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Measuring the Impact of the Coronavirus Disease 2019 Pandemic on Mobility Aspirations and Behaviours

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Abstract: The coronavirus disease 2019 (COVID-19) pandemic prompted tens of thousands of people worldwide to migrate from cities in its early stages, leading to an increased spread of the virus. Understanding the factors driving relocation during a pandemic is crucial for effective outbreak control. We investigated how the pandemic influenced people's aspirations and preparations to move, both domestically and internationally, surveying individuals in Greece, India, Italy, Kenya, Nigeria, Portugal, Serbia, Spain, and the United States of America. Out of 4448 eligible responses, 765 participants (17.2%) had a strong aspiration to move due to COVID-19, and 155 (3.5%) had already prepared. Those considering relocation were statistically significantly more likely to perceive moving to an area with fewer COVID-19 cases as protective against the virus (OR = 1.3, $p < 0.05$) or to know others who intended to relocate because of COVID-19 (OR = 1.5, $p < 0.05$). Conversely, a strong sense of being 'at home' reduced statistically significantly the strength of mobility aspirations (OR = 0.7, $p < 0.01$). Social alienation, social imitation, and the perceived efficacy of mobility increased aspirations to move due to COVID-19. This study emphasizes the rapid population movements at pandemic onset and their potential contribution to disease transmission, urging future pandemic planning to take account of such mobility dynamics.

Keywords: migration; protection motivation theory; relocation; policy

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1. Introduction

The coronavirus disease 2019 (COVID-19) caused tens of thousands of people across the globe to relocate mostly away from cities during the first year of the pandemic [1,2]. These included tens of thousands of daily-wage migrant workers in India who suddenly lost their jobs due to lockdowns, pushing them to return to their villages to avoid hunger [1]. Similarly, in Italy, thousands of workers migrated south after news leaked about stricter and extended lockdowns in the north [2]. This massive migration exacerbated the spread of COVID-19 as infected individuals, usually asymptomatic, travelled and came into contact with non-infected people, either during their journey or upon arrival [3,4]. In response, governments imposed stricter travel restrictions and launched public health communication campaigns to discourage travel and contain the virus's spread [5].

Previous research has examined the impact of COVID-19 on migration aspirations [6–13] defined as 'a conviction that migration is preferable to non-migration' [14]. Overall, these studies consistently found that the most vulnerable segments of society, such as migrants and women, were severely impacted by the pandemic and were often willing to migrate in response if social and financial resources were available [6,11]. Researchers also reported that national governments' responses to the pandemic, typically involving lockdowns, often resulted in business closures, particularly in sectors reliant on manual labour where migrants and other low-income groups were overrepresented [4,15]. Sudden unemployment coupled with minimal savings increased workers' aspirations to move back to their place of origin or to move in with extended family to escape food insecurity and uncertainty [7,9,11]. Migrant women were found to be disproportionately impacted, being significantly less likely to intend returning to their workplace post-pandemic, resulting in greater financial dependence when compared to migrant men [7].

To date, however, there has been no quantitative assessment investigating the effects of COVID-19 on migration aspirations within the general population. The closest study to date employed qualitative interviews with 47 participants from diverse educational and migration backgrounds [16]. However, this study had two limitations: it used qualitative methods, which typically lack generalizability, and it only focused on urban populations, neglecting experiences outside of cities. Moreover, it is not possible to draw parallels from other published reports since no studies have addressed the effect of other disease outbreaks on mobility aspirations. Voluntary migration results from the convergence of high migration aspirations and the capacity to make those aspirations a reality [14]. Therefore, accurate measures of an individual's migration aspirations are critical for predicting migration behaviours with greater precision, especially considering potential differences between the general population and previously studied vulnerable groups who may have distinct motivations and constraints impacting their relocation decisions. The limited knowledge base regarding the impacts of pandemics on the aspirations of people to relocate undermines the capacity to draw effective policy interventions to contain the spread of pandemics such as COVID-19, especially during their early stages.

2. Materials and Methods

2.1. Ethics Statement

Ethical approval for this study was obtained by the University of Thessaly, Department of Physical Education and Sport Science Bioethics Committee (2 April 2020; protocol no. 1634), and is in accordance with the latest version of the Declaration of Helsinki except for registration in a database. Written consent was obtained from all respondents prior to completing the questionnaire.

2.2. Study Objectives

This study aimed to achieve five objectives in order to investigate the mobility aspirations and behaviours of people in response to the COVID-19 pandemic. We implemented a cross-sectional design to assess the impact of COVID-19 on the mobility aspirations of people at an inter-continental (Objective one) as well as sub-continental and national scales

(Objective two) during the first year of the pandemic. We then expanded this methodology by implementing a longitudinal design to test for individual changes in mobility aspirations over time in response to COVID-19 (Objective three). To generate results that reflect a broad and diverse international sample, potentially relevant to a global audience of policymakers and stakeholders, we used information collected from people living in nine different countries (Figure 1) at the time of data collection (i.e., questionnaire distribution). The countries included in this study differed in World Bank income group (i.e., lower-middle, upper-middle, and high), geographical location (i.e., Africa, America, Asia, and Europe), and severity with respect to how they were impacted by the pandemic at the time of study design (i.e., March and April 2020). Information regarding respondents' preparations to move elsewhere in response to COVID-19 (Objective four) and potential mobility destinations (Objective five) was also provided.

