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Peregrino, J. D., Kertesz, A. F., Lunkenheimer, H. G., Erut, A., Etz, A., Burger, O., Fong, F. T. K., Babaeva, N., Eder, S. J., Falade, B., Hashmi, F., Peñaloza, G., Kavanagh, C., Rawilings, B. S., Silva, H. M., Suzuki, Y., Goldwater, M. B., & Legare, C. H. (2026). Latent Profile Analyses of Explanations about the Origins of SARS-CoV-2 within and across Countries. *Collabra: Psychology*, *12*(1). https://doi.org/10.1525/collabra.155621

Social Psychology

Latent Profile Analyses of Explanations About the Origins of SARS-CoV-2 Within and Across Countries

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Keywords: beliefs, SARS-CoV-2, COVID-19, latent profile analysis, explanatory coexistence

https://doi.org/10.1525/collabra.155621

Collabra: Psychology

Vol. 12, Issue 1, 2026

Research on belief endorsement typically estimates an average mean value to describe all individuals even though groups of individuals can have coexisting beliefs within the mind. This study employed a person-centered approach based on latent profile analysis (LPA) to investigate within- and between-population variation in the endorsement patterns of multiple explanations for the origin of SARS-CoV-2, including zoonotic, human-made, and supernatural explanations, across eleven countries. Results revealed seven latent profiles that varied in the number and type of explanations endorsed, as well as the degree of certainty associated with each. Among demographic characteristics, political orientation and religious affiliation predict whether particular types of explanations are endorsed or rejected. Latent profiles characterized by explanatory uncertainty and endorsement of conspiratorial explanations were less likely to wear masks and get vaccinated. We discuss the implications of person-centered analytical approaches for documenting variations in explanation endorsement and as predictors of behavioral health outcomes.

The origin of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) remains a subject of controversy (Holmes, 2024; Sachs et al., 2022). The transfer of pathogens from non-human animals to humans remains the most plausible explanation for the origin of SARS-CoV-2 (Holmes, 2024; World Health Organization, 2021, 2025; Worobey et al., 2022). However, a plethora of explanations exist, varying in relative endorsement by region and country. For example, multiple explanations have circulated within the U.S. that propose the virus was created as a bioweapon at the Wuhan Institute of Virology (WIV), spread through 5G cellular technology, or intentionally designed as a means of population control (Evanega et al., 2020; Siwakoti et al., 2021). The types of explanations available are not always the same within or between countries, such as claims in China that SARS-CoV-2 originated from the U.S. (A. L. Zhu et al., 2023), claims in South Asia and the U.K. that immigrant and minority communities introduced the virus (Siwakoti et al., 2021), or claims in Southeast Asia that global elites introduced the virus to stop the rise of Islam (Siwakoti et al., 2021).

Infectious diseases are complex natural phenomena that often evoke multiple causal explanations for their occurrence (Legare & Gelman, 2008). There are different psychological strategies for reconciling or integrating multiple explanations – a process referred to as explanatory coexistence (Legare et al., 2012). One line of research demonstrates the coexistence of scientific and intuitive theories (Shtulman & Lombrozo, 2016), where children and adults hold intuitive theories that often conflict with scientific theories regarding the cause and effect of natural phenomena (Shtulman, 2017; Shtulman & Harrington, 2016; Young

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& Shtulman, 2020). Another line of research demonstrates the coexistence of natural and supernatural explanations (Legare et al., 2012; Legare & Shtulman, 2018), where children and adults differ in the extent to which they integrate scientific and religious explanations to explain phenomena such as illness, death, and evolution (Legare et al., 2012; Legare & Gelman, 2008).

SARS-CoV-2 is an ideal context for studying explanatory coexistence because it is likely to invoke multiple causal explanations (Legare et al., 2012; Legare & Shtulman, 2018). First, the pandemic involves the spread of microorganisms—causal agents that are unobservable to our everyday senses. Microorganisms such as SARS-CoV-2 likely originate from pathogens that spread from non-human animals to humans due to prior instances of zoonotic spillover of infectious diseases (K. E. Jones et al., 2008; N. Zhu et al., 2020). However, the lack of identification of a progenitor or causal pathway of SARS-CoV-2 may lead people to speculate that hidden, powerful human groups (Evanega et al., 2020; Siwakoti et al., 2021) or supernatural agents (Fountoulakis et al., 2021; Gibson et al., 2021; Sallam et al., 2021) are causally responsible for the pandemic. Second, disease prevention and treatment practices are deeply rooted in cultural traditions that predate our current scientific understanding of pandemics. For instance, despite a lack of efficacy, home remedies or vitamin supplements have been consumed in attempts to prevent or cure SARS-CoV-2 infection (Teovanović et al., 2020). Finally, the pandemic is associated with strong emotions such as impassioned political discourse over adopting novel preventative behaviors (Kerr et al., 2021).

Beliefs regarding the origin of infectious diseases may ultimately impact health behaviors, namely, facial mask-wearing and vaccination status. Discussion regarding the origin of SARS-CoV-2 remains heated as the U.S. government claims it was a lab leak from China (Engber, 2025; Wallace-Wells, 2025), China claiming it was a lab leak from the U.S. (Xinhua, 2025), and the WHO releasing a report stating that zoonotic origins remain the best supported hypothesis despite uncertainties (World Health Organization, 2025). In the current political context, assessments of future disease outbreaks can have significant consequences for implementing actions that facilitate or hinder the spread of emerging infectious diseases. In the United States, the government has dismantled much of the vaccine infrastructure, from defunding research on vaccines to spreading false information on the dangers of vaccination (K. J. Wu, 2025). Mask-wearing was also the subject of political division despite evidence that masks are effective in reducing airborne transmission when used correctly (Greenhalgh et al., 2024). Sources of misleading or false information about infectious diseases can hinder engagement in preventive health behaviors crucial to preventing disease outbreaks, whether now or in the future. Thus, implementing health behaviors requires understanding how groups of individuals might differ in the types of origin explanations they endorse or reject.

The vast majority of research to date has examined explanation endorsement for the origin of SARS-CoV-2 with binary response options, a single question with multiple response options, or multiple statements with multiple categories (Chen et al., 2020; Fountoulakis et al., 2021; Gibson et al., 2021; Hartman et al., 2021; Prati, 2020; Reyes et al., 2021; Salali & Uysal, 2020; Sallam et al., 2020, 2021; Vezzoni et al., 2022). For example, one study found that when participants in Italy were asked to select only one response option, 40% endorsed zoonotic origins, followed by 33% who believed the virus originated from failed scientific experiments, 13% who attributed it to U.S.-China warfare, and 13% who were unsure (Vezzoni et al., 2022). The previous example, however, shows that selecting one response option obscures their degree of confidence in the explanation itself and other explanations. For instance, when accounting for the degree of endorsement, 39.7% of Dominican Republicans were unsure that SARS-CoV-2 had zoonotic origins, 32.5% disagreed, and 27.8% agreed (Reyes et al., 2021). In another study, when U.S. participants could select all options that applied, 59.8% endorsed zoonotic origins, followed by 35.2% endorsement for the virus originating from biological warfare, 14.8% for the will of a higher power, 14.5% for the Earth cleansing itself, and 6.6% for a hoax (Gibson et al., 2021). While these findings describe the level of endorsement for a particular explanation across individuals, they do not indicate whether individuals endorse a single explanation or multiple explanations.

