Master of Public Health

Master de Santé Publique

An Exploration of Positive or Life Improvement Experiences in the Wake of the COVID-19 Pandemic:
Evaluating its Association with Socio-demographic, Work-related, and Health-related Variables

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List of acronyms

African (AFR)

COVID-19 Mental Health Survey (COMET)

Diagnostic and Statistical Manual of Mental Disorder (DSM-IV)

Ecole des Hautes Etudes en Santé Publique (EHESP)

Estimated Class Population Shares (ECPS)

European (EUR)

French National Institute of Health and Medical Research's (INSERM)

Generalized Anxiety Disorder Scale (GAD-7)

Inter-Quartile Range (IQR)

Latent Class Analysis (LCA)

Non-pharmaceutical Interventions (NPIs)

Patient Health Questionnaire (PHQ-9)

Predicted Class Memberships (PCM)

Pierre Louis Institute of Epidemiology and Public Health (IPLESP)

School of Health and Related Research (ScHARR)

Scientific and Ethical Review Board (VCWE)

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)

Social Epidemiology Research Team (ERES)

South-east Asian (SEAR)

Standard Deviation (SD)

Western Pacific (WPR)

World Health Organization (WHO)

Abstract (English)

Introduction: The COVID-19 pandemic has resulted in severe physical health consequences, however, the mental health impact of this pandemic remains uncertain. Though overwhelming amounts of proof have supported the detrimental mental health outcomes of this global disease outbreak, little is known about the potential positive outcomes. This study aims to explore positive feelings and life improvement experiences associated with the coronavirus pandemic and associated cio-demographic, work-related, and health-related factors.

Methods: A sample of 1725 participants from the international COMET survey responded to the final question of the fifth data collection wave ascertaining positive feelings and life improvement experiences. Latent Class Analysis was performed to classify individuals who responded to this question into distinct groups based on their responses. Multinomial logistic regressions were used to quantify the associations of socio-demographic, work-related, and health-related variables with the identified classes.

Results: We identified four distinct classes of positive feelings and life improvement experiences in our sample. Compared to individuals in the "*No Improvement*" class (31.9%), those classified within "*Life Choices*" (15.0%) were more likely to be female (OR = 1.84, 95% CI [1.11-3.06]), live with two other individuals (OR = 1.89 [1.03-3.49]), or have a religious affiliation (OR = 1.66 [1.13-2.44]). Those classified within *Work/Life Balance* (44.4%) were younger age (OR = 0.99 [0.97-1.00]), residing in western Pacific (OR = 1.69 [1.14-2.50]) or south-east Asian regions (OR = 4.96 [1.63-15.1]), in suburban areas (OR = 1.51 [1.07-2.14]), having a religious affiliation (OR = 1.40 [1.03-1.92]), being a student (OR = 2.56 [1.20-5.46]), employed (OR = 2.20 [1.33-3.64]), or otherwise (OR = 2.58 [1.32-5.01]). Those who reported more financial worries than usual in the last 12 months (OR 0.63 [0.43-0.94]) and depressive symptoms (OR= 0.63 [0.42-0.92]) were less likely to be classified within this group. Those classified within *Time with Loved Ones* (8.7%) were more likely to be of younger (OR = 0.99 [0.95-0.99]), residing in south-east Asian region (OR = 10.9 [3.24-36.8]), suburban areas (OR = 2.13 [1.26-3.60]), living with two other individuals (OR = 2.85 [1.28-6.35]), being a student (OR = 3.33 [1.01-11.0]), and less likely to report anxiety symptoms (OR = 0.31 [0.12-0.80]).

Conclusion: We identified four distinct classes of positive feelings and life improvement experiences associated with the COVID-19 pandemic. Factors associated with class membership slightly differ for each specific class. Further understanding of the associated predictors would be useful for the development of mental health-related interventions.

Key words: COVID-19, positive feelings, life improvement, mental health, COMET survey

1. Introduction

1.1. COVID-19 Pandemic

For over three years to date, countries across the globe have been impacted by the effects of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and its resulting COVID-19 disease. The World Health Organization (WHO) officially characterized COVID-19 as a pandemic on the 11th of March, 2020 (1, 2). Subsequently, on the 5th of May 2023, the WHO's International Health Regulations (2005) (IHR) Emergency Committee on COVID-19 released a statement declaring the disease as an ongoing health issue and no longer a pandemic (3). As of May 2023, there have been over 760 million confirmed COVID-19 cases and close to 7 million deaths due to this highly infectious disease (4, 5). During the early onset of the COVID-19 pandemic, when there were peaks in the number of cases and no main pharmaceutical intervention such as vaccines, many countries resorted to more restrictive non-pharmaceutical interventions (NPIs) such as staying at home wherever possible, curfews, national lockdowns, and travel bans (6, 7). Other measures to contain the virus and minimize the spread of COVID-19 included NPIs such as the use of masks in public spaces, observing social distancing, and encouraging appropriate hand hygiene/cough etiquette (6, 8, 9). As a result of the pandemic and its containment measurements, there have been a number of consequences that have affected and continue to affect countries and individuals on a wider physical, psycho-sociological, and economic scale (10). In a study highlighting the societal impacts of COVID-19 in comparison to previous pandemics, it has been implied that the main risks posed by the disease may not be the direct impact of the pathogen of the disease, but rather the indirect effects of control measures on health and essential societal activities (11). Given that COVID-19 has undoubtedly become a major part of contemporary health, an adequate understanding of this pandemic's impact on society could help public health professionals and policymakers prepare for future disease outbreaks.

1.2. Overall Impact of Pandemics on Mental Health and Well-being

Historically, disease outbreaks have played a pivotal role in human existence (12) and public health research generally focuses on the disease, its prevention, or its management. However, the WHO's definition of health suggests it as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (13) — thus emphasizing the significance of incorporating a holistic and inclusive view of diverse aspects in health-related research. Though there is some scientific literature (14,15) recognizing the importance of mental health during past epidemics, the rather unprecedented context of a

worldwide pandemic in contemporary health makes comparison difficult. There is less information about the impact of past pandemics on psychological well-being compared to the SARS-CoV-2 one and although pandemics have adversely impacted the evolution of human health, the COVID-19 pandemic is unique in that access to technology has progressed tremendously. Consequently, this recent pandemic created space for public health researchers to not only study the COVID-19 disease and its prevention/management, but to concurrently examine the ways in which the outbreak impacted the mental well-being of populations across the globe in a revolutionary manner that could be useful for future pandemic preparedness.

1.3. Negative Impacts of COVID-19 on Mental Health

Several mental health issues such as anxiety disorders, depression, substance abuse, increased suicidal ideations, and post-traumatic stress disorder (PTSD) have been found to be common following major economic crises or natural disasters such as pandemics (16-18). More specifically, there is evidence that suggests socio-demographic, work-related, and health-related factors could also be associated with the reporting of mental health outcomes during the SARS-CoV-2 pandemic (19-21). In a WHO-commissioned scientific brief focusing on early evidence of this pandemic's impact on mental health (20), younger age, female gender, and pre-existing health conditions were commonly reported risk factors for general mental health issues and particularly for anxiety and depression. As for individuals with existing mental health disorders, COVID-19 illness severity and mortality increased with younger age and disorder severity (20). Moreover, younger people had higher risks of suicidal behaviors throughout the pandemic (20).

Though it is evident that the coronavirus pandemic has negatively affected people's mental health worldwide, there is no general consensus about the extent of this impact. There is evidence from a systematic review and meta-analysis (22) suggesting that anxiety, depression, and general mental health symptoms related to the quality of life only worsened minimally during the COVID-19 pandemic compared to before. Nevertheless, a more recent umbrella review (23) studying common mental health symptoms in the early phase of the COVID-19 pandemic found a minor yet steady deterioration of mental health in the general population and among people with chronic somatic disorders. Some of the mental health issues discussed in this review include anxiety, depression, as well as PTSD, in general and specific populations (23). Being aware of the potential negative mental health consequences associated with the COVID-19 pandemic, it is important to gather additional information about those individuals at a higher risk of experiencing detrimental mental health outcomes throughout the pandemic as well as the health-related variables potentially associated with

these outcomes. This may grant researchers, healthcare providers, policymakers, and other relevant stakeholders the ability to create better evidence-based and targeted interventions to overcome adverse mental health outcomes in the wake of future pandemics.