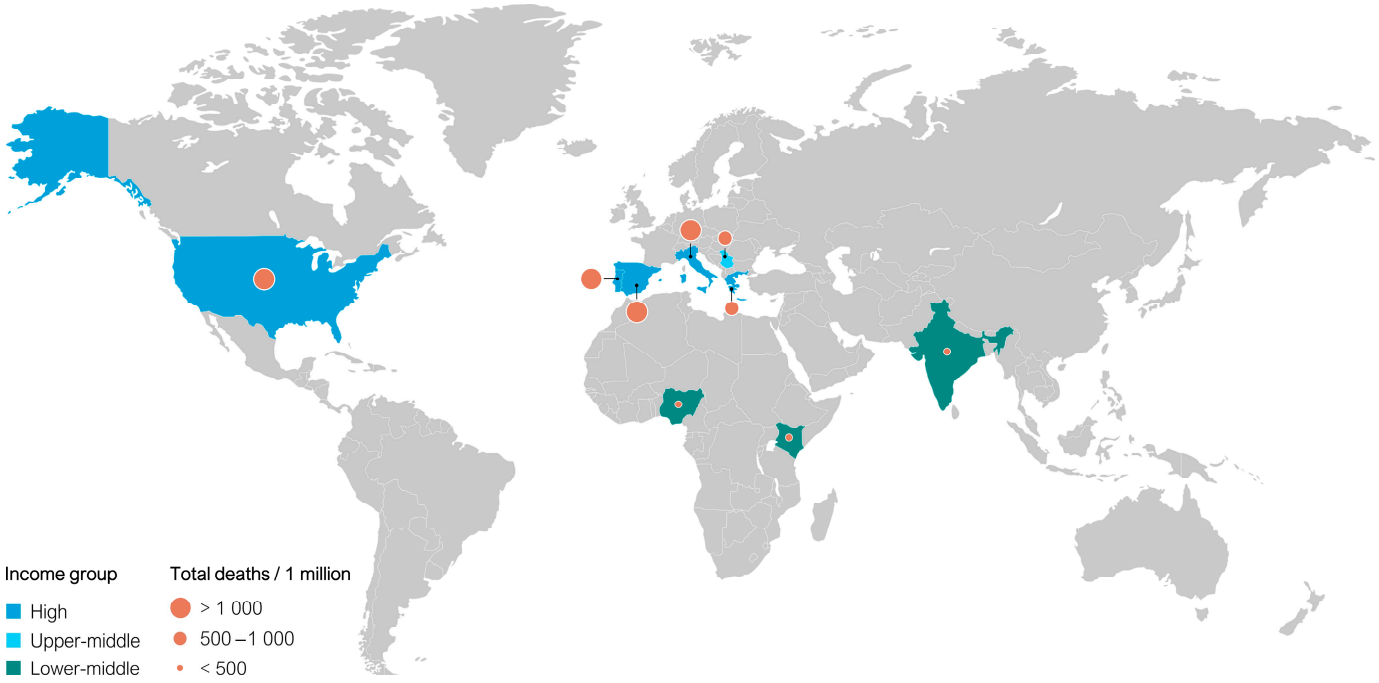

Figure 1. Countries included in the study (from left to right: the US, Portugal, Spain, Nigeria, Italy, Serbia, Greece, Kenya, and India). Countries' World Bank income group [17] and total number of COVID-19 deaths per million people as of 3 February 2021 [18] are illustrated.

2.3. Conceptual Framework

We applied the Protection Motivation Theory (PMT) [19,20] to design the questionnaire and data analysis protocol. The PMT has been previously used in human migration research [21] and was developed to understand what motivates people to adopt self-protective behaviours in response to a perceived health threat [20]. The premise of PMT is that people engage in protective behaviours through two main cognitive processes, namely, 'threat appraisal' and 'coping appraisal' [19]. In this study, the threat appraisal evaluated a person's perception of COVID-19 (i.e., severity of the disease, vulnerability to the disease, positive aspects of not moving elsewhere to live, or rewards), while the coping appraisal assessed a person's ability to cope with COVID-19 by means of internal or international mobility (i.e., efficacy of mobility as a self-protective behaviour to COVID-19, self-efficacy in mobility, and mobility costs) (Figure 2). Experience and knowledge of the disease affect both pathways and ultimately influence an individual's decision to move to another location (Figure 2).