Identifying distinct subgroups that differ in their distribution of explanation endorsement provides insight into the shared characteristics of subgroups rather than assuming an average estimate across every individual. A person-centered approach assumes that individuals are homogeneous within their group but heterogeneous across groups (Morin et al., 2016). Latent profile analysis (LPA) is a type of person-centered analytic tool that identifies latent subpopulations within a population based on a combination of variables (Spurk et al., 2020). Specifically, a latent profile analysis estimates the number and configuration of latent profiles based on observed indicators and then assigns each individual a probability of belonging to each latent profile (Morin et al., 2016). Identifying latent subpopulations, or latent profiles, helps to distinguish whether endorsement levels are consistently high or low across all variables for an individual and whether individuals vary in their level of endorsement across variables (Morin & Marsh, 2015).

Adopting a person-centered approach complements the explanatory coexistence framework, which has demonstrated that individuals often hold multiple explanations for the same phenomenon (Legare et al., 2012). Using LPAs as an analytic tool to study explanatory coexistence provides a fine-grained perspective on studying whether levels of endorsement revolve around a single explanation or a combination of explanations. The current work extends previous research by conducting LPAs with a globally diverse sample and including a comprehensive range of scientifically endorsed, human-made explanations, as well as supernatural explanations. Additionally, we investigated how groups that differ in their endorsement of explanations are associated with variations in demographic characteristics or health behavioral outcomes.

Recent studies that have conducted LPAs on misinformation (Agley et al., 2021; Agley & Xiao, 2021) and conspiracy theories (C. Jones et al., 2023) offer some insight into the kinds of latent profiles that might emerge. Two studies found latent profiles that differed in their endorsement of explanations, including one profile that only endorsed the zoonotic explanation (Agley et al., 2021; Agley & Xiao, 2021). They also demonstrated that a higher level of religious commitment was associated with a latent profile characterized by explanatory uncertainty (Agley & Xiao, 2021). In contrast, more political commitment was associated with a latent profile characterized by endorsement that COVID-19 was meant to restrict personal liberties (Agley et al., 2021). In another study, three latent profiles were identified that differed in their levels of endorsement of COVID-19 conspiracy explanations; however, demographic characteristics such as age, gender, and education were not associated with latent profiles (C. Jones et al., 2023).

The current work investigates four research questions: 1) What are the patterns and levels of endorsement of multiple explanations for the origin of SARS-CoV-2; 2) to what extent do they vary between and within globally diverse populations; 3) what kind of demographic variation is associated with latent profile membership and; 4) how do the latent profiles predict health behavioral outcomes such as facial mask-wearing and vaccination status? To answer these research questions, the current study used a globally diverse sample of 4,831 participants from Brazil, China, Germany, India, Israel, Japan, Mexico, Russia, South Africa, the U.K., and the U.S. In the face of uncertainty about the origin of infectious diseases, this study proposes that individuals are likely to endorse a combination of explanations, including scientifically endorsed, natural explanations (e.g., zoonotic transmission), human-made explanations (e.g., virus created as a bioweapon), and supernatural explanations (e.g., punishment from God). Moreover, identifying distinct subgroups that share similar characteristics helps pinpoint which psychologically meaningful subgroups differ in demographic characteristics and provides insight into which diverse origin beliefs predict engagement in preventive health behaviors.

Our work makes several contributions to the explanatory coexistence literature. First, to our knowledge, no previous studies on explanatory coexistence have employed mixture modeling, despite this analytic approach complementing the theoretical framework suggesting that groups of individuals can differ in the types of explanations they endorse. Second, we examine how groups of individuals differ in their endorsement of a broad range of explanations, building on previous work that primarily focused on the coexistence of intuitive and scientific theories (Shtulman & Lombrozo, 2016) or natural and supernatural explanations (Legare et al., 2012). Third, our study provides a cross-cultural comparison on explanatory coexistence, building upon previous studies that were limited to single sample populations (Anggoro & Jee, 2021; Busch et al., 2017; Legare & Gelman, 2008; Toyama, 2019) or cross-cultural comparisons with a limited number of populations (Gelman & Raman, 2004; Nguyen & Rosengren, 2004). Finally, we investigated the impact of explanatory coexistence on engaging in behaviors that are critical to health outcomes.

Methods

Data, research materials, and analysis scripts are available at: https://osf.io/etbv3/overview?view_only=8c6cc89780c5491bad7e481aa0b1aec4. Data processing and descriptive statistics were conducted using *R* version 4.5.0. Latent Profile Analyses were conducted using the Mplus Base Program and Combination Add-On version 7.4. This study was not preregistered.

Participants

Six thousand seven hundred twenty-eight participant responses were recruited from eleven countries using Qualtrics Panels between July 14, 2021, and August 2, 2021. The eleven countries were selected because of differences in the rollout of vaccine accessibility in 2021. Each of the eleven countries had different trajectories of vaccine doses administered between late 2020 and August 2021 (see Figure S1). For instance, the number of vaccine doses administered in Israel plummeted in the spring of 2021. In contrast, vaccine doses in the U.S. started to decline during the summer of 2021, despite both countries having administered the vaccine in late 2020. Moreover, countries like South Africa and Japan only started administering vaccine doses at a steady rate during the summer of 2021, compared to other countries that had already administered doses by spring 2021. Countries such as Brazil, India, China, Germany, Russia, Mexico, and the United Kingdom showed an increase in the number of vaccine doses administered during the summer of 2021, with some countries exhibiting multiple peaks in their distribution, followed by a steady or gradual decline in vaccination intake.

Participants were excluded if they completed the survey in less than ten minutes, reported their age as below 17, or did not pass the first two attention check questions. One participant was excluded because they had missing data on all ten items regarding explanation endorsement on the origin of SARS-CoV-2. The final analytic sample consisted of 4831 participants from the following countries: Brazil (N = 432), China (N = 445), Germany (N = 441), India (N = 429), Israel (N = 436), Japan (N = 434), Mexico (N = 441), Russia (N = 429), South Africa (N = 444), United Kingdom (N = 429), and the United States of America (N = 471).

The mean age of the total sample was 42.4 years (*SD* = 15.3, range 18–88). The gender distribution was equally balanced (47.9% females, 47.6% males), with a small number of participants self-identifying as non-binary (0.5%). Most participants have received a university degree or graduate-level education (43.7%), followed by those with more than a high school education but no university degree (25.5%), and those with a high school education or less (19.6%). The sample had a balanced distribution of individuals who self-identified as religious (32.0%), spiritual but not religious (33.1%), or not religious (33.4%). Participants held diverse political views on economic or social issues.

Table S1 provides an overview of the demographics of each country.

We also analyzed two health-related behavioral outcomes: COVID-19 vaccination and mask-wearing. Across the entire sample, roughly 36% of respondents reported not having received a COVID-19 vaccine, compared to 64% who have received one. China (88%), India (84%), and Israel (84%) had more respondents who had received a COVID-19 vaccine compared to Japan (35%), Russia (34%), and South Africa (34%) (Figure S2). Across the entire sample, roughly half of respondents (53%) wore a mask multiple times a day, followed by those who wore a mask at least once a day (37%). Brazil (77%), South Africa (72%), and Mexico (67%) had more respondents who wore a mask multiple times a day compared to the U.S. (38%), U.K. (38%), and Japan (29%) (Figure S3).

Procedures

The surveys were translated into Spanish (Mexico), Brazilian Portuguese (Brazil), German (Germany), Russian (Russia), Japanese (Japan), and Mandarin (China). All other field sites used the default English language after consultation with Qualtrics Panels. Collaborators translated the non-English surveys and made minor changes (e.g., political affiliation, income) to ensure that certain survey items were locally relevant. Once the surveys were translated, a different person fluent in the language checked the survey for errors. All English surveys were reviewed for errors, and the survey items were tailored to be locally relevant and culturally sensitive.

