Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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A vicious cycle of health (in)equity: Migrant inclusion in light of COVID-19

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ABSTRACT

Objectives: Whilst mass vaccination is suggested as an important means to contain COVID-19 pandemic, vaccination policies across many countries have systematically excluded some groups of population, especially migrants. This study aims to document the impact of diversified vaccination strategies as a preventative and control measure for the health and safety of the wider population within a country.

Methods: We selected five countries that have experienced the changes in migrant inflows to the most extreme among OECD countries in 2020: The United States, Australia, Canada, Japan, and South Korea. We conducted an extensive qualitative documentary analysis focused on policies and interventions implemented in these countries since January 2020 till the end of September 2021. We also analyzed publicly available epidemiological data (released by the governments and other international organizations).

Results: We find that achieving migrants' health and vaccination equity is not without challenges, and a failure to address those multiplicity of concerns may result in a vicious cycle for the vulnerable population at the fringes of our economy. Migrants continue to face extenuating circumstances with higher risks to their health and safety, when they are excluded or disadvantaged in vaccination policies. The more inclusive and proactive the governments are in consideration of diversity of migrant populations, the better they can manage the pandemic, which leads to overall societal benefit of ensuring public health.

Conclusions: Equity-based policies can mitigate disparities in access to vaccination and healthcare, thereby reducing the spread of COVID-19 in the community.

Introduction

While COVID-19 has affected everyone, the pandemic has exacerbated the vulnerability of migrants, broadly referring to the diversity of people born in other countries, including long-term and recent arrivals, refugees, asylum seekers, economic migrants, and undocumented migrants [1], often left out or inadequately included in policy responses. The COVID-19 vaccine, so far, the most efficient solution to end the pandemic [2] is distributed unevenly between developing and developed countries, and across individuals within each country. In particular, migrants are not getting the health support they need, making them one of the most vulnerable members of the community [3]. For instance, over the summer of 2020, 75% and 95% of new confirmed cases in Saudi Arabia and Singapore, respectively, were migrant workers [4,5]. As observed for other infectious disease outbreaks, COVID-19 transmission increased abuse and stigma towards migrants or specific nationalities [6,7], reinforcing marginalization mechanisms and barriers to healthcare access [8]. Combined with the more limited knowledge of healthcare, unequal access to treatment, and increased incidence of co-morbidities, poorer COVID-19 health-related outcomes are evidenced among migrants [9].

Even among migrants, everyone is facing different degrees of challenges, as their circumstances vary. In light of the COVID-19 pandemic, some migrants were less privileged than others, becoming more exposed to the virus and having limited accessibility to healthcare support and vaccines. For example, many refugees are confined to certain geographic (often regional) areas, where there is limited access to healthcare services. Some manual migrant workers live in packed dormitories, where the spread of the virus is relatively easy [10], or women migrant in general are found to be more likely to catch the virus [11]. Meanwhile, employer-sponsored migrants tend to have a wider coverage of their health insurance, and a greater level of support from the employers in ensuring their health and safety in a foreign country. Similarly, while migrant frontline health care workers may receive prioritized access to vaccines (and permanent residency) [12], access to the vaccine remains uncertain for many migrant farm- and meatpacking workers [13].

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Hesitancy to be vaccinated based on their illegal visa status, demographic, education and cultural beliefs, is also present as key prohibitors to vaccination among migrants [13], for example in the United Kingdom, Australia and South Korea [14–17].

Yet, ensuring equitable allocation of the COVID-19 vaccine and integrating the systematic disadvantage of migrants is critical, from a public health and human rights perspective [18]. There is thus an important role that needs to be played by the governmental organizations to ensure health equity among migrants and local population, especially in terms of vaccination policies as the future preventative and control measures. Despite such, some governments prioritized certain population, such as local workforce over temporary migrants, in the roll out of the COVID-19 vaccinations. These differing vaccination policies have led to diversified consequences. In many ways, the overwhelming evidence of particular vulnerability of migrants in the face of the pandemic is reviving the old debate of health equity, and analyzing how health policies perpetuate systematic differences in the health of migrants due to their unequal positions in society [19,20].

