0.01 (-0.06 to 0.03)	0.481	-0.03 (-0.12 to 0.05)	0.481
History of mental illness	-0.02 (-0.42 to 0.38)	0.928	0.04 (-0.04 to 0.12)	0.336	0.08 (-0.09 to 0.26)	0.336
History of chronic NCD†	**0.79 (0.29 to 1.29)**	**0.002**	-0.00 (-0.07 to 0.07)	0.988	0.00 (-0.15 to 0.15)	0.988
Quarantine status	**-0.23 (-0.44 to -0.02)**	**0.030**	**-0.07 (-0.11 to -0.04)**	**<0.001**	**-0.15 (-0.22 to -0.08)**	**<0.001**
Moderate-stigma towards COVID-19 infection (19-25 points)						
Age	**0.05 (0.02 to 0.07)**	**<0.001**	-0.00 (-0.01 to 0.00)	0.571	**-0.01 (-0.02 to -0.00)**	**<0.001**
Sexual identity	0.17 (-0.08 to 0.42)	0.173	**-0.11 (-0.20 to -0.02)**	**0.022**	-0.06 (-0.03 to 0.14)	0.222
Marital status	0.35 (-0.06 to 0.76)	0.092	-0.03 (-0.16 to 0.10)	0.645	**-0.28 (-0.31 to -0.06)**	**0.004**
Education level	0.30 (-0.04 to 0.65)	0.088	-0.04 (-0.14 to 0.07)	0.520	-0.02 (-0.11 to 0.08)	0.728
Religion	-0.08 (-0.47 to 0.30)	0.678	-0.00 (-0.16 to 0.15)	0.962	**-0.18 (-0.35 to -0.00)**	**0.045**
Occupation	-0.05 (-0.31 to 0.22)	0.727	0.02 (-0.07 to 0.11)	0.650	-0.02 (-0.10 to 0.06)	0.665
Living status	0.07 (-0.12 to 0.27)	0.466	-0.06 (-0.12 to 0.01)	0.082	-0.00 (-0.06 to 0.06)	0.992
Personal income, Baht/month	-0.04 (-0.27 to 0.19)	0.733	0.06 (-0.03 to 0.14)	0.176	0.04 (-0.03 to 0.11)	0.269
History of mental illness	0.03 (-0.37 to 0.43)	0.897	-0.09 (-0.26 to 0.08)	0.304	-0.01 (-0.15 to 0.17)	0.893
History of chronic NCD†	**-0.74 (-1.24 to -0.24)**	**0.004**	-0.01 (-0.16 to 0.14)	0.919	-0.02 (-0.11 to 0.14)	0.819
Quarantine status	**0.26 (0.05 to 0.47)**	**0.013**	**0.09 (0.02 to 0.16)**	**0.015**	-0.00 (-0.07 to 0.06)	0.886
High-stigma towards COVID-19 infection (26 points or higher)						
Age	0.01 (-0.01 to 0.03)	0.426	**0.01 (0.00 to 0.01)**	**0.025**	**0.01 (0.00 to 0.02)**	**0.003**
Sexual identity	-0.00 (-0.25 to 0.25)	0.994	**-0.18 (-0.28 to -0.09)**	**<0.001**	**-0.10 (-0.19 to -0.01)**	**0.034**
Marital status	0.03 (-0.38 to 0.43)	0.900	**0.19 (0.06 to 0.33)**	**0.004**	**0.24 (0.12 to 0.37)**	**<0.001**
Education level	0.15 (-0.20 to 0.49)	0.410	-0.07 (-0.18 to 0.04)	0.201	-0.01 (-0.11 to 0.08)	0.792
Religion	-0.12 (-0.51 to 0.26)	0.540	**-0.24 (-0.40 to -0.09)**	**0.002**	0.08 (-0.09 to 0.26)	0.336
Occupation	-0.13 (-0.40 to 0.13)	0.319	-0.04 (-0.13 to 0.05)	0.354	-0.03 (-0.05 to 0.11)	0.430
Living status	-0.04 (-0.24 to 0.15)	0.673	0.03 (-0.04 to 0.09)	0.403	-0.00 (-0.06 to 0.07)	0.962
Personal income, Baht/month	-0.07 (-0.31 to 0.16)	0.543	-0.04 (-0.12 to 0.04)	0.358	-0.03 (-0.10 to 0.04)	0.428
History of mental illness	-0.02 (-0.42 to 0.38)	0.904	0.01 (-0.16 to 0.18)	0.892	0.03 (-0.13 to 0.19)	0.700
History of chronic NCD†	-0.22 (-0.71 to 0.27)	0.383	0.01 (-0.14 to 0.16)	0.874	-0.01 (-0.12 to 0.14)	0.831
Quarantine status	-0.09 (-0.30 to 0.12)	0.395	**0.08 (0.01 to 0.15)**	**0.034**	0.03 (-0.03 to 0.09)	0.347

†To includes diabetes mellitus, hypertension, dyslipidemia, stroke and heart disease, chronic kidney disease, chronic lung disease, and cancer.