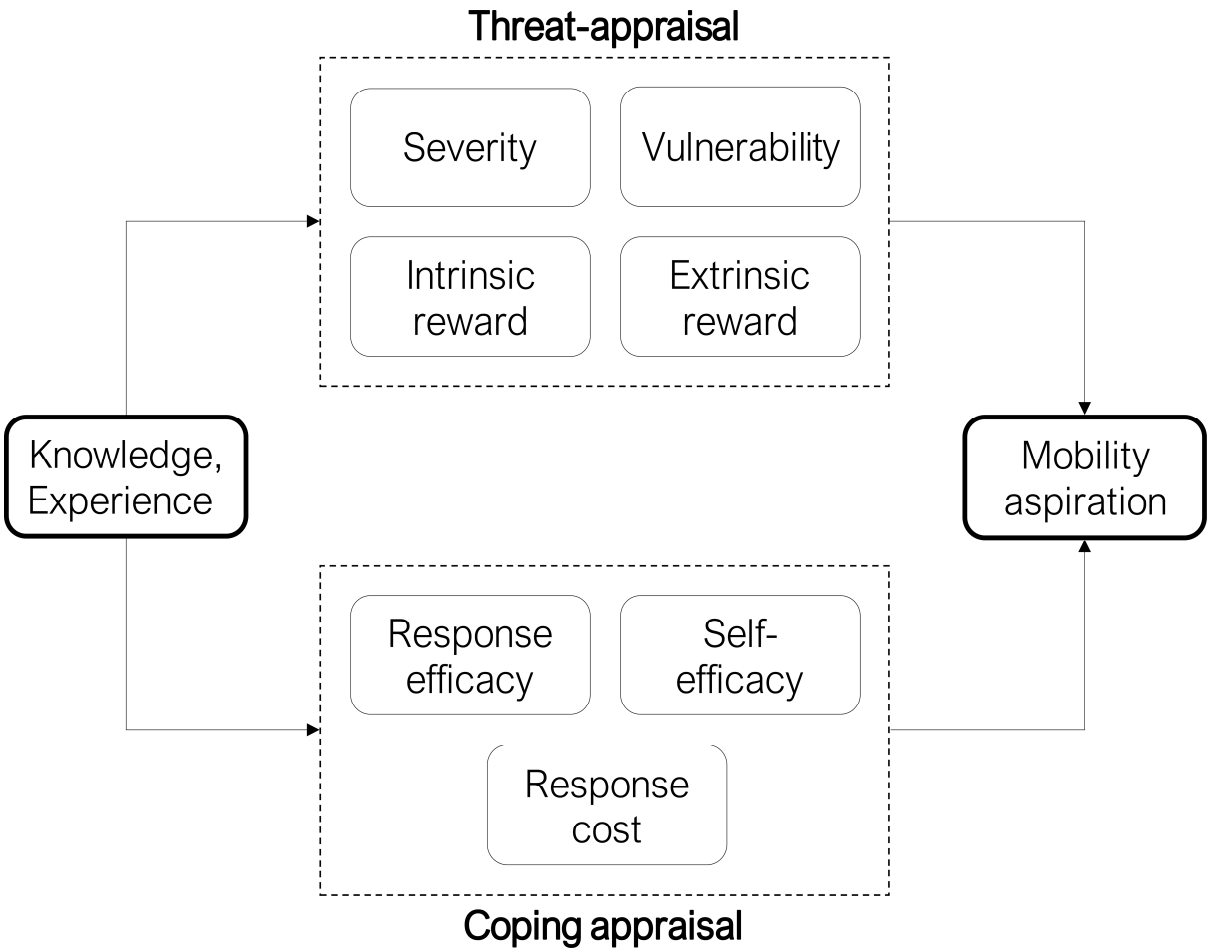

Figure 2. Schematic representation of the Protection Motivation Theory and its seven constructs. The image is a modified version of a previously-published illustration [22].

2.4. Data Collection

Data collection was conducted by means of an online survey between 31 May 2020, and 3 February 2021. We aimed to collect 500 valid responses from each country of focus (i.e., Greece, India, Italy, Kenya, Nigeria, Portugal, Serbia, Spain, and the United States of America (US)) in line with the previous literature [21,23]. Participants who submitted the questionnaire before 1 October 2020 and provided an email address were invited via email between 11 November and 7 December 2020 to complete a shorter version of the same questionnaire to investigate longitudinal changes in mobility aspirations in response to COVID-19. All the collected information was kept confidential.

Participants were recruited by word-of-mouth, social media postings on Facebook, LinkedIn, and Twitter, and face-to-face interactions in shopping malls or on the street. The latter was used to ensure recruitment of populations without access to the internet or under-represented online. Eligible participants were any individual aged 18 years or older who was able to independently complete the questionnaire. We aimed to recruit equal distributions of people with respect to gender, age, and highest achieved education level within each country to allow for comparison between nations.

2.5. Questionnaire

The questionnaire (included in the Supplementary Materials) was administered using an online platform. The questionnaire was distributed to recruited participants and was completed anonymously and independently. All recruitment and questionnaire administration procedures were conducted in compliance with local COVID-19 laws and recommendations.

The questionnaire was translated from English to Greek, Italian, Portuguese, Serbian, and Spanish by translators with a proven excellent command of the used languages to allow for non-English-speaking individuals to participate in the study. The translators were instructed to focus on cross-cultural and conceptual translations rather than linguistic and/or literal equivalence [24]. Each translated questionnaire was then piloted on $\geq$4 participants from the target population to identify any unclear or offensive material prior to being distributed for data collection [24].

Knowledge of COVID-19 was assessed using a 5-item scale (question 28 of the questionnaire in the Supplementary Materials). Specifically, the items assessed whether a participant was familiar with the route of transmission, the symptoms of the disease, and which populations were considered most vulnerable to negative outcomes. Participants earned one point for each correct answer to the five questions. Experience with COVID-19 was assessed by asking participants if they or any family members, relatives, or friends had ever caught COVID-19 (question 29). Mobility aspirations in response to COVID-19 were assessed using a 10-point Likert-type scale, where participants were asked if, considering all reasons to stay or move away (e.g., employment, family, and education), they would move away from their current location of residence due to COVID-19. The scale ranged from one, meaning 'very unlikely', to 10, meaning 'very likely', consistent with previous research (question 21) [21]. Mobility preparations in response to COVID-19 were assessed by asking participants with a strong or moderate mobility aspiration if they had performed any preparation for the move, such as purchasing a ticket or applying for a visa (question 23), while participants with a weak mobility aspiration were asked whether they had prepared for moving due to reasons not necessarily relevant to COVID-19 (question 26) (see Section 2.6 for the definition of strong, moderate, and weak mobility aspirations). Demographic variables were also assessed, including gender, age, country of residence, and perceived social status. A full description of the measures used in this study, beyond those provided in this section, is available in the Supplementary Materials.

