

# Changes in mental well-being in Hong Kong before and during social unrest and COVID-19

**Ming Yin Stephanie Wong**

University of Hong Kong

**Ling Tsz Theresa Siu**

University of Hong Kong

**Lai Ming Christy Hui**

University of Hong Kong

**Kit Wa Sherry Chan**

University of Hong Kong

**Ho Ming Edwin Lee**

University of Hong Kong

**Wing Chung Chang**

University of Hong Kong

**Yi-nam Suen** (✉ [suenyn@hku.hk](mailto:suenyn@hku.hk))

Hong Kong University: University of Hong Kong <https://orcid.org/0000-0003-2766-8476>

**Yu Hai Eric Chen**

University of Hong Kong

---

## Research Article

**Keywords:** life satisfaction, pandemic, social unrest, rumination, population

**Posted Date:** April 19th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-440216/v1>

**License:**   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

# Abstract

**Purpose** Understanding the impact of co-occurring population- and individual-level stressful events on mental well-being should inform future intervention design. This study examined the association of two population-level stressful events (social unrest and COVID-19) and personal stressors with life satisfaction in Hong Kong.

**Methods** This study analyzed data on life satisfaction, experience of stressful life events (SLEs), rumination, and resilience, from two representative population telephone surveys conducted in 2018 (n = 1,514) and 2020 (n = 1,258). The association between life satisfaction and personal SLEs was further compared between the two samples using moderation analysis. Using data from the 2020 survey, the effect of different types of SLEs, rumination, and resilience on life satisfaction was investigated using hierarchical regression analysis.

**Results** The study achieved a response rate of 56.2% and 68.9% for surveys 2018 and 2020, respectively. Life satisfaction of the population decreased significantly in 2020, accompanied by an overall increase in SLEs. Moderation analysis revealed that the relationship between personal SLEs and life satisfaction was significantly greater in 2018 than in 2020. Hierarchical regression analysis showed that an increase in all kinds of SLEs and higher levels of rumination were significantly associated with lower life satisfaction in 2020.

**Conclusion** The significant reduction in life satisfaction reported in this study suggests that measures to support the mental health of populations that have experienced multiple simultaneous, large-scale stressors would be crucial. During distinctive phases as such, rumination may be a potential target for improving overall mental health.

## Plain English Summary

Social unrest and public health crises are becoming increasingly common in many contemporary societies today. However, the impact of these different classes of population-level events has only been explored in isolation in previous studies. This study compared population-level life satisfaction before and after the co-occurrence of social unrest and pandemic, using a total of 2762 data from two population surveys conducted in 2018 and 2020. The findings indicated that the overall life satisfaction of Hong Kong people decreased significantly over the years before and after social unrest, plus the outbreak of coronavirus disease 2019 (COVID-19) in Hong Kong. The changes were more influenced by social unrest and COVID-19 related stressors than by personal stressors. The observations in our study can help raise awareness in the global community to prepare for similar challenges and inform the design of future interventions.

## Introduction

Large-scale stressful events, such as social conflicts and public health crises, can have substantial impacts on a population's mental health [1]. Observations have been made on single events in the past. An increasing number of societies today face multiple co-occurring population-level stressors in the same period, particularly social unrest alongside the novel coronavirus disease 2019 (COVID-19) [2, 3]. How different classes of stressful events together affect the mental health of a population as they evolve necessitates further examination.

Hong Kong people have experienced a distinctive period involving a conjunction of large-scale social unrest, which began in June 2019, and the outbreak of the novel coronavirus disease 2019 (COVID-19) in January 2020. Marked increases in symptoms of depression and post-traumatic stress disorder (PTSD) following social unrest have been observed recently [4]. Several studies have subsequently investigated the mental health impact of COVID-19 in the general population [5–8]. However, as the complex social situation in Hong Kong evolved rapidly, from social unrest to the outbreak of COVID-19, these findings that did not consider the co-occurring events may not fully reflect the mental health of Hong Kong people. A recent large-scale online survey examined the combined mental health impact of social unrest and COVID-19 in addition to personal SLEs and found that the different types of stressors interacted significantly to increase PTSD and depressive symptoms [9].

While similar co-occurrences of population-level stressful events have been observed in other societies [10], it is unknown how the general mental well-being of the population would be affected under such complex societal conditions. It also remains to be further investigated how population-level and personal-level stressors might differently contribute to overall mental health. To fill these gaps, population-based studies that collect representative data on pre-existing mental health conditions are of crucial importance [11]. To the best of our knowledge, the current study in Hong Kong is the first ever to report data on the general mental health of a population before and after the occurrence of multiple large-scale stress events. The availability of baseline data could facilitate the interpretation of the causal relationship between the experience of SLEs and life satisfaction.

A commonly used indicator for assessing the general mental health of the population is life satisfaction, which measures the individual's subjective sense of well-being (SWB) [12,13]. Previous research has linked life satisfaction to socio-demographic characteristics ranging from gender, income, education, and marital status [14] and SLEs [15]. While the association between depressive symptoms and life satisfaction is relatively well-studied, the pattern of the relationship necessitates further investigation [16].