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease-2019; COVID-PSS, coronavirus disease-2019-public stigma scale; NCD, non-communicable diseases.

Table S11 Effect of covariates on the final set of the 10-item COVID-PSS cut-off scores: Perceived Risk of COVID-19 Infection (Continued)

Variables	No/minimal (0-3 Points)		Moderate (4-6 Points)		Severe (7-10 Points)	
	Coefficient (95% CI)	*P* Value	Coefficient (95% CI)	*P* Value	Coefficient (95% CI)	*P* Value
No/minimal-stigma towards COVID-19 infection (18 points or lower)						
Age	**-0.02 (-0.03 to -0.01)**	**0.001**	**-0.01 (-0.02 to -0.00)**	**0.003**	0.00 (-0.01 to 0.00)	0.434
Sexual identity	0.01 (-0.12 to 0.15)	0.837	**0.17 (0.08 to 0.26)**	**<0.001**	-0.05 (-0.17 to 0.07)	0.417
Marital status	-0.18 (-0.37 to 0.01)	0.061	-0.08 (-0.21 to 0.06)	0.261	0.04 (-0.12 to 0.20)	0.605
Education level	0.12 (-0.03 to 0.27)	0.110	-0.02 (-0.12 to 0.08)	0.693	**-0.19 (-0.32 to -0.06)**	**0.003**
Religion	**0.33 (0.10 to 0.57)**	**0.006**	**0.32 (0.17 to 0.47)**	**<0.001**	0.21 (-0.00 to 0.42)	0.051
Occupation	0.02 (-0.11 to 0.14)	0.816	0.05 (-0.03 to 0.14)	0.221	0.00 (-0.10 to 0.10)	0.975
Living status	-0.04 (-0.14 to 0.06)	0.448	0.04 (-0.02 to 0.11)	0.172	-0.08 (-0.17 to 0.00)	0.054
Personal income, Baht/month	-0.01 (-0.13 to 0.12)	0.915	0.05 (-0.03 to 0.13)	0.191	**-0.14 (-0.24 to -0.05)**	**0.003**
History of mental illness	0.16 (-0.09 to 0.41)	0.209	0.11 (-0.06 to 0.27)	0.200	-0.08 (-0.28 to 0.12)	0.427
History of chronic NCD†	0.03 (-0.19 to 0.26)	0.767	0.03 (-0.11 to 0.17)	0.640	**0.19 (0.02 to 0.35)**	**0.027**
Quarantine status	**-0.33 (-0.44 to -0.22)**	**<0.001**	-0.01 (-0.08 to 0.05)	0.743	-0.05 (-0.13 to 0.03)	0.248
Moderate-stigma towards COVID-19 infection (19-25 points)						
Age	**0.02 (0.01 to 0.03)**	**0.003**	-0.01 (-0.01 to 0.00)	0.105	**-0.01 (-0.02 to -0.00)**	**0.019**
Sexual identity	-0.02 (-0.16 to 0.11)	0.722	0.02 (-0.07 to 0.11)	0.646	0.02 (-0.10 to 0.14)	0.758
Marital status	0.17 (-0.02 to 0.36)	0.075	**-0.16 (-0.29 to -0.03)**	**0.017**	**-0.23 (-0.39 to -0.07)**	**0.004**
Education level	-0.12 (-0.27 to 0.03)	0.117	0.04 (-0.06 to 0.14)	0.452	0.09 (-0.22 to 0.03)	0.155
Religion	**-0.29 (-0.53 to -0.06)**	**0.016**	-0.01 (-0.17 to 0.14)	0.882	0.05 (-0.16 to 0.25)	0.668
Occupation	-0.02 (-0.14 to 0.11)	0.817	-0.01 (-0.09 to 0.08)	0.868	0.04 (-0.06 to 0.14)	0.455
Living status	0.02 (-0.08 to 0.12)	0.717	-0.03 (-0.09 to 0.03)	0.330	-0.02 (-0.11 to 0.07)	0.645
Personal income, Baht/month	-0.02 (-0.14 to 0.11)	0.794	0.01 (-0.07 to 0.09)	0.727	**0.17 (0.08 to 0.27)**	**<0.001**
History of mental illness	-0.21 (-0.46 to 0.04)	0.106	-0.07 (-0.23 to 0.09)	0.394	0.17 (-0.03 to 0.37)	0.093
History of chronic NCD†	-0.04 (-0.26 to 0.19)	0.756	-0.00 (-0.14 to 0.14)	0.995	0.02 (-0.14 to 0.19)	0.799
Quarantine status	**0.30 (0.19 to 0.41)**	**<0.001**	-0.00 (-0.07 to 0.06)	0.986	-0.02 (-0.10 to 0.06)	0.583
High-stigma towards COVID-19 infection (26 points or higher)						
Age	0.01 (-0.00 to 0.02)	0.121	**0.02 (0.01 to 0.02)**	**<0.001**	**0.01 (0.00 to 0.02)**	**0.012**
Sexual identity	0.03 (-0.10 to 0.17)	0.632	**-0.17 (-0.26 to -0.08)**	**<0.001**	0.00 (-0.12 to 0.11)	0.943
Marital status	0.04 (-0.15 to 0.23)	0.681	**0.24 (0.11 to 0.37)**	**<0.001**	**0.22 (0.06 to 0.38)**	**0.008**
Education level	-0.01 (-0.16 to 0.13)	0.859	-0.02 (-0.12 to 0.08)	0.665	**0.14 (0.02 to 0.27)**	**0.027**
Religion	-0.15 (-0.38 to 0.09)	0.218	**-0.27 (-0.42 to -0.11)**	**0.001**	0.10 (-0.31 to 0.11)	0.335
Occupation	-0.00 (-0.13 to 0.13)	0.984	-0.04 (-0.13 to 0.05)	0.381	0.04 (-0.14 to 0.06)	0.462
Living status	0.07 (-0.03 to 0.17)	0.183	-0.00 (-0.07 to 0.06)	0.924	0.04 (-0.04 to 0.13)	0.323
Personal income, Baht/month	0.08 (-0.05 to 0.20)	0.227	-0.06 (-0.14 to 0.02)	0.128	**0.13 (-0.22 to -0.04)**	**0.007**
History of mental illness	0.14 (-0.11 to 0.39)	0.268	-0.01 (-0.18 to 0.15)	0.873	0.14 (-0.34 to 0.06)	0.159
History of chronic NCD†	0.00 (-0.22 to 0.23)	0.975	-0.03 (-0.17 to 0.11)	0.690	0.07 (-0.24 to 0.09)	0.385
Quarantine status	**0.13 (0.02 to 0.24)**	**0.023**	0.01 (-0.05 to 0.07)	0.761	0.04 (-0.05 to 0.17)	0.860