2.6. Data Analysis

The data collected in a language other than English were translated into English with the assistance of translators, and open answers were coded to ease the interpretation of the results. The resulting data were then screened for eligibility; in particular, data were deemed ineligible if collected from participants less than 18 years of age or residing in a country other than the nine countries listed above, if from multiple submissions providing identical answers, or if contradictory answers were provided within the same questionnaire.

A multinomial logistic regression framework was then used to ascertain the effects of COVID-19 on the likelihood that participants aspired to migrate (Objectives one and two). The dependent variable was grouped from the values 1 to 3 into 'weak aspiration', 4 to 7 into 'moderate aspiration', and 8 to 10 into 'strong aspiration' in line with the previous literature [21]. The independent variables consisted of socio-economic characteristics and PMT constructs.

The inter-continental analysis aimed at finding the effects of COVID-19 on the mobility aspirations of people living in Greece, India, Italy, Kenya, Nigeria, Portugal, Serbia, Spain, and the US (Objective one). Separate regression models were run for the inter-continental sample and each national (i.e., Greece, India, Italy, Portugal, and the US) and sub-continent (i.e., Eastern and Western Africa, including Kenya and Nigeria, and Southern Europe, including Greece, Italy, Serbia, Spain, and Portugal) sample greater than 500 participants (Objective two) [21,23]. Random effects were included in the models for the analysis of the inter-continental and sub-continental samples in order to control for the clustering of observations for countries in line with the previous literature [25]. In particular, the random effects were tested by means of Z-tests, while the fixed effects were tested by means of *t*-tests in mixed-effects models. Instead, for analyses including only one national sample, first a baseline fixed-effects-only model was run with all relevant independent variables,

and then the best explanatory model was selected based on Bayesian information criterion using a stepwise procedure [21].

The longitudinal analysis on a paired sample (Objective three) was conducted using the non-parametric Wilcoxon signed-ranks test. The statistical analyses were conducted using SPSS v23.0 (IBM, Armonk, NY, USA) and Excel spreadsheets (Microsoft Office, Microsoft, Washington, DC, USA). The level of significance for the analyses was set at $p < 0.05$. All results are provided as mean ± standard deviation (SD), unless otherwise stated.

3. Results

3.1. Sample Characteristics

In total, 5191 responses were collected overall, out of which 743 were considered ineligible due to reasons described in Section 2.6. The 4448 eligible responses were collected from participants living at the time of questionnaire submission in India (n = 803), Italy (n = 653), the US (n = 647), Greece (n = 596), Portugal (n = 546), Kenya (n = 371), Spain (n = 329), Nigeria (n = 322), and Serbia (n = 181). Table 1 describes the characteristics of the sample used for analysis, stratified by the nine countries listed above. The median age of respondents was 35 years (interquartile range: 22.0). In all nine countries except for India where most respondents were male (51.4%) and for Italy where most respondents did not complete a university education (57.3%), the greatest proportion of respondents were females (50.3 to 75.4% range), well-educated (52.6 to 71.1% range of respondents that completed university education), relatively healthy (92.7% to 98.7% range of respondents that perceived their own current health status as fair, good, or very good), and forecasted minimal changes in their own health during the 12 months following the questionnaire completion (−0.1 to 0.2 range of mean arithmetic difference between respondents' current health status and forecasted health status in 12 months, see Supplementary Materials).

Table 1. Sample characteristics stratified by the nine countries that were included in the inter-continent-level logistic regression analysis.

	Total n = 4448	**Greece n = 596**	**India n = 803**	**Italy n = 653**	**Kenya n = 371**	**Nigeria n = 322**	**Portugal n = 546**	**Serbia n = 181**	**Spain n = 329**	**US n = 647**
Age median (IQR)	35.0 (22.0)	35.0 (16.0)	31.0 (21.0)	40.0 (25.0)	32.0 (13.0)	28.0 (11.0)	38.0 (21.0)	29.0 (9.0)	42.0 (18.0)	42.0 (33.0)
Gender %										
Female	59.5	50.3	47.8	64.0	52.6	55.0	66.8	61.9	62.6	75.4
Male	40.2	49.7	51.4	35.7	46.9	45.0	33.2	38.1	37.1	24.1
Other	0.3	0.0	0.8	0.3	0.5	0.0	0.0	0.0	0.3	0.5
Education %										
None	1.3	0.2	3.7	0.0	6.2	0.0	0.0	0.0	0.5	0.5
Primary	2.3	0.3	5.4	0.2	7.5	0.0	0.2	0.0	3.6	2.2
Lower secondary	4.5	1.5	6.8	9.5	4.3	0.0	3.5	4.4	4.9	2.2
Higher secondary	24.0	22.7	19.8	38.1	15.9	26.4	25.6	33.2	12.8	21.8
Vocational	9.1	7.2	11.7	9.5	11.1	2.5	8.6	8.3	19.8	4.5
University	58.8	68.1	52.6	42.7	55.0	71.1	62.1	54.1	58.4	68.8
Current health status % and number of diseases and health-related gaps mean (SD)										
Very bad	1.0	1.7	1.4	0.2	0.8	1.3	1.1	0.5	1.2	0.8
Bad	3.1	3.2	4.5	3.2	0.5	0.9	6.2	3.9	1.8	1.7
Fair	20.5	15.0	21.4	21.9	22.4	14.9	29.5	23.8	20.1	16.5