In studying the relationship between SLEs and life satisfaction, rumination and resilience were cited as important factors [17,18]. Rumination was a particularly prevalent phenomenon accompanying large-scale population conflicts [9]. Meanwhile, resilience has been observed to be critical in addressing the negative impact on mental health during the current pandemic [19]. Significantly, rumination could amplify the role of resilience in its impact on mental health [20]. Extant literature suggests that the cyclical construct of rumination tends to activate, intensify, and maintain individuals' negative emotions, including low mood and anger [21,22]. Ruminators who fixate on symptoms of distress experience more

depressed moods than non-ruminators [21]. Sustained activation of past stressful life events through rumination may undermine individuals' post-event coping and impede recovery and be considered a risk factor for the development of PTSD [23]. However, the role of rumination and resilience in conjunction with successive large-scale stressors in the population has been minimally studied.

Considering the two population-level stressors (social unrest and COVID-19) and personal stressors, the association between SLEs and life satisfaction ought to be further investigated. The current study examined the impact of two recent large-scale stressors on the life satisfaction of the Hong Kong population by comparing data from the population-based samples of 2018 and 2020. We hypothesized that the effect of personal SLEs on life satisfaction would be reduced in 2020 compared to that in 2018. We further hypothesized that SLEs related to social unrest and COVID-19 would explain more significant variance in life satisfaction than personal SLEs. Other psychological factors, including rumination and resilience, would also contribute to lower life satisfaction.

## **Methods**

We conducted two population-based telephone surveys of Hong Kong citizens between 17 January to 26 February 2018 and between 15 July to 7 August 2020. Both surveys were conducted using the Web-based Computer Assisted Telephone Interview (Web-CATI) system (supplementary material 1). They followed the American Association for Public Opinion Research (AAPOR) reporting guidelines. All respondents provided verbal consent as approved by the Institutional Review Board and Ethics Committees.

### ***Study population***

All interviews were conducted anonymously. Inclusion criteria of both surveys were adult Hong Kong residents (18 years or older), able to speak Cantonese, and able to give verbal consent. The target sample was divided into 10 gender-age strata to ensure the sample characteristics were similar to those of the general population [24].

### ***Survey instrument and Measures***

Both surveys included questions on the respondent's demographic characteristics, including age, gender, and education level. Questions on marital status, employment status, and income were included in survey 2020 only. We use a validated single-item life satisfaction ranging from 0 – 10, with 10 indicating the most excellent satisfaction [25].

We used six items extracted and regrouped from the List of Threatening Experiences [26] to assess the respondent's experience of stressful life events in the past year. The six items captured the following sub-types of SLEs: (1) family/relationship issues, (2) legal issues, (3) work/school stress, (4) financial difficulties, (5) health/injury (self), and (6) health/injury (family/close people). To further capture the

impact of social unrest and COVID-19 on the population in the 2020 survey, for each of the SLEs endorsed, we asked the respondents whether this event was related to social unrest only, related to COVID-19 only, or related to both social unrest and COVID-19. Those reporting the SLE as not related to either social unrest or COVID-19 social unrest were considered as personal SLEs.

In survey 2020, we used a 4-item Patient Health Questionnaire (PHQ-4) to assess the respondent's depressive (2 items) and anxiety (2 items) symptoms in the past two weeks [27]. Respondents rated the frequency of each symptom on a 4-point Likert scale from 0 (not at all) to 3 (nearly every day). The summary score of depressive and anxiety symptoms was calculated by summing up the two corresponding items (0 – 6, 6 indicating the highest level of depressive or anxiety symptoms). The PHQ-4 demonstrated high internal reliability, with a Cronbach's  $\alpha$  of 0.83 in this study. We also assessed the respondent's experience of rumination using two items on the brooding of the Rumination Response Scale [28]. We also used a validated 2-item Connor-Davidson Resilience Scale [29]. Respondents rated each item of both scales on a 4-point Likert scale, ranging from 0 (almost never) to 4 (almost always). The summary score of each scale was calculated by summing up the responses (0 – 8, 8 indicating the highest level of rumination and resilience). In this study, the Cronbach's  $\alpha$  of the scale of rumination and resilience was 0.77 and 0.65, respectively.

## ***Statistical analysis***

The response rate was calculated using the American Association for Public Opinion's Research Response Rate definition [30]. Two-sided  $P < .05$  was considered statistically significant. All analyses were performed with Statistical Package for the Social Sciences (SPSS), version 26.0. Weighting was applied to the dataset to adjust for any differences between the sample and the general population.

To test life satisfaction as a good indicator for general mental health, we examined the partial correlation between life satisfaction and depression and anxiety symptoms using the data of survey 2020, with age, gender, and education as controlling variables. Life satisfaction and experience of all sub-types of SLEs were compared between 2018 and 2020 using the Mann-Whitney U test (as the assumption of data normality was not met) and chi-square test, respectively. To compare the relationship between personal SLEs and life satisfaction in the 2018 and 2020 samples, a moderation analysis, with the year of the survey as a dichotomous moderator variable, was performed with PROCESS in SPSS. The model was adjusted for age, gender, and education level. A significant interaction effect would suggest that the relationship between personal SLEs and life satisfaction varied across the two years.