All participants from Qualtrics Panels completed a survey ranging from 30 to 60 minutes in duration. Participants were informed that the study aimed to investigate individuals' beliefs, behaviors, and knowledge regarding COVID-19. Participants first read a page that contained only the informed consent and agreed to participate in the survey if they continued to the next page. Participants were allowed to drop out at any point during the survey. The current study used selected measures that were part of a larger survey. Participants were compensated $2-$3 by Qualtrics Panels, depending on the field site and local exchange rate. IRB approval for this study was obtained (#STUDY00000041) from The University of Texas at Austin.

Measures

Origin Explanations. Explanations on what was responsible for the origin of SARS-CoV-2 were measured with a 7-point Likert-type scale (1 = *Strongly Disagree* to 4 = *Uncertain* to 7 = *Strongly Agree*). Ten items were created to assess the level of endorsement across different types of explanations (see supplemental materials for the exact wording for each country). We aimed to include diverse types of explanations, including scientifically endorsed, folk-intuitive, spontaneous, conspiratorial, and supernatural explanations. Some of the wording was inspired by existing psychological literature (Imhoff & Lamberty, 2020; Legare & Shtulman, 2018) and media headlines (Langfitt, 2020; N. Wu, 2020). Higher scores indicate stronger endorsement that a particular phenomenon was responsible for the origin of COVID-19 (see Table S2 for mean and standard deviation values for each origin item).

Age. Age was converted into a categorical variable with the following categories: *18-29*, *30-39*, *40-49*, and *50* and above. These categories were created to facilitate the interpretation of the age variable, given the high standard deviation value across countries, including the entire sample.

Education. Participants were asked to indicate the highest level of education they had completed. Response options were adapted to reflect the education systems of each country. Response options across countries were then collapsed into the following categories: *High School or Less*, *Post-High School, No University Degree*, *University Degree*, *Some Graduate School or Graduate Degree*, *Other*, and *Do not know*. For Mexico, the response options were not in the correct order because the response option for receiving a bachelor's degree was missing. Thus, all data for Mexico regarding education were treated as missing.

Political Ideology. Participants were asked two questions about their political ideology regarding social and economic issues: "In general, how liberal (left-wing) or conservative (right-wing) are you on social [economic] issues?" For China, participants were asked, "In general, do you favor socialism or capitalism on social issues?" The liberal/conservative labeling was kept in the descriptive reporting because the translators indicated that the socialism/capitalism dichotomy was closely related to the liberal/conservative dichotomy. Responses were on a nine-point Likert-type scale with 1 = *Very Liberal*, 4 = *Moderate*, 7 = *Very Conservative*, 8 = *Don't Know,* and 9 = *Can't pick one label*. Responses were collapsed into four groups for each issue: liberal (1-3), moderate (4), conservative (5-7), and uncertain (8-9).

Religiosity. Participants were asked to self-identify in one of three categories: *religious*, *spiritual but not religious,* or *non-religious*. They were then asked to select one of the following options: "I consider myself to be: religious/spiritual but not religious/not religious."

COVID-19 Vaccination Status. Participants were asked, "Did you receive a vaccine for COVID-19?" with the following response options (0 = *No*, 1 = *Yes*).

Mask Wearing Behavior. This item was part of a larger question matrix that asked, "In the past two weeks, how frequently have you taken the following actions to prevent getting COVID-19?" Participants were asked how often they were "wearing a mask of any kind" with the following response options: (1 = *I didn't do this activity*, 2 = *About once every two weeks*, 3 = *About once a week*, 4 = *About three times a week*, 5 = *About every other day*, 6 = *At least once a day*, 7 = *Multiple times a day*). The variable was collapsed into three groups: *Never*, *Semifrequent*, and *Frequent*. The *Semifrequent* group consisted of respondents who wore a mask once every two weeks, once a week, or three times a week. The *Frequent* group consisted of respondents who wore a mask every other day, once a day, or multiple times a day.

Analysis Plan

LPAs were conducted using Mplus (Muthén & Muthén, 1998) to examine the underlying patterns of endorsement on explanations for the origin of SARS-CoV-2. All origin items were treated as continuous indicators for all LPAs. Factors were not created because of the small number of items to represent higher-order categories (e.g., one accurate biological item vs. four supernatural items). Moreover, conducting LPAs with individual items allows a fine-grained approach to determine which items are relevant for explanatory coexistence. The 5G cellular network and witchcraft explanation items were initially included but ultimately removed because most participants did not endorse these items, and both contributed to convergence issues. Participants were also asked if they believed "Other" explanations were possible, but examination of the response distribution showed that most strongly disagreed or were uncertain. Moreover, not everyone filled in the free response option when answering "Other". Thus, all LPAs focused on the remaining eight origin items.

The current study used the following analysis plan. All LPA models were estimated using 2,000 random start values, allowed 500 iterations, and retained the 250 best solutions for final optimization to prevent convergence on a local maximum. Starting value specifications were adjusted if the model did not replicate the best log-likelihood or failed to reach convergence. First, LPAs were performed on the entire sample, with the means freely estimated, but the variances constrained to be equal across classes. Second, separate LPAs were performed for each country with the means freely estimated, but the variances constrained to be equal across classes. All LPAs started with a two-class model solution, either evolving into a nine-class model solution or failing to converge when the number of classes was increased. Thus, the goal of running latent profile analyses was to determine 1) the number and characteristics of the latent profiles across the entire sample and 2) similarities and differences with respect to the number and characteristics of latent profiles across countries.

All LPAs were conducted as exploratory studies because of the lack of extensive empirical work on using LPAs to study explanatory coexistence and difficulties in operationalizing model constraints. First, only means were freely estimated for LPAs because previous literature suggests that freely estimating both the means and variances increases the number of free parameters estimated, which, in turn, tends to result in poor-fitting solutions or failure to converge (Gillet et al., 2018; Perera & McIlveen, 2018). Second, one of the assumptions for LPAs is local independence, in which the indicators are constrained to be uncorrelated within each latent class. Some indicators had correlation coefficients above 0.50 (see Figure S4). If the correlation coefficients are high, then the local independence assumption can be relaxed by allowing some indicators to correlate within the latent profiles. However, relaxing local independence would mean increasing the number of free parameters, thereby increasing the model's complexity.

All LPA models used maximum likelihood estimation with robust standard errors (MLR) estimation to account for missing data and non-normality. Overall, missing data on the eight origin items accounted for 0.373% of the data. The percentage of participants missing data on one item was 0.290%, and those missing data on two items was 0.083%. Data were missing for the following explanations: the bat explanation (0.103%), the bioterrorism explanation (0.083%), the seasonal flu explanation (0.083%), the spontaneous explanation (0.083%), the karma explanation (0.062%), the mother nature explanation (0.021%), and the wealthy elite explanation (0.021%).

The best model fit was identified using a combination of statistical indices, class interpretability, and theoretical considerations. The -2 Log-Likelihood (-2LL), Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and sample-size-adjusted BIC (SABIC) are model fit indices, where smaller values indicate a better model fit. Entropy is a measure of classification accuracy in defining high separability between classes (Weller et al., 2020). Entropy values can range from 0 to 1, with higher values indicating that a person is more likely to belong to only one class. The average latent class posterior probabilities (AvePP) examine the likelihood of an individual being assigned to a particular class. Generally, AvePP values should be greater than .70, as higher values indicate that the classes are well-separated (Nylund-Gibson & Choi, 2018). Moreover, the interpretability of classes for each model was reviewed to determine if classes were redundant or too small (i.e., ~5-8% of the sample) (Nylund-Gibson & Choi, 2018). Reported values of the Lo-Mendell-Rubin adjusted Likelihood ratio test (LMR LRT) were used to compare whether the current number of profiles, k, was a better fit than a model with k-1 profiles. Non-significant p-values (i.e., larger than .05) for LMR LRT indicate that the *k*-1 model better fits the data than the *k*-class model.