Table 1. *Cont.*

	Total n = 4448	Greece n = 596	India n = 803	Italy n = 653	Kenya n = 371	Nigeria n = 322	Portugal n = 546	Serbia n = 181	Spain n = 329	US n = 647
Good	52.5	46.0	60.4	56.5	51.2	46.9	49.3	48.6	56.8	49.8
Very good	22.9	34.1	12.3	18.2	25.1	36.0	13.9	23.2	20.1	31.2
Number of diseases [a]	0.5 (0.9)	0.3 (0.9)	0.5 (0.7)	0.5 (0.9)	0.3 (1.0)	0.3 (0.9)	0.6 (1.0)	0.3 (0.7)	0.5 (1.1)	0.6 (1.0)
Health gap [b]	0.1 (0.6)	0.0 (0.6)	0.1 (0.5)	−0.1 (0.5)	0.2 (0.6)	0.2 (0.7)	−0.1 (0.5)	0.1 (0.6)	0.0 (0.6)	0.1 (0.5)
Healthcare gap [c]	0.6 (2.3)	0.9 (2.5)	1.0 (2.1)	−0.3 (2.1)	1.0 (2.1)	2.7 (3.1)	0.2 (2.2)	2.0 (2.7)	0.0 (1.4)	−0.2 (1.5)
COVID-19 knowledge mean (SD) and experience %										
Knowledge [d]	4.1 (1.1)	4.5 (0.9)	2.8 (0.9)	4.6 (0.7)	4.0 (0.9)	3.6 (0.9)	4.7 (0.7)	3.8 (1.4)	4.6 (0.7)	4.6 (0.7)
No experience [e]	51.8	66.3	57.4	51.1	39.3	80.4	50.9	55.2	45.9	27.8
Had experience [f]	42.8	30.5	33.1	46.9	36.4	17.1	47.1	44.2	50.8	70.6
Missing experience [g]	5.4	3.2	9.5	2.0	24.3	2.5	2.0	0.6	3.3	1.6
Mobility aspiration in response to COVID-19 %										
Weak	58.6	71.3	11.5	68.3	45.5	53.7	74.6	68.0	69.6	84.2
Moderate	18.8	13.8	30.6	20.4	17.8	29.2	12.8	15.9	16.1	9.6
Strong	17.2	11.7	48.4	9.3	12.4	14.6	10.6	15.5	11.0	4.6
Missing aspiration [g]	5.4	3.2	9.5	2.0	24.3	2.5	2.0	0.6	3.3	1.6

Index [a] ranges from zero to eight, where zero indicates that the participant had never been diagnosed with cancer, cardiovascular diseases, depression, diabetes, HIV/AIDS, kidney diseases, liver diseases, or lung diseases, and eight indicates that the participant had been diagnosed with all eight diseases. Index [b] is calculated by subtracting the participant's current health status score (ranging from zero = very bad to four = very good) from their 12-month prospective health status score (same score range). Index [c] is calculated by subtracting the perceived quality of healthcare available in the participant's current area of residence (ranging from one = very bad to 10 = very good) from their perceived quality of healthcare available in the destination area they have indicated (same score range). Index [d] ranges from zero to five, where zero indicates that the participant answered incorrectly to all five COVID-19 knowledge questions, and five indicates that the participant answered correctly to all five questions. Percentage [e] represents the percentage of participants who had not been infected with COVID-19 and had no family members, relatives, or friends who had been infected. Percentage [f] represents the percentage of participants who had been infected with COVID-19 or had at least one family member, relative, or friend who had been infected. Percentage [g] represents the percentage of participants who answered negatively to the question about whether they had ever heard of COVID-19 and thus were not asked about their COVID-19 experience or aspirations to move due to COVID-19.

The mean score of COVID-19 knowledge was 4.1 ± 1.1 reflecting a high level of knowledge regarding COVID-19, with only participants in India (2.8 ± 0.9), Nigeria (3.6 ± 0.9), and Serbia (3.8 ± 1.4), scoring less than four points out of five on average (see Section 2.5). In total, 42.8% of participants had either caught COVID-19 or had a family member, relative, or friend that had caught it, with participants in the US (70.6%), Spain (50.8%), Portugal (47.1%), and Italy (46.9%) registering greater proportions.

The majority of respondents (58.6%) had a weak aspiration to move elsewhere to live due to COVID-19, while 17.2% had a strong aspiration. Mobility aspirations greatly differed across the nine national samples, with strong mobility aspirations ranging from 4.6% in the US to 48.4% in India. There were no statistically significant changes over time ($p > 0.05$) in the strength of mobility aspirations or whether participants had prepared for moving elsewhere to live in response to COVID-19 in a sample of 41 participants mostly composed of female, well-educated, and relatively healthy people that completed the questionnaire twice (Objective three). The gap between the perceived quality of healthcare available

in participants' current area of residence and a possible area of destination indicated by participants (see Supplementary Materials) was minimal overall, with average gaps greater or equivalent to one score point for participants in India (1.0 ± 2.1), Kenya (1.0 ± 2.1), Serbia (2.0 ± 2.7), and Nigeria (2.7 ± 3.1).