To assess SLEs and psychological factors associated with life satisfaction, we built a 6-step hierarchical multiple regression using the data from survey 2020. The outcome was life satisfaction, and covariates included gender, age, education, marital status, employment status, and income. Variables were added to the regression in the following order: (1) demographic variables (as covariates); (2) number of personal SLEs (those not associated with either social unrest or COVID-19); (3) number of SLEs related to social unrest only; (4) number of SLEs related to COVID-19 only; (5) number of SLEs related to both social unrest

and COVID-19, and (6) psychological factors, including rumination and resilience. The SLEs variables were added according to the chronological order of events. This procedure allowed for determining additional variance in life satisfaction separately explained by the different types of SLEs on top of personal SLEs and psychological responses. The multicollinearity in the regression models was assessed using the variance inflation factor (VIF). Values of VIF exceeding 2.5 would be regarded as indicating multicollinearity.[31]

## Results

### ***Response Rate and Respondent's Characteristics***

The final sample included 1,514 completed surveys, for a response rate of 56.2% in 2018 and 1,258 for a response rate of 68.9% in 2020. The demographic characteristics of the 2018 and 2020 samples were comparable to one another and the adult population in Hong Kong (Table 1) [24].

### ***Life satisfaction and SLEs in 2018 and 2020***

Results of the partial correlation analysis showed a moderate correlation between life satisfaction and depressive ( $r = -0.451, P < .001$ ) and anxiety symptoms ( $r = -0.443, P < .001$ ), indicating that life satisfaction is a good indicator of general mental health.

The mean (SD) score for life satisfaction significantly declined from 7.03 (1.82) in 2018 to 6.37 (2.12) in 2020 ( $P < .001$ ). All sub-types of SLEs also showed significant increases from 2018 to 2020 (Figure 1). The mean (SD) number of SLEs reported increased from 1.35 (0.82) in 2018 to 2.41 (1.91) in 2020 ( $P < .001$ ). Respondents reported a total of 1,331 of SLEs in 2018 and 2,620 in 2020. Notably, the proportion of respondents who reported two or more SLEs in 2020 doubled in 2018 (47.6% vs. 21.8%;  $P < .001$ ).

Of the 2,620 SLEs reported in 2020, 751 (28.7%) were related to both social unrest and COVID-19, 209 (8%) were related to social unrest only, and 356 (13.6%) were related to COVID-19 only. The number of personal SLEs reported in 2020 ( $n = 1,309$ ) was similar to that in 2018 ( $n = 1,331$ ).

#### *Effects of personal SLEs on life satisfaction in 2018 and 2020*

Combining the data of survey 2018 and 2020, every 1 unit increase in personal SLEs was significantly associated with a 0.734 unit decrease in life satisfaction (95%CI,  $-0.918$  to  $-0.551, P < .001$ ). From 2018 to 2020, life satisfaction decreased significantly by 1.030 units (95%CI,  $-1.204$  to  $-0.856, P < .001$ ). The significant interaction effect revealed in the moderation analysis indicated that the association between personal SLEs and life satisfaction significantly varied across the two surveys ( $P < .001$ ) (Table 2).

# ***Effects of personal and external SLEs, rumination, and resilience on life satisfaction in 2020***

Results of the hierarchical regression analyses are presented in Table 3. After controlling for demographic characteristics, more experiences of SLEs ( $b = -0.095$  to  $-0.800$ ), higher levels of rumination ( $b = -0.164$ ) were significantly associated with reductions in life satisfaction. In the first step, demographics explained 4.6% of the variance in life satisfaction. In step two, personal SLEs further explained 0.3% of the variance. In steps three and four, SLEs related to social unrest only, and COVID-19 only further explained 5.8% and 3.1% of the variance in life satisfaction. In step five, SLEs related to both social unrest and COVID-19 explained an additional variance of 9.4%. In the last step, rumination and resilience added 2.4% of the variance in life satisfaction.

## **Conclusion**

Our findings revealed a significant decline in the general mental health of the Hong Kong population as indexed by life satisfaction. Life satisfaction was negatively associated with the experience of SLEs in both 2018 and 2020. Importantly, we found that the experiences of SLEs significantly increased in 2020, with over half of the SLEs reported being related to either social unrest or COVID-19.

To our knowledge, this was one of the first population-based studies that compared the general mental health of a population before and after a protracted period of co-occurring social unrest and COVID-19. It may be noteworthy to further consider the comparison of life satisfaction and reported SLEs between 2018 and 2020. Our regression model showed that, in 2020, personal SLEs contributed relatively less to general mental health, while external SLEs, i.e., stressors affecting the entire population, including social unrest and COVID-19, contributed more. Overall, recent encounters with SLEs have significantly predicted general mental health in 2018 and 2020. The interaction analysis also revealed that the effect of personal SLEs on life satisfaction shifted significantly from 2018 to 2020. When two additional large-scale stressors were taken into account, the personal SLEs were less predictive of life satisfaction.