We interpreted whether the characteristics of the latent profiles in each solution aligned with the explanatory coexistence framework (Legare et al., 2012; Legare & Shtulman, 2018) and recent empirical work (Agley et al., 2021; Agley & Xiao, 2021; C. Jones et al., 2023). In interpreting the latent profiles, both the estimated mean values and the distribution of the raw data points for each indicator were plotted for each latent profile. The distribution of the raw data points helps interpret what unites individuals in the same latent profile. In particular, the raw data points may show that the distribution is negatively or positively skewed for specific indicators. In addition, demographic breakdowns of each latent profile were included for transparency, allowing for an understanding of how latent profiles differ across age, gender, education, religiosity, political ideology, COVID-19 vaccination status, and mask-wearing behavior. The breakdown of latent profiles is not intended to imply causal differences between groups, but rather reflects differences in the base rate demographics of the population sample.

Table 1. Model fit indices for the number of latent profiles for the entire sample

Number of Classes	LL	FP	AIC	BIC	SABIC	Entropy	LMR LRT (*p*)	BLRT (*p*)
2	-75126.511	25	150303.021	150465.092	150385.651	.911	<.001	<.001
3	-73482.822	34	147033.643	147254.059	147146.019	.962	<.001	<.001
4	-72553.815	43	145193.630	145472.391	145335.752	.939	<.001	<.001
5	-71794.951	52	143693.902	144031.008	144031.008	.960	<.001	<.001
6	-71243.750	61	142609.499	143004.950	142811.114	.940	<.001	<.001
7	**-70749.801**	**70**	**141639.602**	**142093.398**	**141870.964**	**.940**	**.9940**	**1.000**
8	-70326.521	79	140811.042	141323.184	141072.151	.943	1.000	1.000
9	-69902.869	88	139981.738	140552.225	140272.593	.942	.9999	1.000

Note. All models assume homoscedasticity, which allows the means to be estimated freely, but constrains the variances and covariances to be equal. Bold text indicates the final class solution selected. FP = Free Parameters. AIC = Akaike information criterion. BIC = Bayesian information criterion. SABIC = sample-sized-adjusted BIC. LMR-LRT = Adjusted Lo-Mendell-Rubin Likelihood Ratio Test. BLRT = Bootstrap Likelihood Ratio Test.

Results

What are the patterns and levels of endorsement for explanations about the origin of SARS-CoV-2?

We applied the LPA model across the eleven countries. Table 1 presents model fit indices from two to nine latent profile solutions. Statistical fit indices generally improved as the number of profiles increased. The entropy values were high for all profile solutions (.911-.962), indicating that each solution had high accuracy in assigning individuals to their appropriate latent profiles. The adjusted Lo-Mendell-Rubin likelihood ratio test (LMR) was significant for all solutions for the seven-, eight-, and nine-profile model solutions. For each solution, the mean endorsement levels were assessed for meaningful latent profile characteristics based on previous literature. The seven-profile solution was selected because increasing the number of profiles (i.e., eight- and nine-profile solutions) introduced latent profiles that were spread along a continuum in their level of endorsement among the indicator variables.

Figure 1 presents the seven-profile solution that includes the estimated mean levels of endorsement and the distribution of the raw data points for the eight explanations within each latent profile. *Profile A* was the largest group (36.22%) with low endorsement for wealthy elites (*M* = 1.15), divine punishment (*M* = 1.08), mother nature (*M* = 1.39), and karma (*M* = 1.23). The distribution of the raw data indicates that none of the individuals endorsed conspiratorial or supernatural explanations, with a few exceptions for the karma explanation. Among the remaining explanations, the bat explanation had the highest mean level of endorsement (*M* = 3.88) compared to the seasonal flu (*M* = 2.02), spontaneous (*M* = 2.96), and bioterrorism (*M* = 3.23) explanations. *Profile B* was the second largest group (20.48%), with no clear endorsement of a particular explanation, as most responses expressed uncertainty regarding all explanations. *Profile C* (13.72%) primarily endorsed one of the supernatural explanations – mother nature (*M* = 5.19) and not divine punishment (*M* = 1.20). *Profile D* (9.14%) primarily endorsed the conspiratorial explanations – the bioterrorism (*M* = 5.05) and wealthy elite (*M* = 5.02) explanations. *Profile E* (8.90%) had no clear endorsement for a particular explanation, but had a low endorsement for the wealthy elite explanation (*M* = 1.44). *Profile F* (8.38%) generally had high levels of endorsement for all explanations, especially for the divine punishment explanation (*M* = 6.16). Finally, *Profile G* (3.17%) primarily endorsed one of the supernatural explanations – divine punishment (*M* = 6.49) - although they were uncertain about mother nature (*M* = 4.40).

To what extent do latent profiles vary between and within globally diverse populations?

We also applied the LPA model to each country individually. The final latent profile solutions for each country varied between three and eight profiles (see Table S3 for model fit indices). Some countries had overlapping numbers of latent profiles when selecting the final solution: Japan, Mexico, Russia, and South Africa each had four latent profiles; China and India had six latent profiles; and the United Kingdom and the United States had seven latent profiles. For the remaining countries, Brazil had three latent profiles, Germany had five latent profiles, and Israel had eight latent profiles. Configural measurement invariance was not established because the number of latent profiles differed across countries. Thus, additional analyses were refrained from that imposed equality constraints on within-profile means, within-profile variances, and relative size of profiles across groups (Morin et al., 2016).

Across countries, *Profile A* refers to the largest proportion of individuals grouped based on homogeneous response patterns (see Table 2). In general, individuals in *Profile A* were grouped by their lack of endorsement for conspiratorial and supernatural explanations across Brazil (70.4%), Germany (50.27%), Israel (44.12%), Mexico (51.93%), Russia (43.39%), South Africa (50.54%), the United Kingdom (41.80%), and the United States (33.12%). For Japan (43.49%) and India (33.87%), individuals in *Profile A* were grouped by their uncertainty – a lack of clear preference for any explanation. For China (30.02%), individuals in *Profile A* are primarily grouped by their endorsement of the mother nature explanation and their lack of endorsement of the wealthy elite or divine punishment explanations.