†To includes diabetes mellitus, hypertension, dyslipidemia, stroke and heart disease, chronic kidney disease, chronic lung disease, and cancer.

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease-2019; COVID-PSS, coronavirus disease-2019-public stigma scale; NCD, non-communicable diseases.

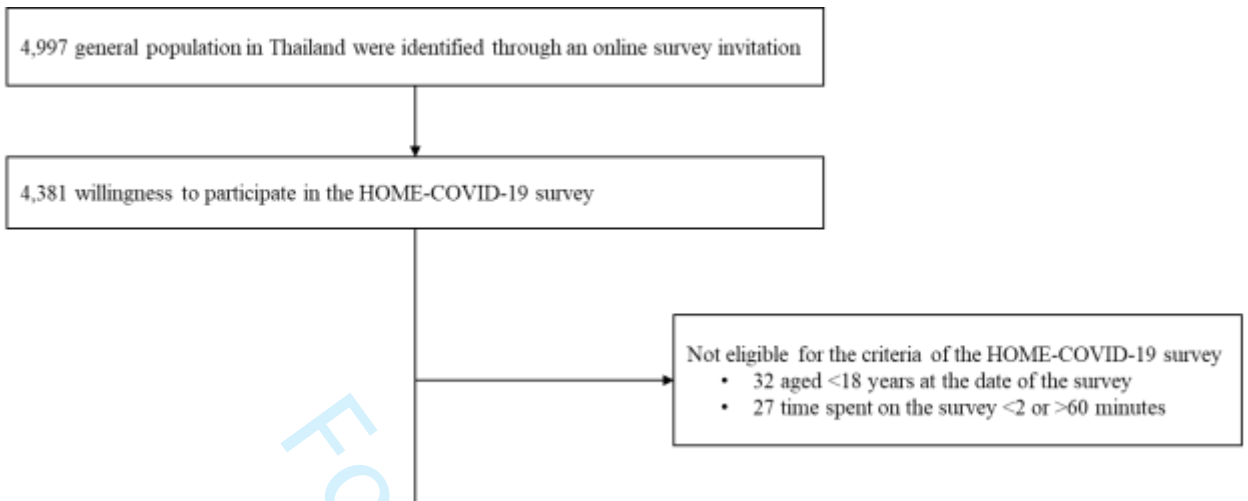
Table S11 Effect of covariates on the final set of the 10-item COVID-PSS cut-off scores: Bogardus social distance scale (Continued)