To date, there is limited information on how SLEs on personal and community levels may differentially impact the general mental health of the population. Existing studies have shown some inconsistencies in the findings, where some researchers found that personal SLEs were more strongly associated with subjective mental health than socioeconomic stressors [32], while others also suggested a mediating role of sense of control in the relationship between SLEs and general mental health in older Chinese adults [33]. Future studies may further investigate how the sense of control affects the relationship between SLEs and general mental health in a population.

Our findings supported the first two hypotheses that general mental health deteriorated from 2018 to 2020 and that SLEs associated with social unrest or COVID-19 had a significant impact on the worsening trend. The findings on the relationship between SLEs and life satisfaction were consistent with previous findings [15]. This study additionally suggested that SLEs related to social unrest and COVID-19 had a

more significant impact on life satisfaction. Therefore, the future design of mental health interventions should consider targeting people who experienced more SLEs related to social unrest and COVID-19. Results of this study about the relationship between rumination and general mental health are consistent with previous findings [34,35]. While past research suggested that general mental health can be explained by rumination [36], the current research put forward rumination as a prominent predictor of life satisfaction.

### *Strengths & limitations*

The study allowed investigation on changes in the general mental health of the population in two representative samples in Hong Kong from 2018 to 2020. Considering the two large-scale stressors, i.e., social unrest and COVID-19 pandemic, could provide important insights into factors contributing to population mental health. These findings would be of global relevance given the increasing number of countries facing the pandemic and mass social movements simultaneously (e.g., the USA, France, Thailand, South Africa) [3].

Meanwhile, several limitations of the study should be noted. First, the validity of using life satisfaction as an index of general mental health is controversial in the literature due to its subjective nature [37,38]. However, as the World Health Organization has recently defined life satisfaction as a core part of good mental health [39], we believe that our study has generated valuable findings on the population mental health of Hong Kong. Second, the mental health status of the population could only be measured from a subjective perspective, but not more objectively, because the study collected data by telephone interview. Third, the sampling method for households using fixed telephones may also have limited the generalizability of our results [15]. Nonetheless, this method also has the advantages of reaching geographically dispersed samples and collecting data from those who may not be willing to participate in person [40], especially during COVID-19 and social unrest. Since data were collected from two distinct samples over two time points, we reported overall changes in trends in population mental health instead of changes within subjects. We would caution against interpreting the study as a prospective investigation of the mental health conditions of a population-based sample over two years.

In summary, we have shown that the general mental health of the Hong Kong population declined significantly in 2020 compared to 2018. Notably, large-scale external events, including social unrest and COVID-19, have contributed significantly to the decline in population mental health in addition to other personal stressors. Supportive measures are vital to protect the mental health of Hong Kong people. We suggest that psychoeducation on the concept of rumination is vital during this distinctive phase in Hong Kong.

## **Declarations**

**Funding** The current study was funded by the Hong Kong Jockey Club Charities Trust as part of the Jockey Club Mental Wellness Project for Women.

**Conflict of interest** The authors declare that they have no conflict of interest.

**Availability of data and material** The data generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

**Code availability** Not available

**Authors' contributions** WMYS, SLTT, CKWS, HLMC, SYN, and CYHE are responsible for study conceptualization and design. MYS, SLTT, SYN, and CYHE are responsible for data analysis and interpretation. WMYS, SLTT, and SYN were responsible for manuscript drafting. All authors were involved in the critical revision of the manuscript for important intellectual content. SYN had full access to all data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Ethics approval** All respondents provided verbal consent as approved by the Institutional Review Board and Ethics Committees

**Consent to participate** All respondents provided verbal consent for participation as approved by the Institutional Review Board and Ethics Committees

**Consent for publication** Not available

## References

1. Charlson, F., van Ommeren, M., Flaxman, A. Cornet, J., Whiteford, H., & Saxena, S. (2019). New WHO prevalence estimates of mental disorders in conflict settings: a systematic review and meta-analysis. *Lancet*, *394*(10194), 240–248. doi: 10.1016/S0140-6736(19)30934-1
2. World Politics Review. (15 October, 2020). *The Global Rise of Anti-Lockdown Protests—and What to Do About It*. Retrieved 23 November, 2020, from <https://www.worldpoliticsreview.com/articles/29137/amid-the-covid-19-pandemic-protest-movements-challenge-lockdowns-worldwide>
3. McVeigh, K. (17 July, 2020). *Protests predicted to surge globally as Covid-19 drives unrest*. The Guardian. Retrieved 23 November, 2020, from <https://www.theguardian.com/global-development/2020/jul/17/protests-predicted-to-surge-globally-as-covid-19-drives-unrest>
4. Ni, M. Y., Yao, X. I., Leung, K. S. M., Yau, C., Leung, C. M. C., Lun, P., Flores, F. P., Chang, W. C., Cowling, B. J., & Leung, G., M. (2020). Depression and post-traumatic stress during major social unrest in Hong Kong: a 10-year prospective cohort study. *Lancet*, *395*(10220), 273–284. [https://doi.org/10.1016/S0140-6736\(19\)33160-5](https://doi.org/10.1016/S0140-6736(19)33160-5)
5. Huang, Y., & Zhao, N. (2020). Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry Research*, *288*, 112954. <https://doi.org/10.1016/j.psychres.2020.112954>