1.4. Positive Impacts of COVID-19 on Mental Health

Despite the evidence of COVID-19's association with the aforementioned detrimental mental health outcomes, there is reason to believe that there may be positive effects associated with this outbreak as well. Finstad et al. (24) demonstrated that traumatic experiences, such as pandemics, may simultaneously lead to positive reactions which promote feelings of growth and foster resilience which can be defined as the ability to adapt or recover from unpleasant and challenging situations (24). Positive feelings, in particular, are an often neglected topic in public health research. Since not much scientific literature has highlighted this subject, positive feelings can be conventionally defined as desirable or pleasant situational responses that are consciously expressed (25, 26). The words 'feeling' and 'emotion' are commonly used interchangeably, however, the scope of this research will focus on positive feelings which can be generally understood as the outward manifestations of an emotional stimulus (27, 28). Correspondingly, a study that took place in Australia (29) found in a sample of 1370 persons, about 70% reported experiencing at least one positive effect or outcome during the COVID-19 pandemic. Amongst these participants (29), living with others, employment situation, working from home, and better health were all found to be associated with experiencing these positive effects. Additionally, a study in Scotland (30) demonstrated that as a result of their first national lockdown, some unintended positive changes took place, such as spending more time in nature, being outdoors, or being appreciative of things usually taken for granted. In the same Scottish study (30), females from younger age groups who were married or living with a partner, employed, and in better health reported higher levels of positive change. Hence, this evidence suggests that there are positive impacts amidst the coronavirus pandemic.

1.5. Research Aims and Objectives

The existing body of literature (16-23) that recognizes the consequences of the COVID-19 pandemic on mental health and well-being provides overwhelming proof of the negative mental health outcomes in comparison to the little-known positive feelings or life improvement experiences associated with this pandemic (24, 25, 29, 30). Thus, using secondary data from the COVID-19 Mental Health Survey (COMET) study, we will explore COVID-19's effect on mental health from a positive perspective as we predict there are simultaneously positive feelings and/or life improvement experiences associated with this

most recent pandemic. We will additionally explore a range of socio-demographic, work-related, and health-related variables to examine their association with these positive feelings. With regard to existing literature (19, 20, 22, 23, 29, 30), we predict younger women in a relationship, employed, with less contact with COVID-19 infection and lower levels of depression and anxiety will report more feelings of positivity and life improvement experiences two years after the onset of the pandemic in comparison to other groups.

The objectives of this thesis are:

- To explore life improvement or positive feeling experiences two years after the onset of the COVID-19 pandemic across a range of individuals who responded to the fifth data collection wave of the COMET study.
- To identify sociodemographic (age, gender, relationship status, etc.) work-related (employment status, income, financial status, etc.), and health-related (COVID-19 infection, pre-existing mental health conditions, general mental health, etc.) factors associated with reporting positive experiences within the study population.

This research was conducted at the French National Institute of Health and Medical Research's (INSERM) Pierre Louis Institute of Epidemiology and Public Health (IPLESP). The topic was proposed by the Social Epidemiology Research Team (ERES) located at Sorbonne University's Medical Faculty at Saint Antoine Hospital. Some of the main tasks executed included: a literature search in international, online bibliographic databases such as PubMed and the University of Sheffield's StarPlus Library, development of a clear data analysis plan, management and analysis of the COMET dataset, implementation of relevant statistical analyses, interpretation of the results from the analyses, and writing of this dissertation in accordance with the modalities defined by Ecole des Hautes Etudes en Santé Publique (EHESP).

2. Methods

2.1. The COMET Survey

The COMET survey initiated by Vrije University in Amsterdam is an international, online longitudinal cohort study. The COMET survey was created in collaboration with an academic consortium of professionals skilled in mental health research located in 14 different countries: The Netherlands, Italy, France, Spain, Germany, Sweden, Switzerland, United Kingdom, Turkey, South Africa, Indonesia, China, Australia, and the United States. The main objective of this survey is to evaluate whether the course of mental health symptoms during the current COVID-19 outbreak is predicted by sociodemographic variables (age, gender, education level, profession, degree of economic losses), social isolation, domestic violence, level of exposure to COVID-19, pre-existing mental health issues, contamination fear, cultural value orientations, coping strategies, and positive feelings or life improvement as a result of the pandemic.

2.1.1. Study Population and Recruitment

In order to participate in this study, participants had to be 18 years of age or older, have an adequate command of one of the study languages (Dutch, English, German, Italian, French, Swedish, Turkish, Mandarin, or Bahasa Indonesia), and checkmark the online informed consent. Recruitment of participants was achieved by snowball sampling strategy through university mailing lists and/or different social network platforms such as Facebook, Instagram, Twitter, etc. Prior to answering any survey questions, participants were given information about the study and its objective(s). Informed consent was thereafter obtained through a secure web link before starting the survey. Subsequently, participants were invited to complete a CAWI (Computer Aided Web Interviewing) survey containing validated mental health questionnaires in addition to questions on sociodemographic factors and on their current situation during the COVID-19 pandemic. The questionnaires are available in different languages of the participating countries. Participation remained anonymous, data was encrypted, and since participation was entirely voluntary, participants were free to withdraw from the survey at any time.

2.1.2. Data Collection Waves

The COMET study followed the same participants over five different data collection waves. Since May 2020, 8084 participants who met the inclusion criteria were followed at baseline (4 May - 5 July 2020). From the initial amount of participants, 4500 responded to the second data collection wave (4 September - 5 October 2020), 4150 during the third wave (7 December - 10 January 2021), 3835 during the fourth wave (19 March - 23 April 2021), and

1737 during the fifth wave (21 May - 25 June 2022). The original study protocol was designed to collect data in the first four waves, however, a fifth wave was administered after the prolongation of the pandemic and validation of an amendment to the protocol. The study population for this particular research is the 1725 participants who responded to the fifth wave and final question variable ascertaining positive feelings or life improvement experiences.

2.1.3. Ethical Consideration

Ethical approval to conduct the COMET study was received by the Scientific and Ethical Review Board (VCWE) of the Faculty of Behavior and Movement Sciences at Vrije University in Amsterdam. Additionally, ethical approval from the University of Sheffield's School of Health and Related Research (ScHARR) was obtained and can be found in **Appendix 1.**

2.2. Measures

2.2.1. Outcome Variable

Positive feelings and life improvement experiences were measured at the end of the COMET survey, only for the fifth data collection wave. This outcome was assessed using the following question:

Have you experienced positive feelings or has your life improved in any way during or as a result of the pandemic? (Please select all that apply)
1. *No*
2. *Yes, I have more time with my family*
3. *Yes, I have more time with other loved ones*
4. *Yes, I spend more time doing pleasant or beneficial activities (e.g. exercising, reading books, etc)*
5. *Yes, my work has been more flexible*
6. *Yes, my business had higher profits*
7. *Yes, I reconsidered what is important in life*

The seven possible responses to this question will be referred to as 'indicators' throughout this thesis.

2.2.2. Predictors and Covariates

As previously mentioned, since little is known about positive feelings and life improvement as it relates to the COVID-19 pandemic, we will explore a range of relevant and commonly researched socio-demographic, work-related, and health-related variables to learn more about the characteristics of the individuals who responded to our outcome variable.

Socio-demographic variables: age (in years), gender (female; male – *due to small sample sizes, those who selected transgender female or transgender male were included in the female and male categories, respectively and respectfully), WHO region of residence (African (AFR); European (EUR); south-east Asian (SEAR); western Pacific (WPR)), area of residence (urban; suburban; rural), relationship status (married; domestic partnership or civil union; steady relationship living together; steady relationship living apart; divorced, separated or widowed; single), number of people living in the household (one; two; three; four or more), religious affiliation (yes; no), and higher education level (yes; no).

Work-related variables: occupation (unemployed; student; employed; retired; other), income reduction in the past year (yes; no), financial worries in the past year (not at all; not more than usual; more than usual; much more than usual), additional financial support (COVID-related) from the government in the past year (yes; no).

Health-related variables: pre-existing mental health issues (yes; no), COVID-19 infection and severity of symptoms (yes, asymptomatic; yes, symptomatic; no), depressive symptoms (yes; no), anxiety symptoms (yes; no).

Regarding the latter, depressive symptoms were measured using the nine-item version of the Patient Health Questionnaire (PHQ-9) (31, 32). The PHQ-9 assesses the presence and severity of depressive symptoms during the past two weeks, with respect to the 4th version of the Diagnostic and Statistical Manual of Mental Disorder (DSM-IV) definition of depression. Participants were asked a total of 9 questions such as *"Over the past two weeks, have you been bothered by having little interest or pleasure in doing things?"*, with a 4-option Likert scale: 0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day. The overall scores range from 0 to 27; 0-4 = minimal depression, 5-9 = mild depression, 10-14 = moderate depression, 15-19 = moderately severe depression, and ≥ 20 = severe depression. A binary variable was then created and used with those who scored less than 10 were considered to have no depression, while those with a score of 10 or more were considered to have depression (33). The full questionnaire in English can be found in **Appendix 2.**

Symptoms of anxiety were measured using the seven-item Generalized Anxiety Disorder Scale (GAD-7) (34). The GAD-7 assesses presence and severity of anxiety disorder symptoms during the past two weeks, with respect to the 4th version of the DSM-IV definition of generalized anxiety disorder. Participants were asked a total of 7 questions such as *"Over the past two weeks, have you been bothered by feeling nervous, anxious, or on edge?"*, with a 4-option Likert scale answer: 0 = not at all, 1 = several days, 2 = over half the days, 3 = nearly every day. The overall scores range from 0 to 21; 0-4 = minimal anxiety, 5-9 = mild anxiety, 10-14 = moderate anxiety, and 15-21 = severe anxiety. Similar to depression, a binary outcome was created. Those who scored less than 10 were considered to have no anxiety, while those with more than 10 were considered to have anxiety (35). The full questionnaire in English can be found in **Appendix 2**.