Variables	No/Low (1 Point)		Moderate (2-3 Points)		High (4-7 Points)	
	Coefficient (95% CI)	*P* Value	Coefficient (95% CI)	*P* Value	Coefficient (95% CI)	*P* Value
No/minimal-stigma towards COVID-19 infection (18 points or lower)						
Age	-0.00 (-0.01 to 0.00)	0.511	-0.01 (-0.01 to 0.00)	0.117	0.00 (-0.02 to 0.02)	0.775
Sexual identity	**0.13 (0.04 to 0.21)**	**0.006**	0.08 (-0.01 to 0.18)	0.072	0.07 (-0.20 to 0.34)	0.624
Marital status	**-0.13 (-0.26 to -0.00)**	**0.042**	-0.03 (-0.17 to 0.10)	0.613	-0.08 (-0.45 to 0.28)	0.650
Education level	0.01 (-0.09 to 0.12)	0.785	0.07 (-0.02 to 0.17)	0.146	0.00 (-0.31 to 0.31)	0.993
Religion	**0.19 (0.04 to 0.34)**	**0.012**	**0.37 (0.20 to 0.53)**	**<0.001**	0.11 (-0.68 to 0.46)	0.705
Occupation	-0.08 (-0.17 to 0.00)	0.051	0.04 (-0.04 to 0.13)	0.339	-0.04 (-0.28 to 0.20)	0.721
Living status	0.03 (-0.03 to 0.10)	0.333	0.05 (-0.02 to 0.11)	0.179	**0.31 (0.12 to 0.50)**	**0.001**
Personal income, Baht/month	-0.06 (-0.14 to 0.02)	0.137	0.01 (-0.07 to 0.09)	0.834	0.05 (-0.17 to 0.27)	0.653
History of mental illness	0.05 (-0.12 to 0.21)	0.566	**0.21 (0.06 to 0.37)**	**0.008**	0.12 (-0.70 to 0.45)	0.673
History of chronic NCD†	-0.00 (-0.15 to 0.15)	0.993	-0.06 (-0.19 to 0.08)	0.403	-0.20 (-0.58 to 0.19)	0.315
Quarantine status	**-0.13 (-0.19 to -0.06)**	**<0.001**	**-0.11 (-0.18 to -0.05)**	**0.001**	-0.02 (-0.21 to 0.17)	0.828
Moderate-stigma towards COVID-19 infection (19-25 points)						
Age	-0.01 (-0.01 to 0.00)	0.084	-0.01 (-0.01 to 0.00)	0.057	0.00 (-0.02 to 0.02)	0.847
Sexual identity	-0.05 (-0.13 to 0.04)	0.321	0.01 (-0.08 to 0.10)	0.839	-0.16 (-0.43 to 0.11)	0.252
Marital status	0.00 (-0.13 to 0.13)	0.963	**-0.18 (-0.31 to -0.05)**	**0.008**	**-0.46 (-0.83 to -0.10)**	**0.013**
Education level	-0.01 (-0.12 to 0.10)	0.840	0.00 (-0.09 to 0.10)	0.955	-0.01 (-0.31 to 0.30)	0.972
Religion	-0.05 (-0.19 to 0.10)	0.550	-0.08 (-0.25 to 0.08)	0.334	-0.20 (-0.78 to 0.37)	0.489
Occupation	0.06 (-0.02 to 0.15)	0.147	-0.08 (-0.17 to 0.00)	0.051	0.10 (-0.14 to 0.34)	0.426
Living status	-0.01 (-0.07 to 0.06)	0.857	-0.02 (-0.08 to 0.05)	0.627	-0.07 (-0.12 to 0.26)	0.466
Personal income, Baht/month	0.07 (-0.01 to 0.15)	0.104	0.03 (-0.05 to 0.11)	0.451	0.14 (-0.08 to 0.36)	0.221
History of mental illness	-0.08 (-0.24 to 0.09)	0.350	-0.09 (-0.25 to 0.07)	0.285	0.26 (-0.32 to 0.84)	0.381
History of chronic NCD†	-0.01 (-0.16 to 0.13)	0.868	-0.01 (-0.14 to 0.13)	0.910	0.09 (-0.29 to 0.47)	0.638
Quarantine status	0.05 (-0.02 to 0.11)	0.175	0.03 (-0.03 to 0.10)	0.294	-0.07 (-0.26 to 0.12)	0.478
High-stigma towards COVID-19 infection (26 points or higher)						
Age	**0.01 (0.00 to 0.02)**	**0.005**	0.01 (0.00 to 0.02)	0.004	0.00 (-0.02 to 0.02)	0.919
Sexual identity	**-0.09 (-0.18 to -0.00)**	**0.039**	-0.06 (-0.16 to 0.03)	0.171	0.13 (-0.14 to 0.40)	0.335
Marital status	**0.15 (0.02 to 0.28)**	**0.020**	0.20 (0.06 to 0.33)	0.004	**0.47 (0.11 to 0.84)**	**0.011**
Education level	-0.00 (-0.11 to 0.10)	0.932	-0.05 (-0.14 to 0.05)	0.317	0.01 (-0.30 to 0.31)	0.971
Religion	**-0.17 (-0.32 to -0.02)**	**0.024**	-0.16 (-0.33 to 0.01)	0.061	0.23 (-0.34 to 0.80)	0.432
Occupation	0.03 (-0.06 to 0.11)	0.545	0.05 (-0.03 to 0.14)	0.212	0.08 (-0.32 to 0.16)	0.506
Living status	-0.03 (-0.10 to 0.03)	0.352	-0.01 (-0.08 to 0.05)	0.683	-0.16 (-0.35 to 0.03)	0.092
Personal income, Baht/month	-0.01 (-0.09 to 0.07)	0.881	-0.03 (-0.11 to 0.04)	0.389	0.15 (-0.37 to 0.07)	0.186
History of mental illness	0.03 (-0.13 to 0.20)	0.678	-0.06 (-0.22 to 0.10)	0.485	0.21 (-0.79 to 0.36)	0.468
History of chronic NCD†	0.02 (-0.13 to 0.16)	0.837	0.05 (-0.09 to 0.18)	0.513	0.03 (-0.41 to 0.35)	0.877
Quarantine status	**0.09 (0.03 to 0.16)**	**0.007**	0.04 (-0.03 to 0.11)	0.237	0.07 (-0.12 to 0.27)	0.451