3.2. Effects of COVID-19 on Mobility Aspirations

A logistic regression analysis using a fitted generalized linear mixed-effects model was performed to investigate the effects at an inter-continental scale of COVID-19 on the likelihood that participants aspire to move elsewhere to live either internally or abroad (Objective one). The model included the total sample described in Table 1 and correctly classified 72.2% of cases. Participants who felt that they would have been able to avoid catching COVID-19 by moving to an area where fewer people were infected with the disease compared to their current area of residence were statistically significantly more likely to have a strong rather than weak aspiration to move (Table 2). Also, participants having most of the people they know intending to relocate because of COVID-19 were statistically significantly more likely to have a strong rather than weak aspiration to move (Table 2), and participants perceiving a greater difference between the overall quality of the healthcare available at their place of residence and their aspired mobility destination were more likely to have a strong rather than weak aspiration to move in a nearly statistically significant fashion (B = 0.037, OR = 1.038, p = 0.071). However, participants feeling 'at home' in their current area of residence were statistically significantly more likely to have a weak rather than strong aspiration to move (Table 2). No statistically significant effects were found for participants with a moderate mobility aspiration compared to those with a weak aspiration, although there were some nearly significant effects. Participants who scored higher on the severity of the financial damages brought by COVID-19 were nearly significantly more likely to have moderate aspirations (B = −0.052, OR = 0.949, p = 0.071), and participants who agreed that they would have avoided catching the disease by moving to an area with fewer infections compared to their current area of residence were also nearly significantly more likely to have moderate aspirations (B = 0.201, OR = 1.223, p = 0.075). The random effects were statistically significant (variance = 0.847, $p < 0.01$), indicating that there were statistically significant differences in the likelihood of having a strong or moderate rather than weak mobility aspiration between participants residing in different countries.

Table 2. Fixed-effects results of the logistic regression model for the inter-continental sample (n = 4448). Unstandardized regression coefficients (B), standard errors (SE), and odd ratios (OR) are shown. Here, 95% confidence intervals are shown for the statistically significant regression coefficients.

	Moderate Mobility Aspiration		**Strong Mobility Aspiration**	
	B (SE)	**OR**	**B (SE)**	**OR**
Fixed-effects intercept	−0.648 (1.113)	0.523	−1.330 (1.115)	0.264
Female	0.011 (0.094)	1.012	−0.010 (0.094)	0.990
Age	0.001 (0.005)	1.001	0.002 (0.005)	1.002
Lives in a big city	0.111 (0.094)	1.117	0.061 (0.094)	1.063
Changed residence in 2020	0.062 (0.121)	1.064	0.150 (0.120)	1.161

Table 2. *Cont.*

	Moderate Mobility Aspiration		Strong Mobility Aspiration	
	B (SE)	**OR**	**B (SE)**	**OR**
Single and never married	0.075 (0.116)	1.078	0.012 (0.116)	1.012
Social status: 1st quintile	−0.106 (0.283)	0.899	−0.392 (0.282)	0.675
Social status: 2nd quintile	0.062 (0.231)	1.064	−0.136 (0.227)	0.873
Social status: 3rd quintile	−0.026 (0.217)	0.974	−0.171 (0.211)	0.843
Social status: 4th quintile	−0.040 (0.222)	0.961	−0.065 (0.215)	0.937
Has university education	−0.007 (0.100)	0.993	0.064 (0.100)	1.066
Works 30 or less hours/week	−0.009 (0.137)	0.991	−0.010 (0.138)	0.990
Student	0.068 (0.147)	1.070	0.120 (0.147)	1.128
Houseworker	−0.072 (0.199)	0.931	0.068 (0.195)	1.070
Unemployed	0.094 (0.174)	1.098	0.160 (0.173)	1.173
Retired	0.024 (0.216)	1.025	−0.009 (0.219)	0.991
Unable to work	0.095 (0.432)	1.100	−0.108 (0.442)	0.897
Possesses land, house, or business	−0.112 (0.103)	0.894	−0.111 (0.103)	0.895
Health gap index	0.013 (0.082)	1.013	−0.011 (0.083)	0.989
Diagnosed cancer	0.088 (0.225)	1.091	−0.111 (0.233)	0.895
Diagnosed cardiovascular disease	0.063 (0.181)	1.065	0.078 (0.180)	1.081
Diagnosed depression	0.013 (0.126)	1.013	0.040 (0.128)	1.041
Diagnosed diabetes	0.044 (0.211)	1.044	−0.047 (0.211)	0.954
Diagnosed HIV/AIDS	0.111 (0.551)	1.118	0.067 (0.569)	1.069
Diagnosed kidney disease	−0.048 (0.293)	0.953	−0.097 (0.296)	0.907
Diagnosed liver disease	0.005 (0.319)	1.005	0.141 (0.312)	1.151
Diagnosed lung disease	−0.061 (0.208)	0.941	0.153 (0.206)	1.165