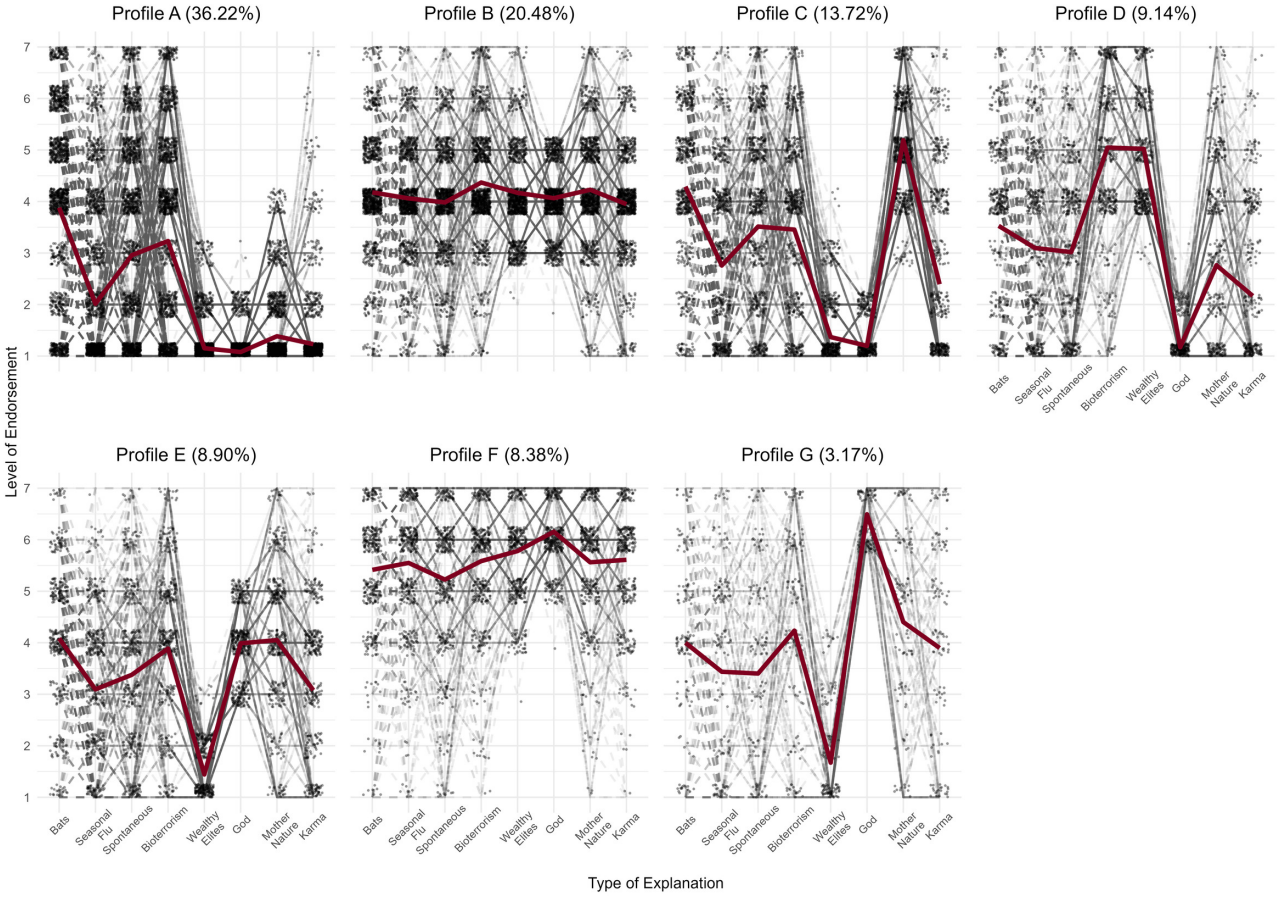

Figure 1. The seven-class latent profile solution with the entire sample. The black dots represent the distribution of raw data points, and the red line indicates the mean levels of endorsement for each explanation within each latent profile.

Table 2. Percentage proportions of each latent profile across the entire sample and each country sample

Sample	Profile A	Profile B	Profile C	Profile D	Profile E	Profile F	Profile G	Profile H
Qualtrics	36.22%	20.48%	13.72%	9.14%	8.90%	8.38%	3.17%	---
Brazil	70.40%	24.21%	5.39%	---	---	---	---	---
China	30.02%	20.19%	17.51%	13.92%	10.22%	8.14%	---	---
Germany	50.27%	20.25%	13.42%	9.48%	6.58%	---	---	---
India	33.87%	28.30%	14.48%	11.25%	6.95%	5.16%	---	---
Israel	44.12%	17.18%	9.16%	6.96%	6.86%	6.82%	5.02%	3.88%
Japan	43.49%	30.52%	19.30%	6.69%	---	---	---	---
Mexico	51.93%	25.85%	13.15%	9.07%	---	---	---	---
Russia	43.39%	26.48%	20.64%	9.49%	---	---	---	---
South Africa	50.54%	29.76%	15.84%	3.86%	---	---	---	---
United Kingdom	41.80%	19.45%	12.43%	9.90%	9.23%	4.28%	2.92%	---
United States	33.12%	28.66%	16.08%	9.84%	6.06%	3.16%	3.16%	---

The remaining latent profiles within each country varied in their kind and level of endorsement, but specific patterns of endorsement seemed more common across countries. In China (*Profile A* – 30.02%), Israel (*Profile C* – 9.16%), Japan (*Profile C* – 19.30%), Mexico (*Profile B* – 25.85%), Russia (*Profile C* – 20.64%), the United Kingdom (*Profile C* – 12.43%), and the United States (*Profile E* – 6.06%), individuals are grouped primarily by their endorsement for the mother nature explanation, and low endorsement for the wealthy elite and divine punishment explanations. In China (*Profile B* – 20.19%), Germany (*Profile B* – 20.25%), India (*Profile A* – 33.87%), Israel (*Profile B* – 17.18%), Japan (*Profile A* – 43.49%), Mexico (*Profile C* – 13.15%), Russia (*Profile B* – 26.48%), South Africa (*Profile B* – 29.76%), the United

Kingdom (*Profile B* – 19.45%), and the United States (*Profile B* – 28.66%), individuals were grouped by their uncertainty for most or all types of explanations. In China (*Profile F* – 8.14%), India (*Profile F* – 5.16%), Israel (*Profile E* – 6.86%), South Africa (*Profile C* – 15.84%), the United Kingdom (*Profile G* – 2.92%) and the United States (*Profile G* – 3.16%), individuals were grouped primarily by their endorsement for the conspiratorial explanations, and low endorsement for divine punishment. Lastly, in China (*Profile D* – 13.92%), India (*Profile B* – 28.30%), the United Kingdom (*Profile E* – 9.23%), and the United States (*Profile C* – 16.08%), individuals were grouped by their endorsement for most or all types of explanations. A description of the final LPA solution for each country can be found in the supplemental materials (see Figures S5-S15 for graphs of LPAs and Tables S4-S14 for LPA demographic breakdown).

What kind of demographic variation is associated with latent profile membership?

Table 3 presents the proportions of individuals who were likely to belong to a latent profile based on demographic characteristics. Table 4 presents the chi-square statistic results, and Figure 2 illustrates the contribution of each cell in the chi-square test for each demographic category, grouped by the latent profile. The R3STEP command (Asparouhov & Muthén, 2014) was also used, in which demographic variables served as latent profile predictors (see Table S15 for a comparison of model fits; Tables S16-S22 for statistical results). For age, the proportion of individuals aged 50 years or older was higher than expected among those who did not endorse conspiratorial and supernatural explanations (*Profile A*). Additionally, those aged 50 years or older were less likely than expected to be in groups with explanatory uncertainty (*Profile B*) or those who endorsed most explanations (*Profile* F). Conversely, those between 30 and 39 years old were more likely than expected among individuals who endorsed most explanations (*Profile F*). For gender, the proportion of individuals who identified as Other was more likely than expected among individuals with explanatory uncertainty, except for the wealthy elite explanation (*Profile E*), and less likely than expected among individuals who endorsed most explanations (*Profile F*). For education, the proportion of individuals with some graduate school or a graduate degree was more likely than expected among individuals who endorsed most explanations (*Profile F*).