†To includes diabetes mellitus, hypertension, dyslipidemia, stroke and heart disease, chronic kidney disease, chronic lung disease, and cancer.

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease-2019; COVID-PSS, coronavirus disease-2019-public stigma scale; NCD, non-communicable diseases.

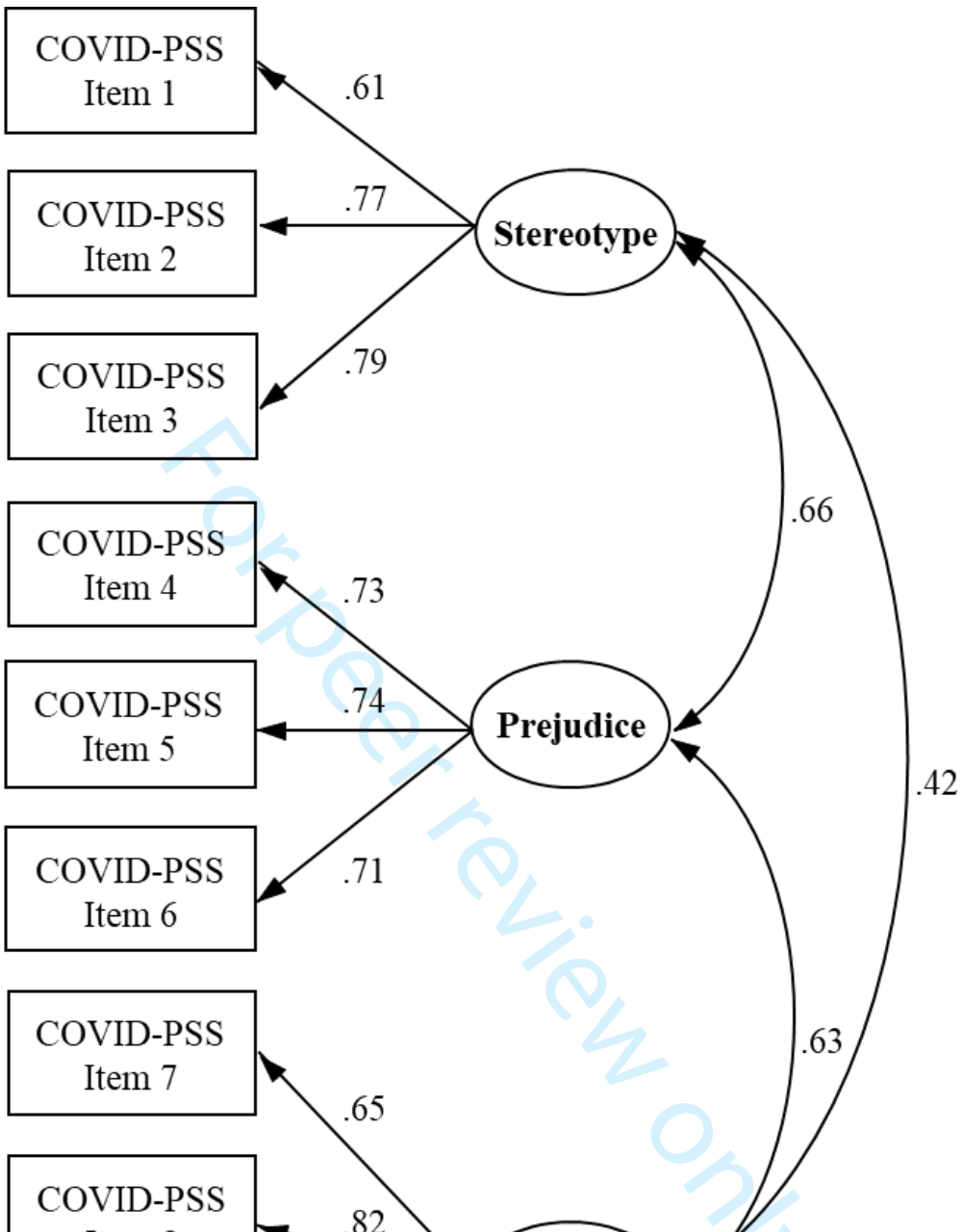
Figure S1 Flowchart on the Selection of Eligible Participants