2.3. Statistical Methods

All statistical analyses were performed using R Studio (version 4.2.2).

2.3.1. Descriptive Analysis

For a better understanding of our study population, a number of descriptive statistics were generated for the outcome variable and its selected predictors and covariates. All of the variables being explored within this study are categorical with the exception of age. Each examined categorical variable is given in frequency (percentages). Continuous variables were analyzed to verify if they were normally distributed. The mean and standard deviation (SD) are used to describe normally distributed continuous variables while the median and interquartile range (IQR) are used to describe the continuous variables that are not normally distributed.

2.3.2. Latent Class Analysis

Most research follows a variable-centered approach, which provides data regarding the sample's "averaged" parameters (e.g., regression, structural equation modeling (SEM), etc.). Person-centered approaches, in contrast, consider that a population might be composed of unobserved subpopulations characterized by different sets of parameters (36). One of the most common applications of person-centered techniques is latent class analysis (LCA) (37). The aim of latent class models is to trace back heterogeneity in a population to a number of existing but unobserved subgroups of individuals, which are referred to as latent classes. The analyses are based on a set of observed variables that can be categorical and/or continuous. The classes are formed such that there is as much similarity within a class while at the same time as much differences between the classes as possible (38). This advanced statistical method was selected to create the outcome variable due to its capacity to identify distinct

subgroups of persons within a study population that shares the same pattern of responses (39). Hierarchical and K-means clustering are also statistical methods often used to model categorical data in exploratory studies (40), however, LCA is more advantageous due to its statistical foundation in both theory and exploration (40).

In our study, LCA was performed to identify the underlying groups of positive feelings and life improvement experiences from the COMET cohort of individuals who responded to these questions on the fifth data collection wave. The subgroups created with LCA are indirectly derived from the original outcome by using at least 2 observed indicators (37, 40). Consequently, the minimum number of classes is set to 2 and there is usually no maximum number when performing LCA. Since we have a total of 7 observed indicators and each indicator was used to define the LCA model, we selected 6 classes to be the maximum. Subsequently, we estimated five different LCA models by the number of successive classes using the *poLCA* package in R Studio (41). To select the model which best fits the data, the following statistical indexes were taken into consideration:

- *Akaike Information Criteria (AIC)* and *Bayesian Information Criteria (BIC)* (39, 42, 43). They both compare the log-likelihoods between models, however, AIC is measured with the assumption that the model will have a higher quality with less information loss and BIC uses the given data to maximize the posterior probability (42, 43). The lower these indexes, the better the model fits. Since class assignments are based on probability (39), the BIC value was mainly taken into account to select the final model.
- However, changes in BIC values may not always be meaningful because the values tend to decrease each time the number of classes increases. Thus, the *log Bayes factor* may help estimate the change in BIC values using the following formula: $2logB_{10} \approx 2\,(BIC)$ (44). By subtracting the BIC value of the simpler model (model with fewer classes) from the BIC value of the more complex model (model with more classes) and multiplying this difference by two, we were able to calculate the value (44). Resulting values which range from 0 to 2 indicate that the complex model is weak, 2 to 6 indicates the model is moderate, 6 to 10 indicates the complex model is strong, and greater than 10 indicates the complex model is very strong (44).
- *G–test of goodness-of-fit (G^2)* was calculated for each LCA model to determine whether the number of observations matches the theoretical explanation and if the sample size is large enough. This test is also known as the likelihood ratio test or

log-likelihood ratio test (45). The G^2 statistic can be calculated using the following formula:

$$G^2 = 2\sum[O \; x \; ln(O/E)] \; ,$$

where O = observed number, E = expected number.

- Similarly to G^2 statistic, the X^2 *statistic* (chi-square test of goodness-of-fit) was calculated for each LCA model to determine whether the number of observations matches the theoretical explanation and if the sample size is large enough (45). The X^2 statistic can be calculated using the following formula:

$$X^2 = \sum(O - E)^2/E \; ,$$

where O = observed number, E = expected number. However, unlike the G^2 values, X^2 values are not additive (45).

In addition to statistical indexes, we also took into account the *Estimated Class Population Shares* (ECPS) and the *Predicted Class Memberships* (PCM) which were automatically generated after running each LCA model. These probabilities give an idea of the population distributions amongst each latent class. Since the probabilities of each membership class are assumed to be mutually exclusive, the ECPS and PCM for each class should add up to one, respectively (46). The more alike the ECPS and PCM are, the better the model fits.

Based on the LCA-centered literature, we established a list of criteria before selecting our final LCA model:

1. Minimize the AIC/BIC values.

2. Check that G^2 and X^2 values are appropriate.

3. Make sure there is an appropriate population distribution and/or spread amongst each latent class by analyzing the ECPS and PCM i.e., search for heterogeneity amongst each model. Classes with ≥ 0.5 ECPS/PCM suggest heterogeneity; more classes usually create more distinction.

4. Verify that the selected model is appropriate for our outcome variable and its indicators.

Subsequently, once the best-suited LCA model was determined, labels were created to better identify the groups of individuals within each of the classes. Labeling classes within LCA is a crucial part of the analysis as it is based on a cautious interpretation of each of the positive

feeling indicators across each class. The indicator(s) with higher distributions had a greater influence in establishing the label.

2.3.2. Multinomial Logistic Regression

Given that our outcome of interest is non-binary, we used multinomial logistic regressions to explore the associations of the socio-demographic, work-related, and health-related variables with the positive feeling classes produced by our final LCA model. After testing whether individual predictors were associated with our outcome at $p<0.20$, all the retained predictors were entered simultaneously in the final, adjusted model. We decided to perform a complete case analysis, thus all missing values were automatically excluded while running the regression.

3. Results

3.1. Descriptive Analysis

The frequency distributions of the socio-demographic, work-related, and health-related variables included in our study can be found in **Table 1.** Out of a total of 1737 participants who responded to the fifth data collection wave of the COMET survey, 1725 participants responded to the final question assessing positive feelings and life improvement experiences. The majority of these respondents were female (80.6%) with a mean age of 42.94 (± 15.94) years. Most of our sample were located in the European region (67.8%) and lived in urban areas (61.7%). A little over half the population was in a relationship or married (64.5%) and about 36.0% of the population had a religious affiliation. Additionally, a large part of our population (78.7%) had achieved university-level education and 67.1% were employed. About a quarter of the population experienced an income reduction (20.8%) one year after the pandemic began. Nearly 26.0% of participants did not experience any financial worries a year after the COVID-19 crisis while 17.0% received additional financial support from the government. Furthermore, over half the population (59.5%) were never formally diagnosed with COVID-19. The majority of the population did not have pre-existing mental health issues (75.5%) nor did they have depression (76.3%) or anxiety (84.5%) symptoms.

Table 1. Characteristics of the COMET study population

Variables	N=1725	M (SD) or % (n)	NA
Age (years)	1720	42.94 (15.94)	5
Gender	1703		22
Male		19.4% (331)	
Female		80.6% (1,372)	
WHO region of residence	1,687		38
Europe (EUR)		67.8% (1,144)	
West Pacific (WPR)		19.0% (320)	
Africa (AFR)		7.7% (130)	
South-East Asia (SEAR)		5.5% (93)	
Area of residence	1,706		19
Urban		61.7% (1,052)	
Suburban		26.1% (445)	
Rural		12.3% (209)	
Relationship status	1,709		16
Married		39.8% (680)	
In a steady relationship living together		14.9% (255)	
In a steady relationship living apart		9.8% (167)	
Divorced, separated, or widowed		8.4% (143)	
Single		27.2% (464)	
Number of people in the household (including participant)	1,713		12
1 (living alone)		23.4% (401)	
2		37.2% (637)	
3		18.9% (323)	
4 or more		20.5% (352)	
Religion	1,718		7
No		64.0% (1,099)	
Yes		36.0% (619)	
Higher education level	1722		3
No		21.3% (367)	

Yes		78.7% (1,355)	
Occupation status	1720		5
Unemployed		10.3% (177)	
Student		7.8% (134)	
Employed		67.1% (1,154)	
Retired		5.9% (101)	
Other		9.0% (154)	
Income reduction in the last 12 months	1,698		27
No		79.2% (1,345)	
Yes		20.8% (353)	
Financial worries in the last 12 months	1,711		14
Not at all		26.0% (445)	
Not more than usual		37.8% (647)	
More than usual		27.1% (464)	
Much more than usual		9.1% (155)	
Financial support from government in the last 12 months	1,710		15
No		83.0% (1,419)	
Yes		17.0% (291)	
Pre-existing mental health issues	1,713		12
No		75.5% (1,293)	
Yes		24.5% (420)	
COVID-19 infection	1,505		220
No		59.5% (895)	
Infected, asymptomatic		14.6% (219)	
Infected, symptomatic		26.0% (391)	
Depressive symptoms	1,655		70
No		76.3% (1,263)	
Yes		23.7% (392)	
Anxiety symptoms	1,655		70
No		84.5% (1,398)	
Yes		15.5% (257)	