For political orientation on economic and social issues, the proportion of individuals with liberal views was more likely than expected among those who endorsed the mother nature explanation (*Profile C*) and less likely than expected among those with explanatory uncertainty (*Profile B*). The proportion of individuals with conservative views was more likely than expected among individuals who endorsed most explanations (*Profile F*) and less likely than expected among individuals who endorsed the mother nature explanation (*Profile C*). For religiosity, the proportion of individuals who are not religious was more likely than expected among individuals who do not endorse conspiratorial and supernatural explanations (*Profile A*) and less likely than expected among individuals who endorsed most explanations (*Profile F*). The proportion of religious individuals was more likely than expected in groups that endorsed most explanations (*Profile F*) or the divine punishment explanation (*Profile G*) and less likely than expected in groups that did not endorsed conspiratorial and supernatural explanations (*Profile A*) or the mother nature explanation (*Profile C*). For country, the proportion of individuals from India was more likely than expected among individuals who endorsed most explanations (*Profile F*) and less likely than expected among individuals who did not endorsed conspiratorial and supernatural explanations (*Profile A*). Similarly, the proportion of individuals from China was more likely than expected among those who endorsed the mother nature explanation (*Profile C*) and less likely than expected among those who did not endorsed conspiratorial and supernatural explanations (*Profile A*).

How do the latent profiles predict health behavioral outcomes?

For vaccination status, the proportion of individuals vaccinated for COVID-19 was less likely than expected among groups with explanatory uncertainty (*Profile B*) or those that endorsed conspiratorial explanations (*Profile D*) and more likely than expected among individuals who endorsed most explanations (*Profile F*). The proportion of individuals who were not vaccinated for COVID-19 was more likely than expected for groups with explanatory uncertainty (*Profile B*) or who endorsed conspiratorial explanations (*Profile D*) and less likely than expected among individuals who endorsed most explanations (*Profile F*). For mask-wearing, the proportion of individuals who frequently wore a mask in the past two weeks was less likely than expected among those with explanatory uncertainty (*Profile B*). The proportion of individuals who semi-frequently wore a mask in the past two weeks was more likely than expected among those with explanatory uncertainty (*Profile B*) and less likely than expected among individuals who did not endorse conspiratorial and supernatural explanations (*Profile A*). The proportion of individuals who never wore a mask in the past two weeks was more likely than expected in groups with explanatory uncertainty (*Profile B*) or those that endorsed conspiratorial explanations (*Profile D*), and less likely than expected in groups that endorsed the mother nature explanation (*Profile C*) or endorsed most explanations (*Profile F*).

Discussion

The current research employed a person-centered approach to investigate global variability in the patterns and levels of endorsement for zoonotic, human-made, or supernatural explanations regarding the origin of SARS-CoV-2. Across the 11-country sample, seven latent profiles emerged that differed in the level and kind of explanation endorsement. The largest group consisted of individuals in Profile A, who were united by their lack of endorsement for conspiracy and supernatural explanations. Profiles C and G mapped onto endorsements of supernatural explanations – one that primarily endorses mother nature (Profile C), the

Table 3. Row proportions for each latent profile grouped by demographic variables for the entire sample

Variable Category	Profile A	Profile B	Profile C	Profile D	Profile E	Profile F	Profile G
Age Group							
18-29	0.32	0.25	0.12	0.09	0.09	0.08	0.04
30-39	0.31	0.22	0.14	0.09	0.09	0.13	0.03
40-49	0.33	0.24	0.12	0.09	0.09	0.10	0.03
50+	0.45	0.15	0.15	0.10	0.08	0.04	0.03
NA	0.39	0.26	0.18	0.06	0.07	0.03	0.02
Gender							
Female	0.35	0.21	0.14	0.09	0.08	0.09	0.03
Male	0.37	0.21	0.13	0.09	0.09	0.08	0.03
Other	0.44	0.12	0.16	0.08	0.20	0.00	0.00
NA	0.39	0.26	0.18	0.06	0.07	0.03	0.02
Education							
High School or Less	0.32	0.24	0.11	0.11	0.10	0.07	0.05
Post High School, no University Degree	0.39	0.20	0.11	0.12	0.09	0.05	0.03
University Degree	0.33	0.21	0.17	0.07	0.10	0.10	0.02
Some Graduate School or Graduate Degree	0.36	0.22	0.11	0.07	0.07	0.15	0.03
Other	0.37	0.23	0.17	0.10	0.08	0.02	0.03
Do not know	0.18	0.32	0.09	0.05	0.18	0.18	0.00
NA	0.45	0.15	0.18	0.10	0.06	0.05	0.02
Political Orientation - Economic Issues							
Liberal	0.39	0.14	0.20	0.08	0.08	0.09	0.03
Moderate	0.36	0.24	0.14	0.09	0.09	0.05	0.03
Conservative	0.34	0.23	0.10	0.10	0.09	0.11	0.04
Uncertain	0.35	0.26	0.09	0.10	0.10	0.07	0.03
NA	0.36	0.28	0.20	0.08	0.05	0.01	0.01
Political Orientation - Social Issues							
Liberal	0.40	0.14	0.19	0.08	0.07	0.09	0.02
Moderate	0.34	0.24	0.14	0.09	0.10	0.05	0.03
Conservative	0.33	0.24	0.09	0.09	0.08	0.12	0.04
Uncertain	0.37	0.25	0.09	0.10	0.10	0.06	0.03
NA	0.36	0.28	0.20	0.08	0.05	0.01	0.01
Religiosity							
Religious	0.30	0.23	0.09	0.09	0.10	0.16	0.05
Spiritual, but not religious	0.34	0.21	0.16	0.11	0.10	0.06	0.03
Not religious	0.45	0.19	0.16	0.08	0.07	0.04	0.02
NA	0.35	0.27	0.20	0.08	0.05	0.04	0.01
Vaccination Status							
No	0.32	0.27	0.11	0.13	0.08	0.05	0.03
Yes	0.39	0.18	0.15	0.07	0.09	0.10	0.03
Mask Wearing Frequency							
Never	0.37	0.30	0.08	0.14	0.07	0.03	0.01
Semifrequent	0.27	0.33	0.12	0.09	0.08	0.10	0.03
Frequent	0.38	0.18	0.15	0.09	0.09	0.08	0.03
Country							

Variable Category	Profile A	Profile B	Profile C	Profile D	Profile E	Profile F	Profile G
BZ	0.39	0.14	0.16	0.07	0.14	0.04	0.06
CH	0.19	0.22	0.27	0.07	0.11	0.12	0.01
GM	0.47	0.14	0.17	0.09	0.06	0.04	0.03
IN	0.14	0.28	0.08	0.07	0.07	0.31	0.04
IS	0.44	0.20	0.11	0.08	0.08	0.05	0.04
JP	0.31	0.36	0.13	0.06	0.10	0.03	0.02
MX	0.48	0.10	0.19	0.10	0.07	0.04	0.02
RU	0.38	0.24	0.11	0.14	0.08	0.02	0.03
SA	0.35	0.16	0.12	0.18	0.10	0.04	0.04
UK	0.41	0.22	0.14	0.06	0.09	0.06	0.02
US	0.40	0.25	0.05	0.07	0.05	0.15	0.03

Note. The proportions are based on assigned likely latent class membership, not estimated posterior probabilities.

Table 4. Chi-Square test statistical results for the seven latent profiles with each variable

Variable	$\chi 2$	DF	p-value
Age	158.6	18	<.001
Gender	12.573	12	.4008
Education	154.07	30	<.001
Political Orientation – Economic Issues	165.19	18	<.001
Political Orientation – Social Issues	185.1	18	<.001
Religiosity	306.37	12	<.001
Vaccination	149.18	6	<.001
Mask Wearing	122.57	12	<.001
Country	890.05	60	<.001

other divine punishment (Profile G). Profile D mapped onto the endorsement of conspiratorial explanations, namely, the bioterrorism and wealthy elite explanations. Profile B and Profile E are uncertain about most explanations, but only Profile E disagrees with the wealthy elite explanation. Finally, Profile F mapped onto the endorsement of all explanations. Our results are consistent with previous studies that identified latent profiles that reject conspiratorial explanations (Profile A) or readily endorse all explanations (Profile F) (Agley et al., 2021; Agley & Xiao, 2021).