In this research, we investigate the implications of different degrees of inclusivity in governments' vaccination policies. To do this, we analyze how the pre-pandemic context, the mitigation and containment measures, vaccination policies together with the migration policies, have affected the COVID-19 epidemiological outcomes. We selected five countries that have experienced changes in migrant inflows to the most extreme among the OECD countries in 2020: The United States, Australia, Canada, Japan, and South Korea. In a contextualized approach, we analyze their responses to the pandemic, and we investigate how these responses have influenced the health inequities faced by migrants. Our focus is on 2020, at the peak of global contagions, and the three quarters of 2021 in order to cover both pre- and post-vaccination periods. We qualitatively analyze publicly available epidemiological data (released by the governments and other international organizations). We find in this paper that there exists a vicious cycle of health inequity; migrants continue to face extenuating circumstances with higher risks to their health and safety, when they are excluded or disadvantaged in vaccination policies.

This paper is organized as follows. In the next sections, we analyze the socio-economic and migration background of the selected countries before describing the associated health system profiles, overall migrant health, and migrant health inclusivity. We then evaluate the responses to the pandemic and the implications for migrants. We assess the impact of COVID-19 on migrants and examine the vicious circle in which migrants get entrapped. We conclude with a summary of the main findings and implications for policymakers.

Socioeconomic profile and migration of the selected countries

The COVID-19 pandemic has brought about strict regulations around international travel in many countries, and led to a historic migration trend in 2020 [100]. A recent report published by OECD estimates the impact of the COVID-19 pandemic on migration to be more than a 40% sharp drop in migration flows to the OECD countries. Among the diversity of the migrant population, across the globe, all categories of permanent migrants have decreased in 2020, with the largest decline of 35% in family reunions. As many countries closed their borders, humanitarian migration flows were also severely impacted as well as labor migration rates. Work and holiday makers also decreased on average by 59%, and similarly, intra-company transferees dropped by 53% in 2020. Among OECD countries, Australia (−37%), Canada (−43%), Japan (−65%), South Korea (−57%) and the United States (−37%) experienced the largest decline in temporary labor migration, leading to difficulties in sourcing talent in many critical industries, such as health care, aged care, food production and agriculture. Scholars and practitioners alike highlight that the presence and movements of migrants are significantly linked to the fundamental demographic, socio-cultural and economic contributors to the recovery of the local economy. To this end, the need for mass vaccination has been put forward, as a way to revitalize the movement of people across the globe.

In this paper, we examine the aforementioned five countries among the top 25 destination countries for migrants pre-COVID-19 period [21] (See Fig. 1 for migration trends) – those are United States, Australia, Canada, Japan, and South Korea, that have experienced the extremes changes in migrant inflows in 2020. This diverse sample aims to capture different realities across the countries, in terms of population size, density, demographic and socio-economic characteristics, health systems, (Anglo-Saxon and Confucian Asian) culture [22], and other development indicators. We now describe the five countries' profiles regarding epidemiologic and demographic characteristics, health system capacity, vaccination policies and migration policy development with a view to understanding how these variables have impacted the effectiveness of the responses to COVID-19.

The socio-economic and demographic characteristics of each country may define their capacity to respond to the pandemic and its strategies to implement systemic response to the pandemic. We, therefore, start by describing the socio-economic, demographic and health system characteristics of the selected countries (see Table 1). In terms of population, the United States has the largest population, followed by Japan. The larger the population, the more difficult it would be to implement quick changes to expand the health system capacity and to secure a larger amount of human and health-related resources, such as vaccines, hospital beds, and ventilators, requiring greater amount of investment. Yet, population is approximately 10 times denser in Japan and about 14 times in South Korea in comparison to the United States, allowing the ease of spread in these two countries. If compared with Australia and Canada, Japan and South Korea are likely to face more challenges in ensuring safety distance in public areas, such as public transportation, and in mitigating the spread of the virus, due to their higher population density. Furthermore, in terms of income inequalities, in each country, they are likely to be a population that may not be able to stay at home, unless a sufficient government income support is provided.

COVID-19 epidemiological outcomes are also related to the health status of the population. Table 1 further illustrates potential health risk factors for the selected countries, outlining life expectancy and portion of aging population, as well as prevalence of obesity, smoking habits and alcohol consumption. Japan for instance has the highest percentage of aged population, who are deemed especially vulnerable to the risks of COVID-19 [28,29]. Not to mention that Japan, along with the United States, has the highest death rate from cardiovascular diseases, for which researchers have found to increase the severity of risks associated with the virus [30,31]. Similar findings were made around smoking habits (more prevalent among Japanese and South Koreans) and alcohol consumption (higher in Australia and the United States) [32,33].