3.2. Latent Class Analysis

Following careful consideration of the previously mentioned statistical indexes and our selection criteria, we chose the LCA model with 4 classes as our best-fit and final model to conduct further analysis on our study population. A table of each model's resulting statistical indexes can be in **Table 2.** while each model's ECPS and PCM can be found in **Table 3.**

Table 2. Statistical fit indexes for each LCA model

	2 CLASSES	3 CLASSES	4 CLASSES	5 CLASSES	6 CLASSES
AIC	10300.4	10068.62	9938.98	9880.292	9842.454
BIC	10382.19	10194.04	10108.02	10092.96	10098.74
G^2	631.1944	383.4163	237.7744	163.0865	109.2488
X^2	969.5085	347.5542	229.1984	162.7349	116.2986

Table 3. Estimated Class Population Shares and Predicted Class Memberships for each LCA model

|	ECPS	PCM		ECPS	PCM
2 CLASSES	0.6747	0.6736	*5 CLASSES*	0.4294	0.3722
	0.3253	0.3264		0.0673	0.087
				0.3171	0.3171
3 CLASSES	0.3248	0.3264		0.0577	0.0736
	0.1088	0.098		0.1283	0.1501
	0.5664	0.5757			
			6 CLASSES	0.3229	0.3246
4 CLASSES	0.3187	0.3188		0.1842	0.1867
	0.1357	0.1501		0.184	0.1733
	0.4615	0.4441		0.1691	0.1681
	0.0841	0.087		0.0547	0.0597
				0.0852	0.0875

Furthermore, after closely examining the distributions of checked responses of all the indicators within each of the latent classes, the following labels were created: Class 1 = "No Improvement", Class 2 = "Life Choices", Class 3 = "Work/Life Balance", Class 4 = "Time with Loved Ones". The ECPS/PCM for the 4 class LCA model were 0.32/0.32 for the *No Improvement* class, 0.14/0.15 for *Life Choices*, 0.46/0.44 for *Work/Life Balance*, and 0.08/0.09 for *Time with Loved Ones*.

Participant's distributions across each latent class were found to be: *No Improvement* = 31.9% (550), *Life Choices* = 15.0% (259), *Work/Life Balance* = 44.4% (766), and *Time with Loved Ones* = 8.7% (150). Most of the population who checked no were classified as "No Improvement". A list of the distributions of each indicator variable and their resulting label can be found in **Table 4.**

Table 4. Distribution of checked responses for indicator variables across four classes

	Positive Feelings Class			
Indicators	**Class 1**	**Class 2**	**Class 3**	**Class 4**
No	1	0.067	0.0019	0.007
I have more time with my family	0.0058	0.0438	0.296	0.9095
I have more time with other loved ones	0	0.0164	0.1198	0.9643
I spend more time doing pleasant or beneficial activities	0.0052	0.0793	0.4968	0.7799
My work has been more flexible	0.0057	0	0.4865	0.6318
My business had higher profits	0	0.0175	0.0363	0.0828
I reconsidered what is important in life	0	1	0.4109	0.7365
Label based on distributions	*No Improvement*	*Life Choices*	*Work/Life Balance*	*Time with Loved Ones*

The final LCA model across the four classes can be found in **Figure 1.** All other LCA model figures automatically generated in R can be found in **Appendix 3**.
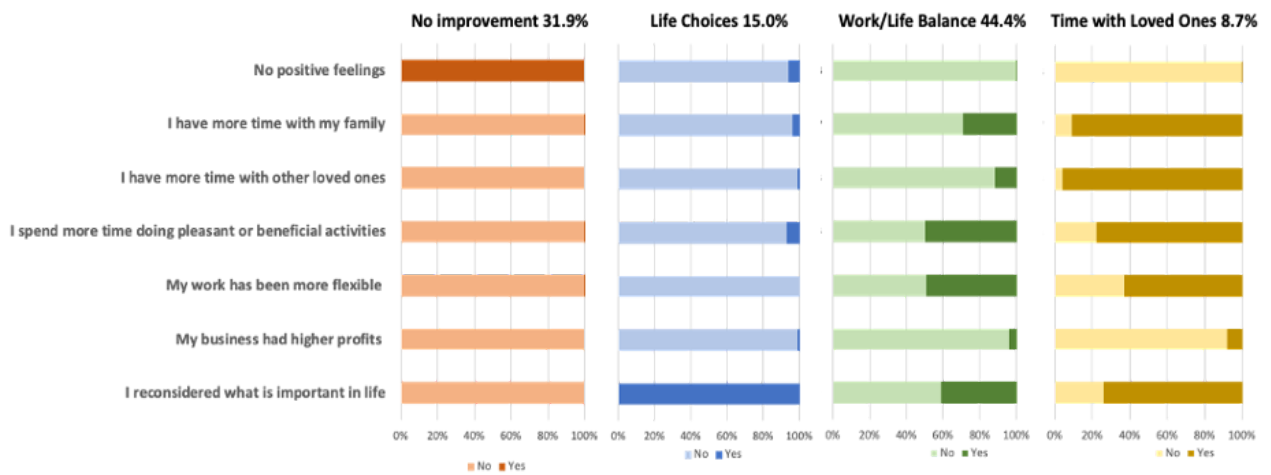
Figure 1. *LCA Model of 4 classes amongst COMET study participants who responded to the final question assessing positive feelings and life improvement experiences*

3.3. Multinomial Logistic Regression

The results of the adjusted multinomial logistic regression model testing the association between each positive feelings class and the selected predictors within our study can be found in **Table 4.** A table showing the bivariate associations between each of the predictors and our outcome can be found in **Appendix 4.**

Table 4. Multinomial logistic regression analyses between positive feelings classes and socio-demographic, work-related, and health-related predictors

Predictors	Life Choices		Work/Life Balance		Time with Loved Ones	
	OR [CI 95%]	*p*	OR [CI 95%]	p	OR [CI 95%]	*p*
Age	0.99 [0.98-1.01]	0.3	**0.99 [0.97-1.00]**	**0.029**	**0.99 [0.95-0.99]**	**0.009**
Gender						
Male	Ref		Ref		Ref	
Female	**1.84 [1.11-3.06]**	**0.018**	1.02 [0.73-1.43]	>0.9	1.06 [0.60-1.88]	0.8
WHO region of residence						
Europe (EUR)	Ref		Ref		Ref	
West Pacific (WPR)	1.03 [0.61-1.73]	>0.9	**1.69 [1.14-2.50]**	**0.009**	1.32 [0.67-2.58]	0.4
Africa (AFR)	1.04 [0.48-2.27]	>0.9	1.09 [0.57-2.06]	0.8	1.72 [0.64-4.64]	0.3
South-East Asia (SEAR)	1.67 [0.41-6.76]	0.5	**4.96 [1.63-15.1]**	**0.005**	**10.9 [3.24-36.8]**	**<0.001**
Area of residence						
Urban	Ref		Ref		Ref	
Suburban	0.85 [0.53-1.38]	0.5	**1.51 [1.07-2.14]**	**0.019**	**2.13 [1.26-3.60]**	**0.005**
Rural	1.19 [0.69-2.05]	0.5	1.39 [0.89-2.16]	0.15	1.41 [0.66-3.03]	0.4
Relationship status						
Married	Ref		Ref		Ref	