The differences in the number and type of latent profiles across countries revealed evidence for explanatory coexistence, as individuals entertained multiple explanations rather than endorsing a single explanation for the origin of SARS-CoV-2 (Legare et al., 2012; Legare & Shtulman, 2018). However, not all countries had the same number of latent profiles. For example, Brazil had three latent profiles and Israel had eight latent profiles. Countries with more latent profiles suggest within-country variation regarding the kinds of explanations that are endorsed. For example, in China, India, the U.K., and the U.S., most, if not all, individuals endorsed multiple types of explanations. The endorsement of all types of explanations may seem logically inconsistent, but empirical evidence suggests that some groups of people readily accept all types of explanations (Agley et al., 2021; Agley & Xiao, 2021). In addition, individuals who readily endorse pseudoscientific claims, conspiracy theories, or paranormal beliefs tend to endorse all these types of beliefs (Lobato et al., 2014).

We identified specific demographic characteristics associated with certain latent profiles. Individuals aged 50 years or older seem more likely to reject conspiratorial or supernatural explanations (Profile A) and are less likely to have explanatory uncertainty (Profile B) or endorse most explanations (Profile F). This result suggests that older adults are skeptical of unfounded claims, which aligns with previous research showing that older adults are less susceptible to misinformation (Roozenbeek et al., 2020; Scherer & Pennycook, 2020). For political orientation, individuals who identified as liberal on economic and social issues were more likely to endorse the mother nature explanation (Profile C) and less likely to be in explanatory uncertainty (Profile B). In contrast, conservatives were more likely to endorse most explanations (Profile F) and less likely to endorse the mother nature explanation (Profile C). These results suggest that specific explanations resonate more with individuals depending on their political ideology. Finally, non-religious individuals were more likely to reject conspiratorial and supernatural explanations (Profile A). In contrast, religious individuals were more likely to endorse most expla-

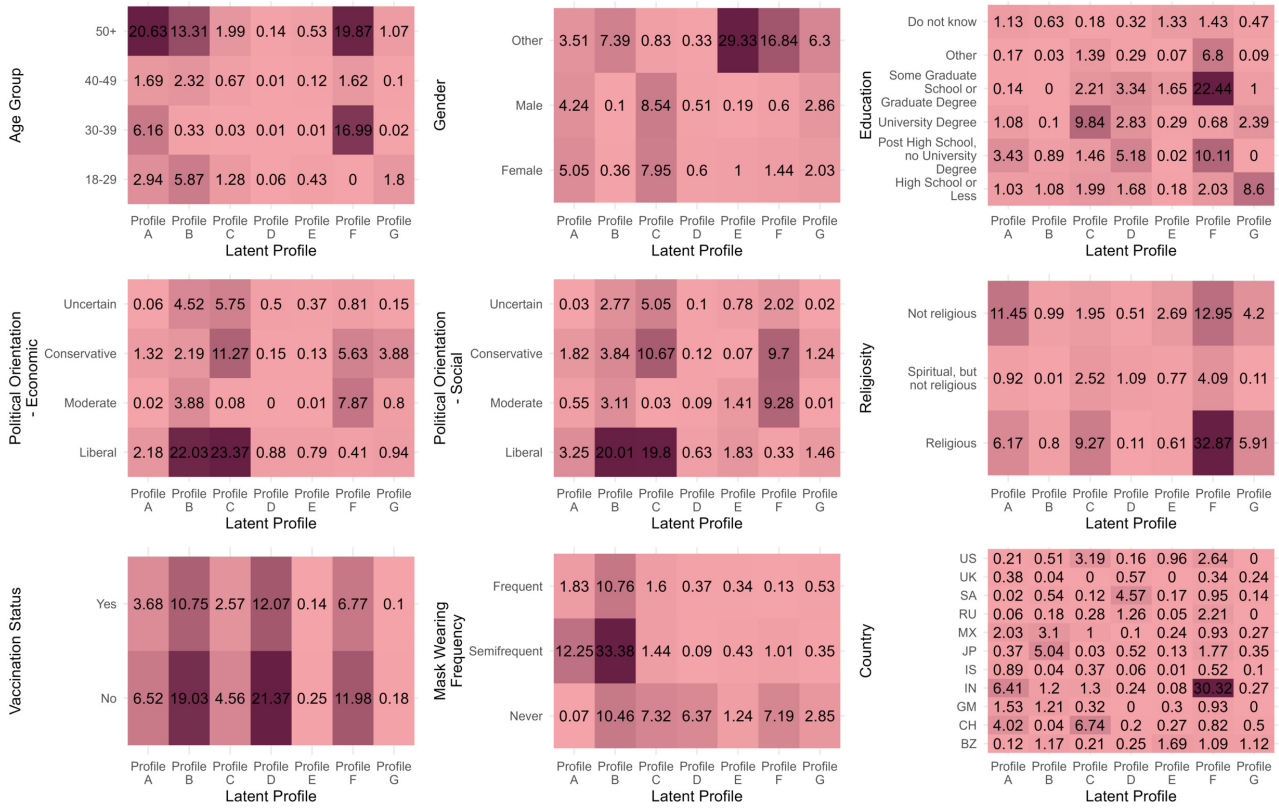

Figure 2. Percentage contributions from the Chi-Square Test for the entire sample. Higher values indicate that a particular cell's values account for more of the Chi-Square Test result.

nations (Profile F) or the divine punishment explanation (Profile G). Our findings are consistent with previous literature, which found that one latent profile that only endorsed zoonotic transmission also had the lowest reported levels of religious commitment (Agley & Xiao, 2021). However, we also extend the literature by finding that religious individuals are more likely to endorse other types of explanations, especially that of divine punishment.

We also found that explanatory uncertainty (Profile B) and endorsement of conspiratorial explanations (Profile D) were associated with lower rates of mask-wearing and vaccination. Groups of individuals with explanatory uncertainty (Profile B) were less likely to have worn a mask in the past two weeks and less likely to have been vaccinated for COVID-19. Individuals who endorsed both the bioterrorism and wealthy elites explanations (Profile D) were less likely to have worn a mask in the past two weeks and were less likely to be vaccinated for COVID-19. These findings highlight potential reasons why individuals may not wear a mask or be vaccinated. First, individuals in a state of explanatory uncertainty may be hesitant or skeptical about engaging in health behaviors, especially if there are lingering uncertainties about the origins of SARS-CoV-2. Second, the endorsement of conspiratorial explanations (Profile D) may foster the endorsement of other conspiracy theories regarding the medical establishment, leading to skepticism about the efficacy of mask-wearing and vaccination. Notably, we found that individuals who endorsed most, if not all, explanations (Profile F) were more likely to wear a mask and more likely to be vaccinated. This suggests that endorsing multiple explanations is not inconsistent with engaging in health-related behaviors.

Our results have implications for understanding public opinions about SARS-CoV-2. Reporting only the mean value for a single item across all respondents would fail to capture that individuals may disagree, remain uncertain, or agree with other items. For example, some group of individuals may believe that SARS-CoV-2 originated from a lab leak. In contrast, another group of individuals may believe that both the zoonotic and lab leak explanations remain plausible. The distinction regarding the endorsement of explanations is subtle, but different groups are likely to respond differently to evidence and whether they revise their beliefs. Suppose new evidence emerged that pangolins were the intermediate animal host for SARS-CoV-2, thereby providing support for the zoonotic transmission origin. Individuals who believe that both zoonotic and lab leak explanations are plausible may be more likely to update and reflect their beliefs. In contrast, individuals who only believe in the lab leak explanation may discount or reinterpret the evidence to fit their pre-existing views.