6. Ran, L., Wang, W., Ai, M., Kong, Y., Chen, J., & Kuang, L. (2020). Psychological resilience, depression, anxiety, and somatization symptoms in response to COVID-19: A study of the general population in China at the peak of its epidemic. *Social Science & Medicine*, 262, 113261. <https://doi.org/10.1016/j.socscimed.2020.113261>
7. Tso, I. F., Park, S. (2020) Alarming levels of psychiatric symptoms and the role of loneliness during the COVID-19 epidemic: A case study of Hong Kong. *Psychiatry Research*, 293, 113423. <https://doi.org/10.1016/j.psychres.2020.113423>
8. Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R., Majeed, A., & McIntyre, R. S. (2020). Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*, 277, 55–64. <https://doi.org/10.1016/j.jad.2020.08.001>.
9. Wong, S. M. Y., Hui, C. L. M., Wong, C. S. M., Suen, Y. N., Chan, K. W., Lee, H. M. E., Chang, W. C., Chen, E. Y. H. (2020). Mental health risks after repeated exposure to multiple stressful events during ongoing social unrest and pandemic in Hong Kong: the role of rumination. *Canadian Journal of Psychiatry*. <https://doi.org/10.1177/0706743720979920>.
10. Pleyers, G. (2020). The pandemic is a battlefield. Social movements in the COVID-19 lockdown. *Journal of Civil Society*, 16(4), 295-312. <https://doi.org/10.1080/17448689.2020.1794398>
11. Szklo, M. (1998). Population-based cohort studies. *Epidemiologic Reviews*, 20(1), 81–90. <https://doi.org/10.1093/oxfordjournals.epirev.a017974>
12. Vaillant, G. E. (2003). Mental health. *American Journal of Psychiatry*, 160(8), 1373–1384. <https://doi.org/10.1176/appi.ajp.160.8.1373>
13. Pavot, W., Diener, E. (2009). Review of the Satisfaction With Life Scale. In E. Diener (Eds.), *Assessing Well-Being: The Collected Works of Ed Diener* (pp. 101 – 117). Springer.
14. Myers, D. G., Diener, E. (1995). Who Is Happy? *Psychological Science*. 6(1), 10–19. <https://doi.org/10.1111/j.1467-9280.1995.tb00298.x>
15. Suen, Y. N., Chan, K. W. S., Siu, L. T. T., Lo, L. H. L., Cheung, C., Hui, L. M. C., Lee, H. M. E., Chang, W. C., Wong, P. S., & Chen, Y. H. E. (2020). Relationship between stressful life events, stigma and life satisfaction with the willingness of disclosure of psychotic illness: A community study in Hong Kong. *Early Intervention in Psychiatry*, 1-11. <https://doi.org/10.1111/eip.13008>
16. Bartels, M. (2015). Genetics of well-being and its components satisfaction with life, happiness, and quality of life: a review and meta-analysis of heritability studies. *Behavior Genetics*, 45(2), 137–156. <https://doi.org/10.1007/s10519-015-9713-y>
17. Vitale, R. A. (2020). *Spirituality, resilience, and social support as predictors of life satisfaction in young adults with a history of childhood trauma* (Doctoral dissertation, Kent State University, Northern Ohio, America). Retrieve from [http://rave.ohiolink.edu/etdc/view?acc\\_num=kent1444820307](http://rave.ohiolink.edu/etdc/view?acc_num=kent1444820307).
18. Karabati, S., Ensari, N., & Fiorentino, D. (2019). Job Satisfaction, Rumination, and Subjective Well-Being: A Moderated Mediation Model. *Journal of Happiness Studies*, 20, 251–268.