	Life Choices		Work/Life Balance		Time with Loved Ones	
Predictors	OR [CI 95%]	*p*	OR [CI 95%]	p	OR [CI 95%]	*p*
In a steady relationship living together	0.91 [0.50-1.66]	0.8	1.04 [0.67, 1.62]	0.9	0.56 [0.26, 1.20]	0.13
In a steady relationship living apart	1.21 [0.59-2.45]	0.6	1.06 [0.60, 1.86]	0.8	0.60 [0.23, 1.55]	0.3
Divorced, separated, or widowed	0.94 [0.48-1.86]	0.7	0.64 [0.36, 1.13]	0.12	0.67 [0.23, 1.94]	0.5
Single	0.91 [0.52-1.61]	0.9	0.91 [0.58, 1.41]	0.7	0.73 [0.37, 1.44]	0.4
Number of people in the household including participant						
1 (living alone)	Ref		Ref		Ref	
2	1.21 [0.68-2.15]	0.5	1.15 [0.74-1.78]	0.5	1.56 [0.70-3.47]	0.3
3	**1.89 [1.03-3.49]**	**0.041**	1.46 [0.90-2.36]	0.13	**2.85 [1.28-6.35]**	**0.010**
4 or more	1.39 [0.74-2.61]	0.4	0.90 [0.55-1.46]	0.7	1.46 [0.64-3.34]	0.4
Religion						
No	Ref		Ref		Ref	
Yes	1.66 [1.13-2.44]	0.010	1.40 [1.03-1.92]	0.034	1.55 [0.93-2.58]	0.090
Higher education						
No	Ref		Ref		Ref	
Yes	1.00 [0.65-1.53]	>0.9	1.39 [0.98-1.97]	0.067	1.47 [0.82-2.65]	0.2
Occupation status						
Unemployed	Ref		Ref		Ref	
Student	0.98 [0.40-2.38]	>0.9	**2.56 [1.20-5.46]**	**0.015**	**3.33 [1.01-11.0]**	**0.048**
Employed	0.79 [0.45-1.39]	0.4	**2.20 [1.33-3.64]**	**0.002**	1.99 [0.80-4.95]	0.14
Retired	1.14 [0.49-2.63]	0.8	0.84 [0.37-1.90]	0.7	2.46 [0.62-9.77]	0.2
Other	0.89 [0.40-1.99]	0.8	**2.58 [1.32-5.01]**	**0.005**	1.63 [0.46-5.76]	0.4
Income reduction in the last 12 months						
No	Ref		Ref		Ref	
Yes	1.35 [0.85-2.14]	0.2	0.96 [0.65, 1.40]	0.8	1.25 [0.68-2.30]	0.5
Financial worries in the last 12 months						
Not at all	Ref		Ref		Ref	
Not more than usual	1.15 [0.72-1.85]	0.6	0.89 [0.63-1.26]	0.5	0.74 [0.43-1.28]	0.3
More than usual	0.97 [0.58-1.64]	>0.9	0.63 [0.43-0.94]	0.023	0.59 [0.31-1.11]	0.10
Much more than usual	0.90 [0.41-1.94]	0.8	0.71 [0.38-1.30]	0.3	0.57 [0.21-1.55]	0.3
Financial support from government in the last 12 months						
No	Ref		Ref		Ref	
Yes	1.25 [0.77-2.05]	0.4	0.97 [0.66-1.44]	0.9	1.15 [0.60-2.19]	0.7
Pre-existing mental health issues						
No	Ref		Ref		Ref	
Yes	1.26 [0.82-1.95]	0.3	1.15 [0.82-1.62]	0.4	0.89 [0.49-1.60]	0.7
COVID-19 infection symptoms						
No	Ref		Ref		Ref	
Infected, asymptomatic	1.15 [0.68, 1.92]	0.6	1.06 [0.70, 1.59]	0.8	0.74 [0.36-1.52]	0.4
Infected, symptomatic	0.73 [0.47, 1.15]	0.2	0.88 [0.63, 1.23]	0.4	1.28 [0.77-2.13]	0.3

Predictors	Life Choices OR [CI 95%]	p	Work/Life Balance OR [CI 95%]	p	Time with Loved Ones OR [CI 95%]	p
Depressive symptoms						
No	Ref		Ref		Ref	
Yes	0.91 [0.56-1.50]	0.7	**0.63 [0.42-0.92]**	**0.018**	0.69 [0.36-1.33]	0.3
Anxiety symptoms						
No	Ref		Ref		Ref	
Yes	0.78 [0.43-1.39]	0.4	0.84 [0.53-1.33]	0.5	**0.31 [0.12-0.80]**	**0.015**
OR = Odds Ratio, CI = Confidence Interval						

In the adjusted model, those classified within *No Improvement* were selected as the reference class. Those classified within *Life Choices* were more likely to be female (OR = 1.84, 95% CI [1.11-3.06]), live with two other individuals (OR = 1.89 [1.03-3.49]), or have a religious affiliation (OR = 1.66 [1.13-2.44]) in comparison to the reference category.

Those classified within *Work/Life Balance* were more likely to report younger age (OR = 0.99 [0.97-1.00]), residing in WPR (OR = 1.69 [1.14-2.50]) or SEAR (OR = 4.96 [1.63-15.1]) in suburban areas (OR = 1.51 [1.07-2.14]), having a religious affiliation (OR = 1.40 [1.03-1.92]), being a student (OR = 2.56 [1.20-5.46]), employed (OR = 2.20 [1.33-3.64]), or otherwise (OR = 2.58 [1.32-5.01]). Additionally, those who reported more financial worries than usual in the last 12 months and depressive symptoms were both less likely to be classified within *Work/Life Balance* (OR 0.63 [0.43-0.94] and 0.63 [0.42-0.92]).

Lastly, those classified within *Time with Loved Ones* were more likely to report younger age (OR = 0.99 [0.95-0.99]), residing in SEAR (OR = 10.9 [3.24-36.8]) and suburban areas (OR = 2.13 [1.26-3.60]), living with two other individuals (OR = 2.85 [1.28-6.35]), being a student (OR = 3.33 [1.01-11.0]), and less likely to report anxiety symptoms (OR = 0.31 [0.12-0.80]).

4. Discussion

4.1. Main Findings

In the wake of the COVID-19 pandemic, the aim of this study was to explore its effect on mental health from a positive perspective as positive feelings and/or life improvement experiences could also be associated with this global outbreak. We additionally explored a wide range of socio-demographic, work-related, and health-related variables to examine their association with the identified positive feelings. Within our sample, we found 4 unique classes of life improvement experiences: *No Improvement* (31.9%), *Life Choices* (15.0%), *Work/Life Balance* (44.4%), and *Time with Loved Ones* (8.7%). The findings from the LCA illustrate that a large proportion of individuals from our study population experienced life improvement experiences, however, the associations between positive feeling classes and their predictors vary.

4.1.1. Sample Selection

The majority of the respondents to the question ascertaining positive feelings and life improvement experiences two years after the onset of the coronavirus pandemic were female (80.6%), living in urban areas (61.7%), and in a relationship or married (64.5%). Furthermore, the majority of our study population achieved university-level education (78.7%) and were either students, employed, retired, or other (89.8%). With greater than half the population not experiencing an income reduction (79.2%) and not receiving financial support from the government (83.0%) in the last 12 months, we can deduce that our sample population is of higher economic status. As higher socioeconomic status is often associated with better health (49), the COMET participants were possibly more likely to see the positive side of the pandemic as compared to individuals with lower socioeconomic status. Regarding our health-related variables, over half the population (59.5%) was not formally diagnosed with COVID-19, and most respondents did not have pre-existing mental health issues (75.5%) nor did they have depression (76.3%) or anxiety (84.5%) symptoms. While we were not able to test how the persons replying to the fifth data wave differed from those originally included in the study, it is likely that attrition over time for the COMET cohort was associated with some of these variables, including lower socio-economic status, COVID-19 experiences and mental health difficulties (47). Moreover, the characteristics of our study population might have impacted their responses to the question on potential positive feelings. Thus, our outcomes might not necessarily be replicated in population samples with other characteristics. Nevertheless, even in this highly selective sample, we were able to demonstrate variation in how respondents experienced positive outcomes in wake of the COVID-19 pandemic.

4.1.2. Exploring Positive Feelings and Life Improvement Experiences

Using LCA, we were able to determine a number of subgroups of individuals in our overall study population that had a similar experience of life improvement during the COVID-19 pandemic. According to the distributions of checked responses for each indicator, our selection of the best-fit LCA model established 4 unique classes amongst participants who responded to the last question of the COMET survey assessing positive feelings and life improvement experiences: *No Improvement* (31.9%), *Life Choices* (15.0%), *Work/Life Balance* (44.4%) and *Time with Loved Ones* (8.7%). The resulting classes are similar to some of the themes mentioned in Cornell et al's study (29) on positive outcomes associated with COVID-19 pandemic. It seems possible that these similar results could be due to the impact the pandemic had in people's daily lives. This may reflect what the respondents felt was more important during this uncertain time in global health.

4.1.3. Associations between Positive Feeling Classes and Predictors

Overall, many of the predictors associated with our four LCA classes are supported by previous research (19, 20, 29, 30) that shows their associations with mental health and the COVID-19 pandemic. However, a major difference is that previously these predictors have been reported as risk factors while they would be considered protective factors in the context of this study. This seems to indicate that certain population groups are both more susceptible to the positive and negative mental health impact of the pandemic. Further study is needed to better understand these associations.

The largest proportion of the study population was classified in *Work/Life Balance* which is comprised mainly of those of younger age, living in WPR or SEAR, in suburban areas, having a religion, being a student, employed or other, not facing more than usual financial worries in the last 12 months, and not experiencing depressive symptoms compared to those who did not experience positive experiences. Several factors could explain this observation. Firstly, those living in the WPR and SEAR could have dealt with a more difficult work/life balance pre-pandemic. Secondly, suburban areas may need less time to commute to and from work. Thirdly, being a student, employed, and not facing significant financial issues within this class is rational given that these are the individuals who are working and thus more likely to find a balance with their personal lives and generate more income. Lastly, having lower levels of depression is plausible because these individuals are likely to have balancing strategies that may aid in monitoring depression.

Subsequently, participants who reported being female, living with two other individuals, and having a religion were more likely to be classified in *Life Choices'* rather than the reference

(*No Improvement*) class. This observed correlation could be attributed to how religion may influence one's decisions in life. Moreover, the coronavirus pandemic fostered a relatively slower pace in everyday life. This could have allowed the female participants and their household counterparts to take a step back and reevaluate their lives through their religious faith.