Table 2. *Cont.*

	Moderate Mobility Aspiration		Strong Mobility Aspiration	
	B (SE)	**OR**	**B (SE)**	**OR**
Healthcare gap index	−0.002 (0.021)	0.998	0.037 (0.021)	1.038
COVID-19 knowledge index	0.310 (0.525)	1.364	0.616 (0.530)	1.851
COVID-19 knowledge index squared	−0.132 (0.0203)	0.876	−0.241 (0.204)	0.786
COVID-19 knowledge index cubic	0.012 (0.023)	1.013	0.024 (0.023)	1.025
Had COVID-19 or has contacts that had COVID-19	−0.058 (0.094)	0.944	0.046 (0.093)	1.047
The severity of COVID-19 damages on people's health	0.009 (0.024)	1.009	0.016 (0.024)	1.016
The severity of COVID-19 damages on people's finances	−0.052 (0.029)	0.949	0.005 (0.029)	1.005
Respondent's vulnerability to the health effects of COVID-19	0.018 (0.021)	1.018	0.014 (0.021)	1.014
Respondent's vulnerability to the financial effects of COVID-19	0.028 (0.019)	1.028	0.015 (0.019)	1.015
The current area of residence feels like home	−0.187 (0.146)	0.830	−0.397 ** [−0.652, −0.143] (0.146)	0.672
Knows healthcare staff in their current area of residence	−0.056 (0.094)	0.946	0.047 (0.095)	1.048
Most of the known people intend to move because of COVID-19	0.155 (0.165)	1.168	0.401 * [0.117, 0.685] (0.162)	1.494
Worried for family and friends because of COVID-19	0.050 (0.109)	1.051	0.077 (0.109)	1.080
Agrees that they would avoid catching COVID-19 by moving	0.201 (0.113)	1.223	0.256 * [0.054, 0.457] (0.113)	1.291
Agrees that they would not die of COVID-19 by moving	0.140 (0.096)	1.150	0.042 (0.096)	1.043
Agrees that moving would maintain pre-pandemic lifestyle	0.069 (0.102)	1.071	0.024 (0.102)	1.025
Finds moving easy	0.034 (0.095)	1.034	0.081 (0.096)	1.084
Competent and capable in important activities	−0.179 (0.144)	0.836	−0.205 (0.143)	0.814
Moved in the last 10 years at least once without financial difficulties	0.097 (0.095)	1.102	0.019 (0.095)	1.019
Would live with no family or friends if moved	−0.023 (0.095)	0.978	0.007 (0.095)	1.007
Resides in Greece	0.056 (1.314)	1.058	0.150 (1.314)	1.161

Table 2. *Cont.*

	Moderate Mobility Aspiration		Strong Mobility Aspiration	
	B (SE)	**OR**	**B (SE)**	**OR**
Resides in India	0.828 (1.323)	2.289	1.342 (1.323)	3.828
Resides in Italy	0.310 (1.312)	1.364	0.204 (1.313)	1.227
Resides in Kenya	0.164 (1.321)	1.178	0.130 (1.322)	1.139
Resides in Nigeria	0.343 (1.323)	1.410	0.128 (1.324)	1.136
Resides in Portugal	0.057 (1.313)	1.059	0.133 (1.313)	1.143
Resides in Serbia	0.027 (1.326)	1.027	0.175 (1.326)	1.192
Resides in Spain	−0.306 (1.320)	0.736	−0.204 (1.321)	0.816
Included observations	4002		4002	

The reference category is weak mobility aspiration. * $p < 0.05$; ** $p < 0.01$.

To determine the effects of COVID-19 on participants' mobility aspirations at reduced geographical scales (Objective two), we performed additional logistic regression analyses at the country (i.e., Greece, India, Italy, Portugal, and the US) and sub-continent (i.e., Eastern and Western Africa and Southern Europe) levels. The results indicate that the effects are heterogeneous across sub-samples and that the effect direction of the predictors on mobility aspirations remains constant across sub-samples (Table S1).

3.3. From Mobility Aspirations to Behaviours

We asked participants if they had made any preparation, such as purchasing a ticket or applying for a visa, for moving towards a location they indicated as their aspired destination as a means to indirectly measure mobility behaviours in response to COVID-19 (Objective four). In total, 209 answers (4.7%) to questions regarding mobility preparations and destinations were deemed ineligible (see Section 2.6) and were thus not included in the analysis.

Overall, 3.5% of participants had made preparations to move in response to COVID-19, with greater proportions observed among participants with a strong mobility aspiration (13.3%) compared to those with a moderate mobility aspiration (6.3%). Only 3.7% of participants with a weak mobility aspiration had made preparations; they were asked whether they had prepared for moving due to reasons not necessarily relevant to COVID-19 (see Section 2.5). The percentage of participants that had made preparations greatly differed between countries (Figure S1). We also found that 8.3% of participants who felt alienated in their place of residence, a subgroup shown to have heightened mobility aspirations due to COVID-19 (see Section 3.2), had made preparations to relocate.

We also asked participants with a strong or moderate aspiration where they would move to because of COVID-19, while participants with a weak mobility aspiration were asked where they would move to if they were to leave their current location of residence (see Supplementary Materials) (Objective five). Overall, 40.3% of participants would move to a location within the same region, while 36.2% would move to another region in the same country, and 18.8% would move abroad. Differences in proportions were observed between participants with strong (i.e., within region 28.1%, another region in the same

country 47.7%, and abroad 17.1%), moderate (i.e., within region 36.9%, another region in the same country 36.2%, and abroad 16.9%), and weak (i.e., within region 44.1%, another region in the same country 32.9%, and abroad 20.4%) mobility aspirations. The proportion of destination areas indicated by participants greatly differed between countries (Figure S2). Among the participants that had made preparations, 24.9% would move within the same region, 44.2% to another region in the same country, and 30.9% abroad.