<https://doi.org/10.1007/s10902-017-9947-x>

19. Lau, H. P., & Ng, S. M. (4 April, 2020). 心理健康風險 [Risks and opportunities of mental health in the pandemic]. *MingPao Hong Kong*. Retrieved November 23, 2020 from [https://news.mingpao.com/ins/zh/article/20200414/s00022/1586783158577/心理健康風險\(粵-新聞-新聞\)](https://news.mingpao.com/ins/zh/article/20200414/s00022/1586783158577/心理健康風險(粵-新聞-新聞))
20. Harding, K. A., & Mezulis, A. (2017). Is rumination a risk and a protective factor? *Europe's Journal of Psychology, 13*(1), 28–46. <https://doi.org/10.5964/ejop.v13i1.1279>
21. Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology, 100*(4), 569–582. <https://doi.org/10.1037//0021-843x.100.4.569>
22. Rusting, C. L., & Nolen-Hoeksema, S. (1998). Regulating responses to anger: effects of rumination and distraction on angry mood. *Journal of Perspective Social Psychology, 74*(3), 790–803. <https://doi.org/10.1037//0022-3514.74.3.790>
23. Cann, A., Calhoun, L.G., Tedeschi RG, Triplett, K. N., Vishnevsky, T., & Lindstrom, C., M. (2011). Assessing post-traumatic cognitive processes: the Event Related Rumination Inventory. *Anxiety Stress Coping, 24*(2), 137–156. <https://doi.org/10.1080/10615806.2010.529901>
24. Census and Statistics Department. *2016 Hong Kong Population By-census*. Retrived 23 November, 2020 from <https://www.byccensus2016.gov.hk/en/index.html>.
25. Cheung, F., & Lucas, R. E. (2014). Assessing the validity of single-item life satisfaction measures: results from three large samples. *Quality of Life Research, 23*(10), 2809–2818. <https://doi.org/10.1007/s11136-014-0726-4>
26. Brugha, T., Bebbington, P., Tennant, C., Hurry, J. (1985). The List of Threatening Experiences: a subset of 12 life event categories with considerable long-term contextual threat. *Psychological Medicine, 15*(1), 189–194. <https://doi.org/10.1017/s003329170002105x>
27. Kroenke, K., Spitzer, R. L., Williams, J. B. W., Löwe, B. (2009). An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics, 50*(6), 613–621. <https://doi.org/10.1176/appi.psy.50.6.613>
28. Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. Rumination Reconsidered: A Psychometric Analysis. *Cognitive Therapy and Research, 27*, 247–259. <https://doi.org/10.1023/A:1023910315561>
29. Vaishnavi, S., Connor, K., & Davidson, J. R. T. (2007). An abbreviated version of the Connor-Davidson Resilience Scale (CD-RISC), the CD-RISC2: psychometric properties and applications in psychopharmacological trials. *Psychiatry Research, 152*(2-3), 293–297. <https://doi.org/10.1016/j.psychres.2007.01.006>
30. Smith, T. W. (August, 2009). A revised review of methods to estimate the status of cases with unknown eligibility. Retrieved 23 November, 2020 from [https://www.aapor.org/AAPOR\\_Main/media/MainSiteFiles/FindingE.pdf](https://www.aapor.org/AAPOR_Main/media/MainSiteFiles/FindingE.pdf)
31. Althouse, A. D. (2016). Adjust for multiple comparisons? It's not that simple. *The Annals of Thoracic Surgery, 101*(5), 1644-1645. <https://doi.org/10.1016/j.athoracsur.2015.11.024>

32. Parsaei, R., Roohafza, H., Feizi, A., Sadeghi, M., & Sarrafzadegan, N. (2020). How Different Stressors Affect Quality of Life: An Application of Multilevel Latent Class Analysis on a Large Sample of Industrial Employees. *Risk Management and Healthcare Policy, 13*, 1261–1270. <https://doi.org/10.2147/RMHP.S256800>
33. Chou, K. L., & Chi, I. (2001). Financial strain and depressive symptoms in Hong Kong elderly Chinese: The moderating or mediating effect of sense of control. *Aging & Mental Health, 5*(1), 23–30. <https://doi.org/10.1080/13607860020020609>
34. Yang, H., Wang, Z., Song, J., Lu, J., Huang, X., Zou, Z., & Pan, L. (2020). The positive and negative rumination scale: Development and preliminary validation. *Current Psychology, 39*, 483–499. <https://doi.org/10.1007/s12144-018-9950-3>
35. Zheng, Y., Zhou, Z., Liu, Q., Yang, X., & Fan, C. (2019). Perceived Stress and Life Satisfaction: A Multiple Mediation Model of Self-control and Rumination. *Journal of Child and Family Studies, 28*, 3091–3097. <https://doi.org/10.1007/s10826-019-01486-6>
36. Traş, Z., Yakıcı, H. B., Baltacı, U. B. (2020). Interpersonal competence and life satisfaction as the predictor of rumination about an interpersonal offense. *European Journal of Education Studies, 7*(7), 169-186. <http://dx.doi.org/10.46827/ejes.v7i7.3162>.
37. Fergusson, D. M., McLeod, G. F. H., Horwood, L. J., Swain, N. R., Chapple, S., & Poulton, R. (2015). Life satisfaction and mental health problems (18 to 35 years). *Psychological Medicine, 45*(11), 2427–2436. <http://dx.doi.org/10.1017/S0033291715000422>
38. Henrich, G., & Herschbach, P. Questions on Life Satisfaction (FLZM) - A Short Questionnaire for Assessing Subjective Quality of Life. *European Journal of Psychological Assessment, 16*(3):150–159. <https://doi.org/10.1027/1015-5759.16.3.150>
39. World Health Organization. *Mental health*. Retrieve 23 November, 2020 from <https://www-who-int.eproxy.lib.hku.hk/news-room/facts-in-pictures/detail/mental-health>.
40. Boland, M., Sweeney, M. R., Scallan, E. Harrington, M., & Staines, A. (2006). Emerging advantages and drawbacks of telephone surveying in public health research in Ireland and the U.K. *BMC Public Health, 6*, 208. <https://doi.org/10.1186/1471-2458-6-208>