Finally, respondents that were more likely to be classified in *Time with Loved Ones, as opposed to the reference class,* were those who reported younger age, living in SEAR or in suburban areas, with two other individuals, being a student, and less likely to experience anxiety symptoms. Explaining this result is quite complex, but it may be that these participants are likely to belong to collectivistic societies and cultures. After all, south-east Asian and suburban areas are commonly known to have tight-knit communities and as a student, there is usually communal support provided by academic networks. Furthermore, increased anxiety may make it more difficult to be able to spend time with loved ones.

4.2. Strengths and Limitations

From what is known, this research is the first to classify positive feelings and life improvement experiences from the coronavirus pandemic using LCA. Consequently, there are many strengths within this study that can be acknowledged, however, there are unequivocally limitations that require a cautious interpretation of our findings. As a novel and uncommon research topic, innovative findings have emerged and may contribute to broadening the scope of public health research. On the other hand, the strength of this study, was reduced due to the loss of follow-up within this cohort. It is not rare to observe attrition between different study waves, however, the COMET study initially had over 8000 individuals at the first wave and 1737 by the fifth. It is to be expected that those who continued to participate in the survey had specific characteristics associated with their participation. It would have been useful to know in what way these 1737 differ from the initial 8084 participants. Moreover, data collected concerning positive feelings and life improvement experiences were only collected during the fifth wave of the COMET study. It would have been interesting to compare positive feelings across each wave instead of cross-sectionally.

Additionally, data from the COMET survey was collected online by self-selection which may result in respondent bias. Subsequently, though technology has become a large part of contemporary lifestyle, some hard to reach populations with no access to the internet were unintentionally excluded. As a consequence, people who responded to the COMET survey were mainly from higher-income countries which further widens the health inequity gap. It

would have also been interesting to observe how positive feelings vary amongst higher-income vs lower- and middle-income countries as there is evidence (48) suggesting positive impacts on the lifestyle of those from lower-income countries during the COVID-19 pandemic. In spite of its limitations, our study adds to our understanding of the positive feelings and life improvement experiences associated with this global outbreak.

4.3. Future Research Recommendations

Given that this is an exploratory study, it lays the foundation for much more research to be conducted. Other exploratory methods such as multiple component analysis (MCA), K-means clustering, or hierarchical clustering could be carried out to compare differences in how positive feelings and life improvement experiences are categorized. Additionally, multiple imputations could be incorporated instead of using complete case scenarios to run the multinomial logistic regressions. Although the percentage of missing data on our predictor variables was not too high, imputing missing data could have increased our sample size and ability to detect some additional associations. Furthermore, everyone who responded to the COMET survey was exposed to the COVID-19 pandemic in one way or another and thus there was no comparison group of unexposed persons. Future research could compare those who were infected with COVID-19 vs those not and see if there are differences amongst these groups in relation to the outcome of the positive feelings. Moreover, although the trends of COVID-19 varied for each country, there remains a paucity of evidence on general mental health-related outcomes from a multilevel or multidimensional lens. Given the volatility of the coronavirus' spread, it could be significant to take into account the country-related differences while studying its impact. The sample sizes for the fifth data collection of the COMET survey were not large enough for us to investigate this in our study at country level, however, we were able to classify differences by WHO region.

4.4. Public Health Implications

Based on our findings, new insights could be developed concerning the positive mental health impact of pandemics by focusing on the positive feelings and life improvement aspects of the coronavirus pandemic. Since one of the main goals of public health is to improve the health of people and their communities (49, 50), it is equivalently important to take into consideration not only the outcome of experiencing disease but also the life improvement aspects that may be associated with the presence of disease. If life improvement is simultaneously analyzed with disease experience, a more comprehensive result could be further discussed for future action. An implication of this study is the possibility that it will help provide useful information for the development and implementation of mental health policies

and interventions as it relates to future pandemics. Disease outbreaks can be alarming and difficult to navigate, however, having evidence-based research on some of the positive feelings and life improvement experiences associated with one of the most challenging pandemics in contemporary health science could result in the advancement of coping techniques and resilience tactics. The results of the research may also be used to promote multidisciplinary mental health research as it is clear that a diverse amount of perspectives are needed to analyze and interpret broad results.

5. Conclusion

The main goal of this study was to explore the positive feelings and/or life improvement experiences in the wake of the COVID-19 pandemic and examine its association with socio-demographic, work-related, and health-related variables. Conducting the LCA confirmed that there are positive feelings and/or life improvement experiences associated with the coronavirus pandemic, and analyzing the results from the multinomial logistic regression gave us insight into how our selected predictors/covariates could be associated with our resulting latent classes. The generalizability of these results is subject to certain limitations, however, this study can be used for further research. Continued efforts are needed to make mental health a priority amidst disease outbreaks. This information can be used to develop targeted interventions aimed at reducing negative mental health outcomes in future public health emergencies. Thus, positive mental health outcomes are relevant in public health research and evidence-based policymaking and practice should be adopted to guide the creation of these prospective interventions.

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Appendices

Appendix 1. University of Sheffield's ScHARR Ethical Approval

The
University
Of
Sheffield.

Aji Mary Jagne
Registration number: 210128169
School of Health and Related Research
Programme: Europubhealth: European Masters Programme in Public Health

Dear Aji Mary

PROJECT TITLE: An Exploration of Positive or Life Improvement Experiences in the Wake of the COVID-19 Pandemic: Evaluating its Association with Sociodemographic and Health-Related Variables
APPLICATION: Reference Number 052450

This letter confirms that you have signed a University Research Ethics Committee-approved self-declaration to confirm that your research will involve only existing research, clinical or other data that has been robustly anonymised. You have judged it to be unlikely that this project would cause offence to those who originally provided the data, should they become aware of it.

As such, on behalf of the University Research Ethics Committee, I can confirm that your project can go ahead on the basis of this self-declaration.

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since full ethical review may be required.

Yours sincerely

Devianee Keetharuth
Departmental Ethics Administrator

Appendix 2. Patient Health Questionnaire (PHQ-9) and Generalized Anxiety Disorder (GAD-7) Questionnaires in English

1. Patient Health Questionnaire (PHQ-9)

	Over the past 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several Days	More than half the days	Nearly every day
1	Little interest or pleasure in doing things	0	1	2	3
2	Feeling down, depressed or hopeless	0	1	2	3
3	Trouble falling asleep, staying asleep, or sleeping too much	0	1	2	3
4	Feeling tired or having little energy	0	1	2	3
5	Poor appetite or overeating	0	1	2	3
6	Feeling bad about yourself – or that you´re a failure or have let yourself or your family down	0	1	2	3
7	Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8	Moving or speaking so slowly that other people could have noticed. Or, the opposite- being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9	Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

2. Generalized Anxiety Disorder (GAD-7)

	Over the past 2 weeks, how often have you been bothered by the following problems?	Not at all	Several Days	Over half the days	Nearly every day
1	Feeling nervous, anxious, or on edge	0	1	2	3
2	Not being able to stop or control worrying	0	1	2	3
3	Worrying too much about different things	0	1	2	3
4	Trouble relaxing	0	1	2	3
5	Being so restless that it´s hard to sit still	0	1	2	3
6	Becoming easily annoying or irritable	0	1	2	3
7	Feeling afraid as if something awful might happen	0	1	2	3

Appendix 3. R-Generated Figures of LCA Models

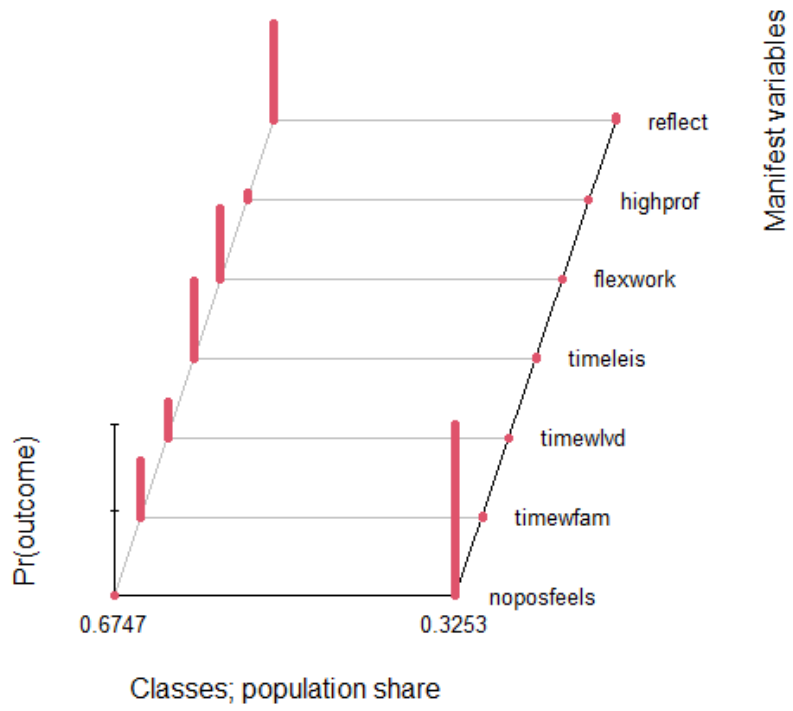**Figure A.3.1.** LCA Model with 2 Classes