Abbreviation: HOME-COVID-19, The Health Outcomes and Mental Health Care Evaluation Survey Research Group-Coronavirus disease 2019

Figure S2 Parallel Analysis of the 15-item prototype of the COVID-PSS

Figure S3 Three-Factor Model of the COVID-PSS

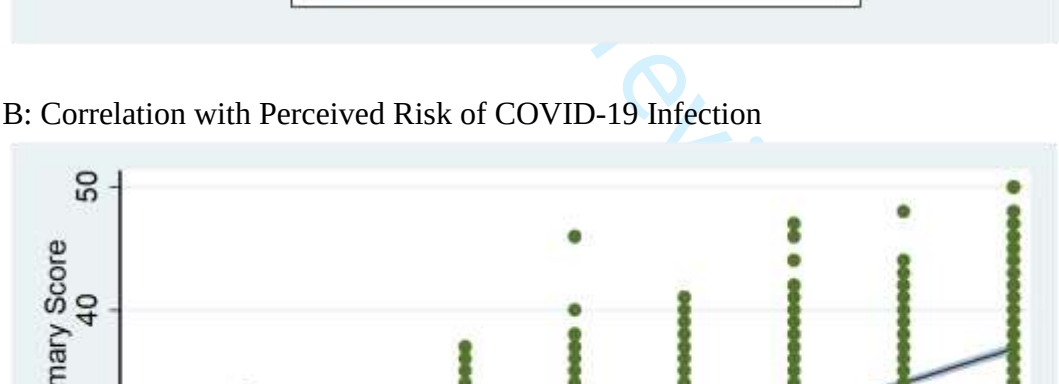


Abbreviation: COVID-PSS, coronavirus disease-2019-public stigma scale

Figure S4 Correlations Between Measures of the Psychosocial-Related to COVID-19 and the COVID-PSS Scores

A: Correlation with Fear of COVID-19

B: Correlation with Perceived Risk of COVID-19 Infection



Abbreviations: COVID-19, coronavirus disease 2019; COVID-PSS, coronavirus disease 2019-public stigma scale.

Figure S4 Correlations Between Measures of the Psychosocial-Related to COVID-19 and the COVID-PSS Scores (Continued)

C: Correlation with Social Distance Scale

Appendix I: The 30-Item Pilot Questionnaire

คำชี้แจง กรุณาตอบข้อคำถามในแต่ละข้อต่อไปนี้ว่าท่านมีความคิดเห็นต่อข้อคำถามนั้น มากน้อยเพียงใด โดยทำเครื่องหมาย ✓ ลงในช่อง ที่ตรงกับความรู้สึกเกิดขึ้นกับท่านมากที่สุด

ความคิดเห็นที่ตรงกับท่านมากที่สุด	1	หมายถึง	ไม่เห็นด้วยอย่างมาก
	2	หมายถึง	ไม่เห็นด้วย
	3	หมายถึง	เฉย ๆ
	4	หมายถึง	เห็นด้วย
	5	หมายถึง	เห็นด้วยอย่างมาก

ข้อคำถาม		ความคิดเห็นที่ตรงกับท่านมากที่สุด				
		1	2	3	4	5
Q1	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ภูมิต้านทานไม่ดี	☐	☐	☐	☐	☐
Q2	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่ใส่ใจการดูแลสุขภาพ	☐	☐	☐	☐	☐
Q3	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ดื่มแอลกอฮอล์	☐	☐	☐	☐	☐
Q4	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่ค่อยสนใจและปฏิบัติตามคำแนะนำของผู้เชี่ยวชาญ	☐	☐	☐	☐	☐
Q5	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ชอบกิน/เที่ยว สังสรรค์	☐	☐	☐	☐	☐
Q6	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นตัวเชื้อโรค	☐	☐	☐	☐	☐
Q7	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนไม่มีความรู้ ขาดการศึกษา	☐	☐	☐	☐	☐
Q8	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นอันตรายต่อผู้อื่น	☐	☐	☐	☐	☐
Q9	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นภาระต่อครอบครัวและสังคม	☐	☐	☐	☐	☐
Q10	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่รับผิดชอบต่อสังคม	☐	☐	☐	☐	☐
Q11	คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 น่ารังเกียจ	☐	☐	☐	☐	☐
Q12	คนที่ติดเชื้อไวรัสโควิด-19 ควรจะละอายใจ	☐	☐	☐	☐	☐

Appendix I: The 30-Item Pilot Questionnaire (Continued)

คำชี้แจง กรุณาตอบข้อคำถามในแต่ละข้อต่อไปนี้ว่าท่านมีความคิดเห็นต่อข้อคำถามนั้น มากน้อยเพียงใด โดยทำเครื่องหมาย ✓ ลงในช่อง ที่ตรงกับความรู้สึกเกิดขึ้นกับท่านมากที่สุด