## Tables

**Table 1. Demographic characteristics of respondents of survey 2018 and 2020, and the total population.**

	Survey 2018 (n = 1 514) No. (%)	Survey 2020 (n = 1 258) No. (%)	Total Population 2016 <sup>a</sup> No. (%)
<b>Gender</b>			
Male	719 (47.5)	591 (47.0)	2 846 845 (47.5)
Female	795 (52.5)	667 (53.0)	3 152 235 (52.5)
<b>Age Range, y</b>			
18-24	143 (9.4)	99 (10.2)	591 454 (9.9)
25-44	434 (28.7)	307 (31.7)	1 969 826 (32.8)
45-64	472 (31.2)	335 (34.6)	2 275 323 (37.9)
>=65	316 (20.9)	228 (23.5)	1 162 467 (19.4)
<b>Education</b>			
Primary	300 (19.8)	236 (19.0)	1 272 280 (20.6)
Secondary	716 (47.4)	580 (46.6)	2 858 359 (46.2)
Post-secondary	496 (32.8)	429 (34.5)	2 053 696 (33.2)

<sup>a</sup> Data from the Hong Kong by-census 2016 (Census and Statistics Department, 2017).

**Table 2. Moderation analysis of personal SLEs by survey year on life satisfaction.**

Variables	<i>b</i>	S.E.	<i>t</i>	<i>p</i>	95%CI (LCI, UCI)
(Constant)	6.475	0.288	22.467	< .001	5.910, 7.040
Personal SLEs	-0.734	0.094	-7.843	< .001	-0.918, -0.551
Survey year	-1.030	0.089	-11.597	< .001	-1.204, -0.856
Personal SLEs x Year	0.338	0.053	6.329	< .001	0.233, 0.443

The model was adjusted for age, gender, and education level.

$R^2 = 0.103$ . ANOVA:  $F_{6, 2655} = 50.912$ ,  $p < .001$

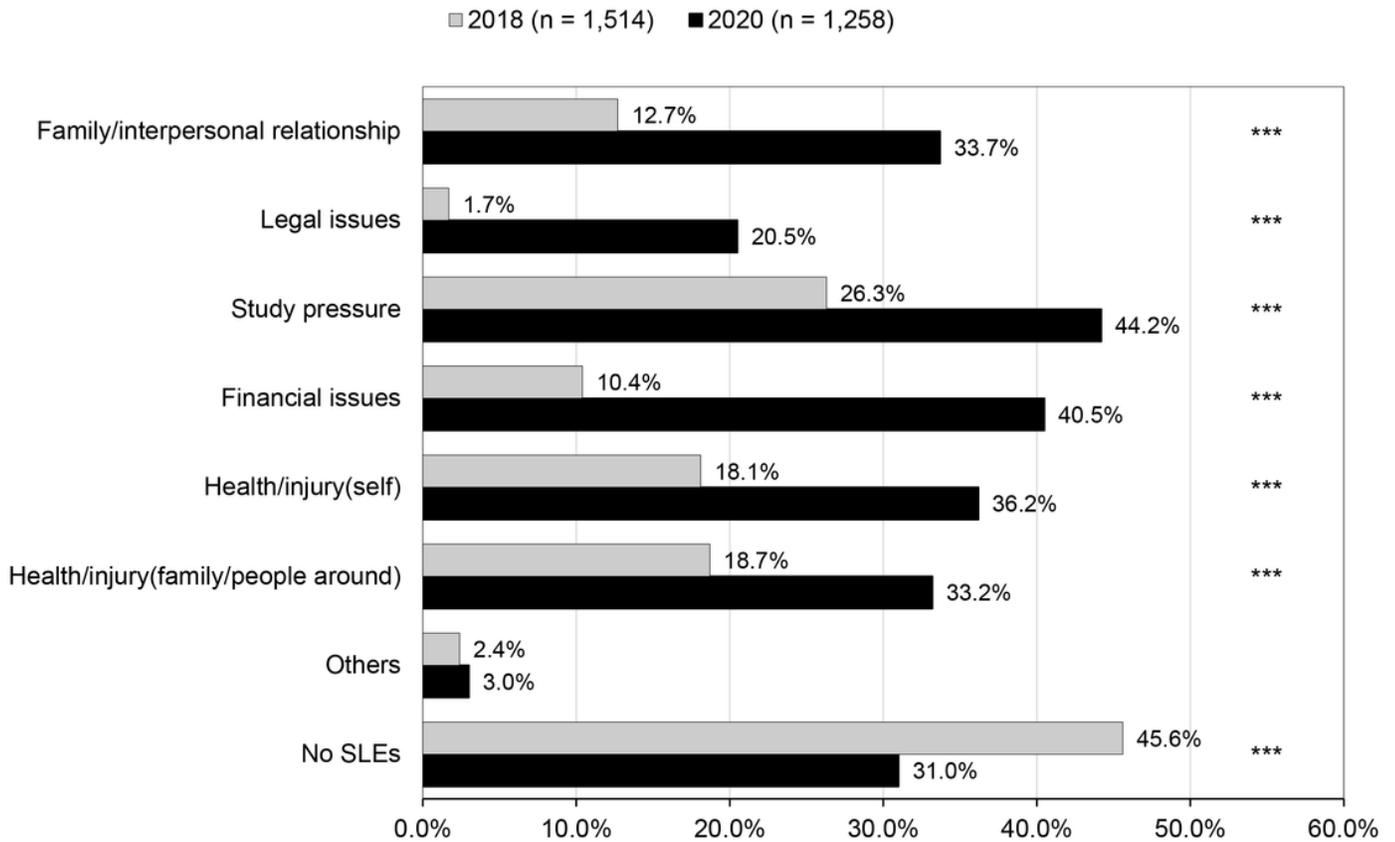
*b* = unstandardised coefficient; S.E. = standard error; CI = confidence interval; LCI = lower CI; UCI = Upper CI.