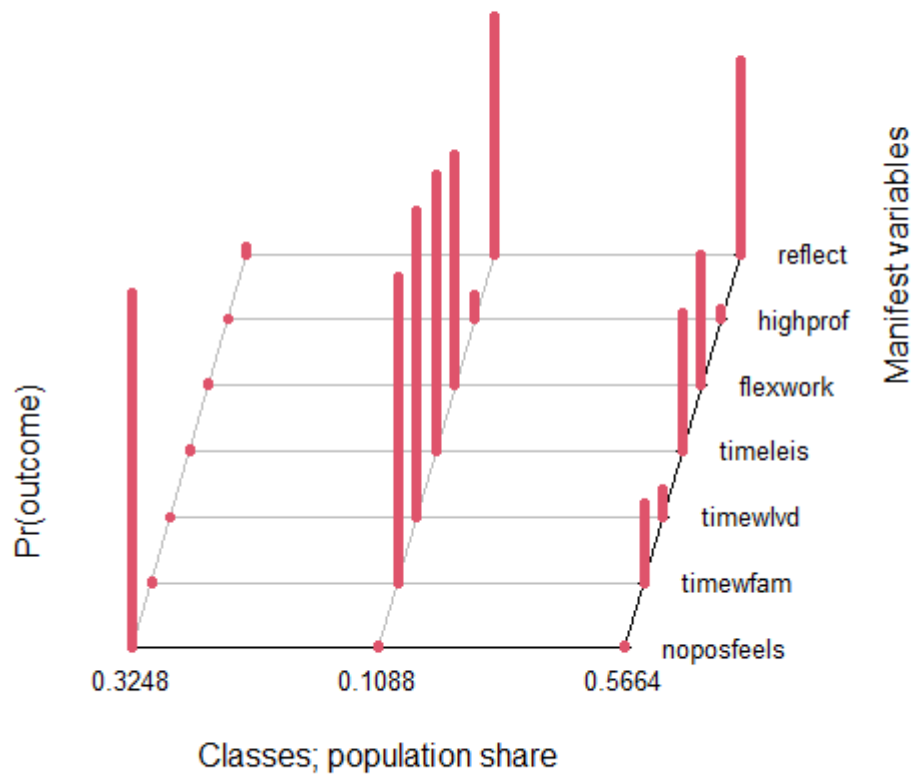**Figure A.3.2.** LCA Model with 3 Classes
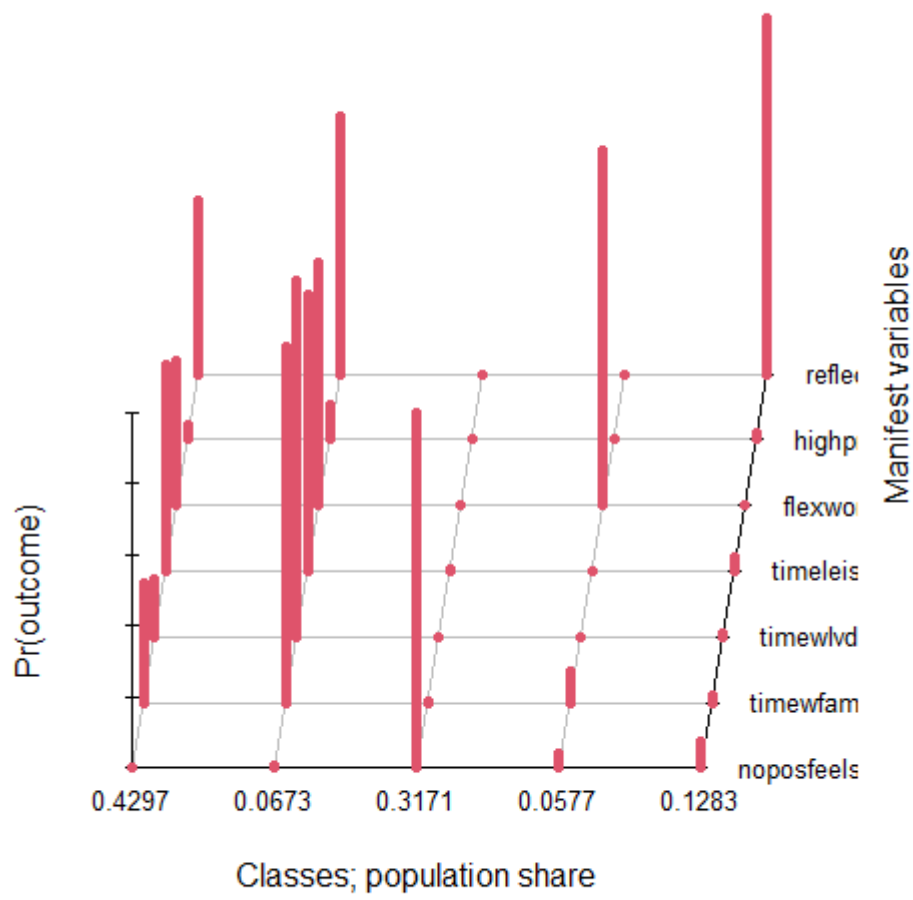
Figure A.3.3. LCA Model with 5 Classes

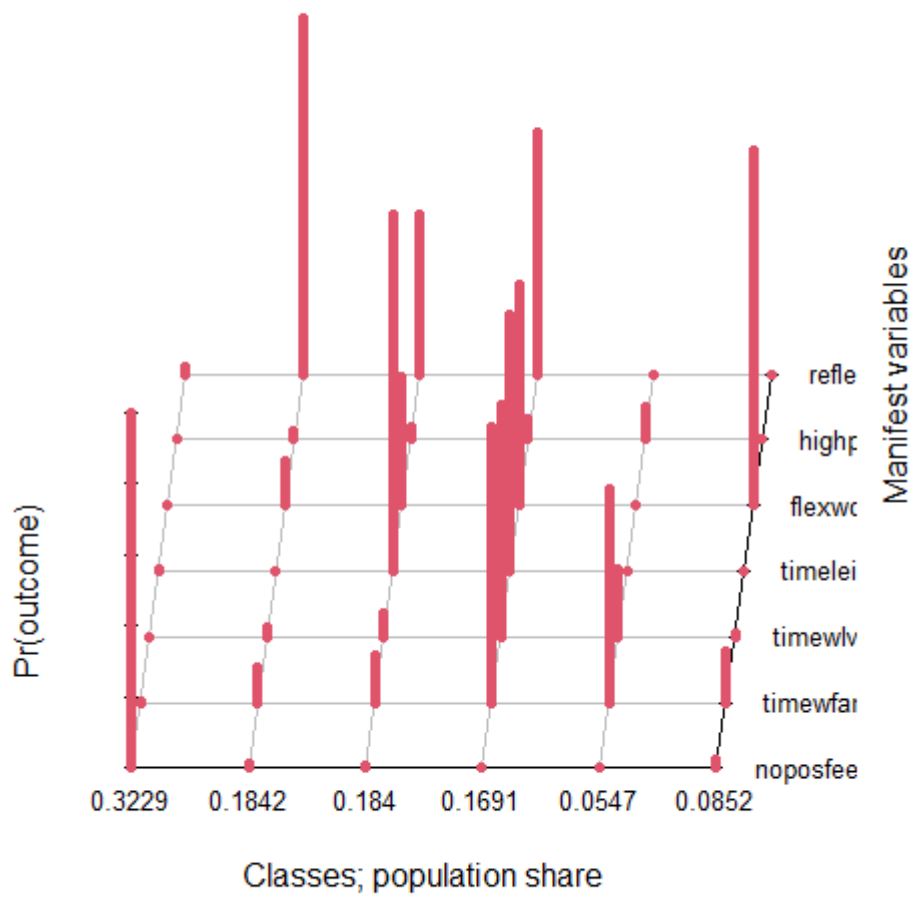**Figure A.3.4.** LCA Model with 6 Classes

Appendix 4. Bivariate associations between each of the predictors and outcome variable