Our work provides several empirical contributions to the explanatory coexistence literature. First, the application of mixture modeling helped identify latent groups of individuals who differed in their endorsement of explanations. Focusing on single explanation endorsement in isolation from other explanations fails to capture that individuals can hold coexisting explanations or entertain multiple ex-

planations with varying degrees of certainty. Second, our analysis highlights the distribution of explanations endorsed within and between populations. For instance, the endorsement of conspiracy explanations is a meaningful subgroup (Profile D). However, the proportion of individuals who endorse these explanations can vary between countries or when all data are pooled together in the same analysis. Finally, our data shed light on how explanatory coexistence can impact critical preventive health behaviors, such as mask-wearing and vaccination. Previous literature has speculated about the cognitive factors that influence explanatory coexistence (Legare & Shtulman, 2018; Shtulman & Lombrozo, 2016), but our study demonstrates that people with explanatory uncertainty (Profile B) and who endorse conspiratorial explanations (Profile D) are less likely to wear a mask and less likely to vaccinate.

Our work also makes several contributions to the mixture modeling framework, specifically in the area of latent profile analyses. First, our work applies LPAs within the context of the explanatory coexistence framework, rather than the contexts of misinformation (Agley et al., 2021; Agley & Xiao, 2021) or conspiracy theories (C. Jones et al., 2023). The explanatory coexistence framework helps guide the selection of indicators for LPAs and the possible combinations of explanation endorsements that can emerge from the latent profiles. Second, we utilized LPAs to examine within- and between-population variation in perceptions of emerging infectious diseases across eleven countries. Most studies that apply latent profile or latent class analysis to study psychological attitudes and behaviors related to COVID-19 only include a single sample population, such as Australia (Oldmeadow et al., 2023), China (Qu et al., 2024; Wang et al., 2022), Israel (Ayalon, 2021), Italy (Aresi et al., 2022), or the United States (Agley et al., 2021; Agley & Xiao, 2021). Third, we investigated the relationship between latent profiles and two behavioral outcomes: facial mask-wearing and vaccination. Previous research has examined how latent profiles differ across demographic characteristics (Agley & Xiao, 2021; C. Jones et al., 2023), but not distal health-related outcomes. Moreover, our study focuses on actual vaccination status, rather than previous studies that report how endorsement of COVID-19 conspiracy theories is associated with fewer intentions to vaccinate (Hartman et al., 2021; Sallam et al., 2021; Teovanović et al., 2020).

Finally, our results have implications for modeling responses, which raise important methodological and theoretical considerations within the latent profile analysis literature. First, some LPA solutions with relatively small profile sizes were retained despite recommendations to avoid latent profiles with redundant or small class sizes (~5-8% of the sample) when selecting final LPA solutions (Nylund-Gibson & Choi, 2018). Avoiding small latent profiles can be problematic because latent profiles with large proportions of individuals might oversimplify the data or obscure pattern combinations aligned with theoretical expectations. Consider the proportion of individuals who endorsed conspiratorial explanations (Profile D). The proportion of individuals who endorsed both conspiratorial explanations was 9.14% when LPAs were conducted for the entire sample. However, the proportion ranged from 2.92% to 15.84% when LPAs were conducted for each country separately. Second, a latent profile with a small proportion of individuals can represent instances of skewed endorsement of explanations. For instance, measuring endorsement for specific conspiracy theories is likely to result in skewed distributions with frequent disagreement (Imhoff et al., 2022). Indeed, most individuals in the U.K. did not endorse SARS-CoV-2 conspiracy theories; however, a small proportion of individuals endorsed specific conspiracy theories (Sutton & Douglas, 2022). Our current data illustrate that we identified meaningful groups of individuals who endorsed conspiracy-related explanations (Profile D) or the divine punishment explanation (Profile F), despite the proportion of the latent profiles being small.

The current study has some methodological limitations regarding the listed explanations for the origin of SARS-CoV-2. Only ten possible explanations for the origin of SARS-CoV-2 were provided, which may not fully represent the plethora of explanations that people could endorse. Individuals might believe that SARS-CoV-2 has zoonotic origins, but express disagreement or uncertainty with the wording of the explanation. For instance, individuals might express uncertainty about the origin of SARS-CoV-2 being from bat transmission but endorse a broader statement about animal-to-human transmission. Thus, future studies assessing explanation endorsement must account for differences in the proposed causal mechanism and whether it is intentional or non-intentional.

LPAs are advantageous over previous approaches that only consider the mean value of a single item, but caution should be exercised when using them. We treated the data as continuous for analysis purposes; however, the interpretation of the mean values are unclear. Consider Profile A for the seven-class LPA solution with the entire sample. One might be tempted to label Profile A as Bat Ambivalent because the mean value for the bat explanation suggests that individuals are uncertain of the explanation. The raw data, however, showed that individuals in Profile A varied in their endorsement of the bat explanation based on the response distribution, and that individuals were grouped due to their lack of endorsement for the wealthy elite and supernatural explanations. In other words, the interpretation of the latent profiles cannot be solely based on the parameters (i.e., the mean values), even though the parameters are used to create the latent profiles.

Our data demonstrate that studying beliefs about emerging infectious diseases requires an understanding of how multiple explanations are endorsed, rejected, or suspended within the same mind. The discovery of seven latent profiles demonstrates that there is no single, overarching public opinion about the origin of SARS-CoV-2 – individuals vacillate or endorse multiple types of explanations. Political and religious affiliations appear to serve as important markers for latent profiles that endorse or reject conspiratorial and supernatural explanations. Latent profiles characterized by explanatory uncertainty and endorsement of conspiratorial explanations provide insight into

why certain origin beliefs predict whether groups of individuals might not wear masks or vaccinate for COVID-19. A person-centered approach offers insights into the psychological complexity of explanatory coexistence, providing a deeper understanding of natural phenomena, such as the origin of infectious diseases.

Acknowledgements

We are grateful to Julia Abrea, Aziza Babaeva, Carlos Chichiri, Ruiqi Gong, Emily Messer, Segun Sotola, Johannes Tropper, Jun Zhang, Dana Katsoty, and Ariel Knafo-Noam for assistance with instrument translation. We are thankful to Zachary Horne, Ellen Markman, and Andrew Perfors for feedback on the survey design of the project.

Funding

This research was supported by TRT0206, awarded to Cristine H. Legare by Templeton Religion Trust. Additional support for this research comes from the University of Texas at Austin Office of Vice President for Research and College of Liberal Arts. This research was also supported by grant P2CHD042849, Population Research Center, awarded to the Population Research Center at The University of Texas at Austin by the Eunice Kennedy Shriver National Institute of Child Health and Human Development. Content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Ethics Statement

The study was approved by the Institutional Review Board at the University of Texas at Austin (#STUDY00000041).

Competing Interests

The authors declare that they have no conflict of interest with respect to the research, authorship, and/or publication of this article.

Data Accessibility Statement

The data, study materials, and analysis scripts used for the study can be found here: https://osf.io/etbv3/overview?view_only=8c6cc89780c5491bad7e481aa0b1aec4

Editors: Norman Farb (Senior Editor)

Submitted: October 22, 2025 PST. Accepted: December 04, 2025 PST. Published: February 04, 2026 PST.

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