**Table 3. Results of hierarchical multiple regression analysis on correlates of life satisfaction in 2020.**

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
	<i>b</i> (95%CI)	<i>b</i> (95%CI)	<i>b</i> (95%CI)	<i>b</i> (95%CI)	<i>b</i> (95%CI)	<i>b</i> (95%CI)
Demographic characteristics						
Gender	0.030 (-0.240, 0.299)	0.036 (-0.233, 0.306)	0.002 (-0.259, 0.264)	0.047 (-0.210, 0.305)	0.102(-0.141, 0.346)	0.184 (-0.044, 0.412)
Age	0.327 (0.140, 0.514)***	0.329 (-0.142, 0.517)**	0.324 (0.143, 0.506)**	0.276 (0.096, 0.455)**	0.230 (0.060, 0.399)**	0.118 (-0.043, 0.279)
Education	-0.113 (-0.345, 0.119)	-0.089 (-0.323, 0.144)	-0.068 (-0.295, 0.158)	-0.065 (-0.287, 0.158)	-0.098(-0.308, 0.112)	-0.067 (-0.262, 0.128)
Marital status	-0.316 (-0.605, -0.027)*	-0.312 (-0.601, -0.023)*	-0.312 (-0.592, -0.032)*	-0.334 (-0.609, -0.059)*	-0.296 (-0.556, -0.036)*	-0.301 (-0.543, -0.058)*
Employment	0.271 (-0.033, 0.576)	0.271 (-0.033, 0.575)	-0.195 (-0.100, 0.491)	0.155 (-0.136, 0.446)	0.105 (-0.170, 0.380)	0.168 (-0.087, 0.424)
Income	0.495 (0.195, 0.795)	0.486 (0.187, 0.786)**	0.479 (0.189, 0.769)**	0.440 (0.154, 0.726)**	0.403 (-0.133, 0.673)**	0.349 (0.097, 0.600)**
SLEs						
Personal	-	-0.063 (-0.142, 0.016)	-0.060 (-0.136, 0.017)	-0.063 (-0.136, 0.012)	-0.089 (-0.756, -0.361)*	-0.085 (-0.155, -0.015)*
Related to social unrest only	-	-	-0.971 (-1.229, -0.714)	-1.006 (-1.259, -0.753)***	-0.866 (-1.106, -0.625)***	-0.800 (-1.039, -0.562)***
Related to COVID-19 only	-	-	-	-0.585 (-0.794, -0.376)***	-0.559 (-0.160, -0.018)***	-0.493 (-0.689, -0.297)***
Related to both social unrest and COVID-19	-	-	-	-	-0.597 (-0.713, -0.481)***	-0.531 (-0.648, -0.414)***
Others						
Rumination	-	-	-	-	-	-0.164 (-0.226, -0.102)***
Resilience	-	-	-	-	-	-0.030 (-0.030, 0.089)
<i>Adjusted R</i> <sup>2</sup>	0.046	0.048	0.106	0.136	0.230	0.252
$\Delta R^2$	-	0.003	0.058	0.031	0.094	0.024
VIF	1.048 -	1.020 -	1.011 -	1.014 - 1.559	1.026 - 1.56	1.027 - 1.613

Note. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ .  $b$  = unstandardised regression coefficient; CI = confidence interval.

## Figures



\*\*\*  $p < 0.001$ .

### Figure 1

The mean (SD) score for life satisfaction significantly declined from 7.03 (1.82) in 2018 to 6.37 (2.12) in 2020 ( $P < .001$ ). All sub-types of SLEs also showed significant increases from 2018 to 2020

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [sm120210417.docx](#)