4. Discussion

Using individual-level survey data collected from 4448 participants from a heterogeneous sample of nine countries across four continents (i.e., Greece, India, Italy, Kenya, Nigeria, Portugal, Serbia, Spain, and the US), we report findings of importance to policy makers and stakeholders engaged in either public health communication or migration management considering the COVID-19 pandemic and possible future disease outbreaks. As of February 2021, the willingness of participants to relocate (either temporarily or permanently) was driven by the desire to avoid catching COVID-19 and the perception that moving elsewhere, in particular to a location where fewer people were infected compared to the participants' area of residence, would have been an effective means to avoid catching the disease. We also find evidence of social imitation, with participants having most of the people they know intending to relocate because of COVID-19 being more likely to have a strong rather than weak aspiration to move elsewhere, potentially triggering a cascade of intensified mobility aspirations through social networks. On the other side, we also report factors mitigating the mobility aspiration of participants; in particular, participants feeling 'at home' in their current area of residence were more likely to have a weak rather than strong aspiration to move. We also wanted to measure how many participants had already made preparations for moving due to COVID-19, and we found that 3.5% had already prepared for the move. Among participants with a strong mobility aspiration, 13.3% had already made preparations for the movement (approximately one out of five to a foreign country and the remaining majority to a location within the same country), which was approximately twice as many participants as those with a moderate aspiration (6.3%) and four times more than participants with a weak aspiration (3.7%).

4.1. Policy Implications

Previous studies examining the effects of COVID-19 on people's mobility aspirations focused mostly on highly vulnerable populations such as migrants [6,8] and women [7,11] in developing countries such as India [6] and Nigeria [8], observing increased mobility aspirations in association with COVID-19 in such populations. Our findings suggest a broader impact of COVID-19 on mobility aspirations, including on highly educated and healthy populations. Previous research suggests that highly vulnerable groups, such as daily wage workers, were often motivated to migrate during pandemics to escape the immediate danger of reduced income and potential hunger [6,9,11]. However, the same trend may not be evident in the general population. Compared to these vulnerable groups, individuals in the general population appeared to be primarily driven by the fear of contracting the virus and potentially by a sense of isolation due to social distancing measures.

The results of this study, taken in the context of the existing evidence, suggest that public health communication campaigns that effectively address anxieties related to COVID-19 and any other pandemic disease could help reduce mobility aspirations, thereby minimizing the risk of transmission during relocation. Such communication campaigns should address the mobility aspirations of a wider range of populations, including those not traditionally considered vulnerable to COVID-19 or other pandemic diseases. Emphasis should be placed on targeting people who perceive themselves as alienated in their place of residence and are more likely to aspire to relocate at the onset of a pandemic. Surely, any intervention aimed at reducing relocation should be coupled with support programs helping individuals and communities cope in situ with the economic and social impacts of a pandemic, which could in turn further reduce relocation aspirations and transmission

rates. Particular attention should be paid to highly vulnerable groups. As research suggests, they might lack the resources necessary to afford relocation as well as to maintain their livelihoods where they currently live, remaining trapped in potentially risky environments without the ability to adapt to the pandemic's challenges [6,16].

We find great heterogeneity in factors predicting stronger mobility aspirations across the national and sub-continental samples included in the analysis (i.e., Eastern and Western Africa and Southern Europe), suggesting that interventions aimed at reducing the likelihood of people moving elsewhere to live because of COVID-19 should be tailored to the specific target population. Nevertheless, the direction of effect of each predictor on mobility aspirations remained constant across all sub-samples where the predictor appears to play a statistically significant role in affecting aspirations, suggesting that the studied factors induce the same direction of change in mobility aspirations across countries.

4.2. Limitations

The sample we used for the inter-continental analysis is mainly composed of female and well-educated participants, which does not represent the entire population of reference, and thus we have refrained from extrapolating the results to the whole population. The same consideration holds for the national and sub-continental samples used for analyses at reduced geographical scales, which do not represent the respective populations. We also note that the data collected reflects the aspirations and behaviours of people at a time when COVID-19 vaccines were not or were only recently made available in their country of residence, as the first COVID-19 jab was injected on 2 December 2020, and 66% of all responses had been collected by then. We did not use measures to control for the role played by the availability of the vaccine in modulating the mobility response of participants to COVID-19. In the absence of accurate information on the participants' region or town of residence, we did not control for the varying government policies that restricted movement, as these policies exhibited significant variation across regions and urban centres within the same country over time. Also, we did not provide any measure of the representability of the mobility data we collected, as we found no report providing statistics on mobility aspirations and behaviours fit for comparison.

4.3. Conclusions

In conclusion, this study reveals that, as of February 2021, in a sample including participants from nine countries across four continents, social alienation, social imitation, and perceived efficacy of mobility increased people's aspirations to move elsewhere to live because of COVID-19. Overall, one in every five participants had a strong aspiration to move elsewhere to live because of the pandemic, and one in every 30 had already made preparations for the movement. Policy and planning for future pandemics should consider that population movements can rapidly occur at the start of a disease outbreak and may contribute to disease spread.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/covid4020018/s1. Complementary measures; Questionnaire; Table S1: Best explanatory fixed-effects logistic regression model results for Greece, India, Italy, Portugal and the United States of America, and fixed-effects results of the mixed-effects model for Eastern and Western Africa and Southern Europe (SE); Figure S1: Percentage of participants that made preparations for moving elsewhere to live because of COVID-19 stratified by country; Figure S2: Percentage of participants that would move abroad, to another region in the same country, or within the same region in the same country because of COVID-19, stratified by country.

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