ความคิดเห็นที่ตรงกับท่านมากที่สุด	1	หมายถึง	ไม่เห็นด้วยอย่างมาก
	2	หมายถึง	ไม่เห็นด้วย
	3	หมายถึง	เฉย ๆ
	4	หมายถึง	เห็นด้วย
	5	หมายถึง	เห็นด้วยอย่างมาก

ข้อคำถาม		ความคิดเห็นที่ตรงกับท่านมากที่สุด				
		1	2	3	4	5
Q13	ฉันรู้สึกกลัวคนที่ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q14	ฉันรู้สึกกลัวคนที่มีความเสี่ยงที่จะติดเชื้อไวรัสโควิด-19 แม้ว่าเขาจะยังไม่ได้ติดเชื้อก็ตาม	☐	☐	☐	☐	☐
Q15	ฉันรู้สึกโกรธคนที่ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q16	ถ้าฉันติดเชื้อไวรัสโควิด-19 ฉันจะไม่เปิดเผยสิ่งนี้กับใคร	☐	☐	☐	☐	☐
Q17	ฉันคิดว่าจะปิดบังคนรอบข้าง หากมีคนในครอบครัวติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q18	ฉันกลัวว่าจะถูกเลือกปฏิบัติ หากคนในครอบครัวติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q19	ถ้าฉันติดเชื้อไวรัสโควิด-19 ฉันจะบอกเพื่อนให้เพื่อนทราบ	☐	☐	☐	☐	☐
Q20	หากคนในครอบครัวของฉันติดเชื้อไวรัสโควิด-19 ฉันจะเข้าไปดูแลอย่างดี	☐	☐	☐	☐	☐
Q21	ฉันรู้สึกสงสารคนที่ติดเชื้อไวรัสโควิด-19 ทุกคน	☐	☐	☐	☐	☐
Q22	ผู้คนมักจะดูแลและเห็นอกเห็นใจคนที่ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q23	ฉันอยากจะเข้าไปช่วยคนที่ติดเชื้อไวรัสโควิด-19 หากทำได้	☐	☐	☐	☐	☐

Appendix I: The 30-Item Pilot Questionnaire (Continued)

คำชี้แจง กรุณาตอบข้อคำถามในแต่ละข้อต่อไปนี้ว่าท่านมีความคิดเห็นต่อข้อคำถามนั้น มากน้อยเพียงใด โดยทำเครื่องหมาย ✓ ลงในช่อง ที่ตรงกับความรู้สึกเกิดขึ้นกับท่านมากที่สุด

ความคิดเห็นที่ตรงกับท่านมากที่สุด	1	หมายถึง	ไม่เห็นด้วยอย่างมาก
	2	หมายถึง	ไม่เห็นด้วย
	3	หมายถึง	เฉย ๆ
	4	หมายถึง	เห็นด้วย
	5	หมายถึง	เห็นด้วยอย่างมาก

ข้อคำถาม		ความคิดเห็นที่ตรงกับท่านมากที่สุด				
		1	2	3	4	5
Q24	คนที่ติดเชื้อไวรัสโควิด-19 น่าจะมีความผิดทางกฎหมายด้วย เพราะทำให้คนอื่นพลอยเดือดร้อน	☐	☐	☐	☐	☐
Q25	รัฐบาลน่าจะเอาทรัพยากรทั้งบุคคล และเครื่องมือ มาทุ่มเทกับคนที่ยังไม่ติดเชื้อดีจะกว่า	☐	☐	☐	☐	☐
Q26	รัฐบาลควรจะประกาศรายชื่อผู้ติดเชื้อไวรัสโควิด-19 และคนในครอบครัวทั้งหมด เพื่อให้ประชาชนรับทราบและไม่เข้าใกล้บุคคลเหล่านี้	☐	☐	☐	☐	☐
Q27	ฉันรู้สึกกลัวว่าจะติดเชื้อไวรัสโควิด-19 ได้ ถ้าอาศัยอยู่ในชุมชนเดียวกับผู้ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
Q28	คนที่ติดเชื้อไวรัสโควิด-19 น่าจะเอาไปกักตัวไว้ที่เกาะใดเกาะหนึ่งต่างหาก ไม่ควรมาอยู่ในชุมชน	☐	☐	☐	☐	☐
Q29	คนที่ติดเชื้อไวรัสโควิด-19 ควรถูกขับไล่ออกจากชุมชน	☐	☐	☐	☐	☐
Q30	คนที่ติดเชื้อไวรัสโควิด-19 ควรถูกปฏิเสธรับเข้าทำงาน หรือควรถูกให้ออกจากงาน	☐	☐	☐	☐	☐

Appendix II: The Final 10-Item COVID-PSS (Validated Thai Version)

คำชี้แจง กรุณาตอบข้อคำถามในแต่ละข้อต่อไปนี้ว่าท่านมีความคิดเห็นต่อข้อคำถามนั้น มากน้อยเพียงใด โดยทำเครื่องหมาย ✓ ลงในช่อง ที่ตรงกับความรู้สึกเกิดขึ้นกับท่านมากที่สุด