	Life Choices		Work/Life Balance		Time with Loved Ones	
Predictors	OR [CI 95%]	*p*	OR [CI 95%]	p	OR [CI 95%]	*p*
Age	0.99 [0.98-1.00]	**0.036****	0.98 [0.97-0.98]	**<0.001****	0.97 [0.96-0.98]	**<0.001****
Gender						
Male	Ref		Ref		Ref	
Female	1.72 [1.13-2.60]	**0.011****	1.07 [0.81-1.40]	0.6	1.02 [0.65-1.59]	>0.9
WHO region of residence						
Europe (EUR)	Ref		Ref		Ref	
West Pacific (WPR)	1.23 [0.82-1.83]	0.3	1.60 [1.20-2.15]	**0.002****	1.42 [0.85-2.37]	0.2
Africa (AFR)	0.80 [0.46-1.39]	0.4	0.75 [0.50-1.14]	0.2	1.05 [0.52-2.10]	0.9
South-East Asia (SEAR)	3.95 [1.31-12.0]	**0.015****	7.35 [2.89-18.7]	**<0.001****	33.8 [12.8-89.0]	**<0.001****
Area of residence						
Urban	Ref		Ref		Ref	
Suburban	0.83 [0.57-1.20]	0.3	1.16 [0.89-1.50]	0.3	1.52 [1.02-2.27]	**0.040****
Rural	1.08 [0.69-1.69]	0.7	1.02 [0.72-1.43]	>0.9	0.70 [0.36-1.35]	0.3
Relationship status						
Married	Ref		Ref		Ref	
In a steady relationship living together	0.97 [0.60-1.56]	0.9	1.36 [0.98, 1.91]	**0.069***	0.71 [0.39, 1.27]	0.2
In a steady relationship living apart	1.24 [0.73-2.10]	0.4	1.26 [0.85, 1.88]	0.2	0.69 [0.34, 1.41]	0.3
Divorced, separated, or widowed	0.93 [0.57-1.54]	0.8	0.49 [0.32, 0.74]	**<0.001****	0.28 [0.11, 0.66]	**0.004****
Single	1.11 [0.76-1.61]	0.6	1.17 [0.89, 1.54]	0.3	0.97 [0.63, 1.50]	0.9
Number of people in the household including participant						
1 (living alone)	Ref		Ref		Ref	
2	0.96 [0.65-1.40]	0.8	1.22 [0.92-1.62]	0.2	2.04 [1.11-3.74]	**0.021****
3	1.40 [0.89-2.20]	**0.14***	1.52 [1.08-2.15]	**0.017****	4.66 [2.47-8.79]	**<0.001****
4 or more	1.20 [0.77-1.88]	0.4	1.46 [1.05-2.05]	**0.026****	4.48 [2.40-8.35]	**<0.001****
Religion						
No	Ref		Ref		Ref	
Yes	1.57 [1.16-2.14]	**0.004****	1.16 [0.92-1.47]	0.2	2.29 [1.58-3.31]	**<0.001****
Higher education						
No	Ref		Ref		Ref	
Yes	1.00 [0.71-1.39]	>0.9	1.78 [1.36-2.32]	**<0.001****	1.55 [0.98-2.43]	**0.059****
Occupation status						
Unemployed	Ref		Ref		Ref	
Student	1.49 [0.76-2.94]	0.2	3.96 [2.25-6.97]	**<0.001****	3.53 [1.53-8.14]	**0.003****
Employed	0.96 [0.62-1.47]	0.8	3.02 [2.04-4.45]	**<0.001****	1.93 [1.03-3.60]	**0.04****
Retired	0.79 [0.42-1.50]	0.5	0.67 [0.36-1.25]	0.2	0.81 [0.30-2.15]	0.7
Other	1.27 [0.69-2.33]	0.4	2.68 [1.60-4.50]	**<0.001****	1.19 [0.47-3.00]	0.7
Income reduction in the last 12 months						
No	Ref		Ref		Ref	
Yes	1.23 [0.87-1.74]	0.2	0.75 [0.57, 0.99]	**0.042****	1.04 [0.67-1.60]	0.9

Predictors	Life Choices		Work/Life Balance		Time with Loved Ones	
	OR [CI 95%]	*p*	OR [CI 95%]	p	OR [CI 95%]	*p*
Financial worries in the last 12 months						
Not at all	Ref		Ref		Ref	
Not more than usual	1.34 [0.89-2.01]	0.2	0.86 [0.65-1.15]	0.3	0.85 [0.54-1.34]	0.5
More than usual	1.31 [0.86-2.01]	0.2	0.65 [0.48-0.88]	**0.006****	0.69 [0.42-1.12]	**0.13***
Much more than usual	1.17 [0.66-2.07]	0.6	0.59 [0.39-0.90]	**0.014****	0.55 [0.27-1.14]	**0.11***
Financial support from government in the last 12 months						
No	Ref		Ref		Ref	
Yes	1.47 [1.00-2.17]	**0.051***	1.26 [0.93-1.70]	**0.14***	1.29 [0.80-2.09]	0.3
Pre-existing mental health issues						
No	Ref		Ref		Ref	
Yes	1.06 [0.75-1.48]	0.7	0.98 [0.76-1.26]	0.9	0.63 [0.40-1.01]	**0.054***
COVID-19 infection symptoms						
No	Ref		Ref		Ref	
Infected, asymptomatic	1.24 [0.79, 1.95]	0.4	1.28 [0.90, 1.82]	0.2	1.02 [0.55-1.90]	>0.9
Infected, symptomatic	0.88 [0.60, 1.30]	0.5	1.09 [0.83, 1.45]	0.5	1.65 [1.08-2.53]	**0.022****
Depressive symptoms						
No	Ref		Ref		Ref	
Yes	0.91 [0.65-1.28]	0.6	0.61 [0.47-0.80]	**<0.001*****	0.45 [0.28-0.74]	**0.001****
Anxiety symptoms						
No	Ref		Ref		Ref	
Yes	0.85 [0.57-1.26]	0.4	0.64 [0.48-0.87]	**0.004****	**0.37 [0.20-0.70]**	**0.002****
OR = Odds Ratio, CI = Confidence Interval, (***) p-value <0.001, (**) p-value <0.05, (*) p-value <0.20						

Résumé (Français)

Introduction : Si la pandémie de COVID-19 a impacté la santé physique des populations, son impact à long terme sur la santé mentale reste incertain. De plus, la majorité des études se sont focalisées sur les composantes négatives de la santé mentale (dépression, anxiété, comportements suicidaires,...) et moins sur ses composantes positives. . Cette étude vise à explorer les sentiments positifs et d'amélioration de la vie deux ans après le début de la pandémie de coronavirus, ainsi que les facteurs sociodémographiques, liés au travail et à la santé qui y sont associés.

Méthodes : Ce travail a porté sur un échantillon de 1725 participants de la cohorte internationale COMET ayant répondu à la dernière question de la cinquième vague de collecte de données, concernant les sentiments positifs et d'amélioration de la vie suite à la pandémie. Une analyse en classes latentes a été réalisée afin d'identifier des groupes distincts de participants ayant des réponses homogènes à cette question. Des régressions logistiques multinomiales ont ensuite été utilisées pour quantifier les associations entre les variables sociodémographiques, liées au travail et à la santé et les classes identifiées.

Résultats : Nous avons identifié quatre classes distinctes de sentiments positifs et d'amélioration de la vie dans notre échantillon. Comparés aux individus de la classe "*Aucune amélioration*" (31,9%), ceux classés dans la classe "*Choix de vie*" (15,0%) étaient plus susceptibles d'être des femmes (OR = 1,84, IC à 95 % [1,11-3,06]), de vivre avec deux autres personnes (OR = 1,89 [1,03-3,49]) ou d'avoir une affiliation religieuse (OR = 1,66 [1,13-2,44]). Ceux classés dans la classe "*Équilibre travail/vie personnelle*" (44,4%) étaient plus susceptibles d'être plus jeunes (OR = 0,99 [0,97-1,00]), de résider dans la région Asie-Pacifique occidentale (OR = 1,69 [1,14-2,50]) ou Asie du Sud-Est (OR = 4,96 [1,63-15,1]), dans des zones suburbaines (OR = 1,51 [1,07-2,14]), d'avoir une affiliation religieuse (OR = 1,40 [1,03-1,92]), d'être étudiant (OR = 2,56 [1,20-5,46]), employé (OR = 2,20 [1,33-3,64]), ou autre (OR = 2,58 [1,32-5,01]). Ceux qui ont signalé plus de préoccupations financières que d'habitude au cours des 12 derniers mois (OR = 0,63 [0,43-0,94]) et des symptômes dépressifs (OR = 0,63 [0,42-0,92]) étaient moins susceptibles d'être classés dans ce groupe. Ceux classés dans la classe "*Temps avec les proches*" (8,7%) étaient plus susceptibles d'être plus jeunes (OR = 0,99 [0,95-0,99]), de résider dans la région de l'Asie du Sud-Est (OR = 10,9 [3,24-36,8]) et des zones suburbaines (OR = 2,13 [1,26-3,60]), de vivre avec deux autres personnes (OR = 2,85 [1,28-6,35]), d'être étudiant (OR = 3,33 [1,01-11,0]), et moins susceptibles de signaler des symptômes d'anxiété (OR = 0,31 [0,12-0,80]).

Conclusion : Nous avons identifié quatre classes distinctes de sentiments positifs et d'amélioration de la vie associées à la pandémie de COVID-19. Les facteurs associés à l'appartenance à chaque classe spécifique diffèrent légèrement. Une meilleure compréhension des prédicteurs associés serait utile pour le développement d'interventions liées à la santé mentale.

Mots clés : COVID-19, sentiments positifs, amélioration de la vie, santé mentale, cohorte COMET