ความคิดเห็นที่ตรงกับท่านมากที่สุด	1	หมายถึง	ไม่เห็นด้วยอย่างมาก
	2	หมายถึง	ไม่เห็นด้วย
	3	หมายถึง	เฉย ๆ
	4	หมายถึง	เห็นด้วย
	5	หมายถึง	เห็นด้วยอย่างมาก

ข้อคำถาม	ความคิดเห็นที่ตรงกับท่านมากที่สุด				
	1	2	3	4	5
❶ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่ใส่ใจการดูแลสุขภาพ	☐	☐	☐	☐	☐
❷ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่ค่อยสนใจและปฏิบัติตามคำแนะนำของผู้เชี่ยวชาญ	☐	☐	☐	☐	☐
❸ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ชอบกิน/เที่ยว สังสรรค์	☐	☐	☐	☐	☐
❹ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นตัวเชื้อโรค	☐	☐	☐	☐	☐
❺ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นภาระต่อครอบครัวและสังคม	☐	☐	☐	☐	☐
❻ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นคนที่ไม่รับผิดชอบต่อสังคม	☐	☐	☐	☐	☐
❼ คนส่วนใหญ่ที่ติดเชื้อไวรัสโควิด-19 เป็นอันตรายต่อผู้อื่น	☐	☐	☐	☐	☐
❽ ฉันรู้สึกกลัวคนที่ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐
❾ ฉันรู้สึกกลัวคนที่มีความเสี่ยงที่จะติดเชื้อไวรัสโควิด-19 แม้ว่าเขาจะยังไม่ได้ติดเชื้อก็ตาม	☐	☐	☐	☐	☐
❿ ฉันรู้สึกกลัวว่าจะติดเชื้อไวรัสโควิด-19 ได้ ถ้าอาศัยอยู่ในชุมชนเดียวกับผู้ติดเชื้อไวรัสโควิด-19	☐	☐	☐	☐	☐

Appendix III: The Final 10-Item COVID-PSS (Non-Validated English Version)

Instruction: Please answer each of the following questions for the degree you think of that question by marking ✓ in the box which best fits your feelings.

Best fit your opinion	1	meaning	Strongly disagree
	2	meaning	Disagree
	3	meaning	Neutral
	4	meaning	Agree
	5	meaning	Strongly agree

Question	Best fit your opinion				
	1	2	3	4	5
❶ Most people infected with COVID-19 do not take care of their health.	☐	☐	☐	☐	☐
❷ Most people infected with COVID-19 do not follow expert medical advice.	☐	☐	☐	☐	☐
❸ Most people infected with COVID-19 like to party or socialize often.	☐	☐	☐	☐	☐
❹ Most people infected with COVID-19 are contaminated with germs.	☐	☐	☐	☐	☐
❺ Most people infected with COVID-19 are a burden to their families and society.	☐	☐	☐	☐	☐
❻ Most people infected with COVID-19 are socially irresponsible.	☐	☐	☐	☐	☐
❼ Most people infected with COVID-19 are a danger to other people.	☐	☐	☐	☐	☐
❽ I fear people infected with COVID-19.	☐	☐	☐	☐	☐
❾ I fear people who are at risk of COVID-19 infection even if they have not yet been infected yet.	☐	☐	☐	☐	☐
❿ I fear being infected with COVID-19 if I live a community with people who are infected with COVID-19.	☐	☐	☐	☐	☐

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STROBE Statement—Checklist of items that Should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page#
Title and abstract	1	*(a)* Indicate the study's design with a commonly used term in the title or the abstract	3
		(b) Provide in the abstract on informative and balanced summary of what was done and what was found	3
Introduction			
Background/ rational	2	Explain the scientific background and rationale for the investigation being reported	6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6, 7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	*(a)* Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7, 8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9, 10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	9-11
		(b) Describe any methods used to examine subgroups and interactions	NA
		(c) Explain how missing data were addressed	9
		(d) if applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
Results			
Participants	13*	*(a)* Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed	11, 12, Figure 1, Figure S1
		(b) Indicate number of participants with missing data for each variable of interest	NA

STROBE Statement—Checklist of items that Should be included in reports of ***cross-sectional studies*** (Continued)

	Item No	Recommendation	Page#
Results			
Participants	13*	*(c)* Consider use of a flow diagram	Figure 1, Figure S1
Descriptive data	14*	*(a)* Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table1
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	Table 2-4
Main results	16	*(a)* Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 3
		(b) Report category boundaries when continuous variables were categorized	Table 4
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarize key results with reference to study objectives	14
Limitations	19	Discussion limitations of the study, taking into account sources of potential bias or imprecision. Discussion both direction and magnitude of any potential bias	15, 16
Interpretation	20	Give a cautions overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16
Generalizability	21	Discuss the generalizability (external validity) of the study results	15, 16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for exposed and unexposed groups

Abbreviation: NA, not applicable.