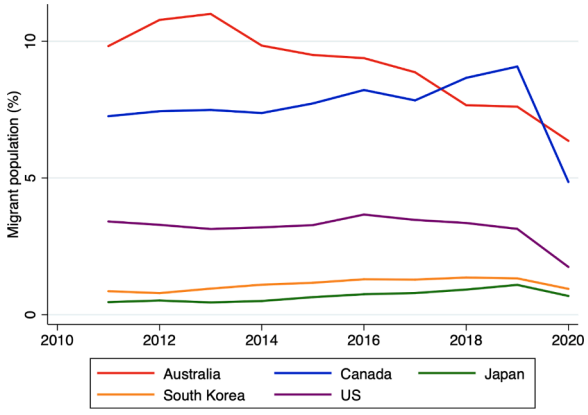

Fig. 1. Permanent Migrant Population (%) 2011–2020
Authors' elaboration.
Source: OECD [23].

Table 1
Socioeconomic characteristics for the five selected countries.

	United States	Australia	Canada	Japan	South Korea
Population (millions) [24]*	332.9	25.8	38.0	126.0	51.3
Population density (pop/km2) [25]	36	3	4	345	531
GDP per capita (current US$) [25]	63,543.6	51,812.2	43,258.2	39,538.9	31,489.1
2019–2020 GDP per capita growth (annual %) [25]	−3.8	−1.5	−6.3	−5.5	−1.1
Unemployment (% ILO estimates) [25]	8.3	6.6	9.5	3.0	4.1
2019–2020 unemployment growth [25]	1.26	0.28	0.67	0.24	0.09
Income share held by richest 10% (%) [25]	30.8	27.0	25.3	26.4	24.0
Human development index [80]	0.926	0.944	0.929	0.919	0.916
Population aging 65 or above (%) [26]	17	16	18	28	16
Life expectancy at birth [26]	77.3	83	81.7	84.7	83.3
Death rate from cardiovascular diseases per 100,000 [27]	≃291	≃210	≃226	≃291	≃145
Smoking prevalence (% daily population aged 15+) [26]	10.9	11.2	10.3	16.7	16.4
Alcohol consumption (liters per capita) [26]	8.9	9.5			
	8	7.1	8.3		

Source: (United Nations, 2021) [24];(World Bank, 2021) [25] ; UNDP(2020) [80]; OECD (2021) [26]; (IHME, 2021) [27].

Table 2 presents detailed composition of migrant population in the selected five countries (see Table 3 for categorization). Altogether, about 20% of the world's migrants live in the United States [34]. Australia, Canada and the United States have the high percentages of migrant population, represented by the foreign-born population: 30%, 21.3% and 13.7% respectively. All five countries have an increasing trend in foreign-born population in the last decade. For all countries, however, 2020 has been a historical year of a downturn in the inflows of both permanent and temporary migrants. All countries either closed their borders or implemented restrictions to entry into their countries in 2020, in an effort to contain the virus. This was accompanied by a large number of population that were reluctant to travel overseas across the globe, as evidenced by the decreasing trend observed in all of the OECD countries. All of these countries heavily rely on permanent and temporary migrant population to fill in the talent gaps, and many contribute to the economic development of these hosting countries. In Japan for instance, where 20% of the population is now older than 65, migrants critically contribute to facing the demographic challenges and labor shortage [7]. In the United States, the temporary immigrations restrictions and the decrease of incoming un-authorised migrants made it difficult for farmers to recruit and/or replace sick workers [35].

In terms of temporary migrant population, the United States and Australia had the largest inflows of newly enrolled international students in 2020 [23]; however, those were still significantly decreased in numbers in comparison to 2019. Interestingly, the United States had an increase of 4% international seasonal workers in 2020 compared to 2019, although working holidaymakers decreased by 95% [23]. Other countries in the sample also observed a similar trend in a decrease in working holidaymakers, but in significantly less degrees for international seasonal workers. This observation could be a result of individuals who are reluctant to move overseas for holidays, but there was a drive for work and employment opportunities. This is understandable given the economic consequences many would have experienced in their home countries. There were also a decrease in international trainees and intra-company transferees, which could be evidenced by the reluctance of companies to send their employees overseas to decrease the risk of exposure. There was also a decrease in asylum seeker applications across the countries as well, given the border closures and stricter travel restrictions imposed in these countries.

Health system profiles, migrant health, and inclusivity

Table 4 presents indicators of health system typology and availability of health support for both local and migrant population in the selected five countries. All countries provide access to a mandatory basic healthcare insurance scheme to their citizens and permanent residents, except for the United States, which government schemes entitle coverage of specific groups, such as individuals with 65 or above age, people with disabilities, low-income individuals, children and veterans. Therefore, private health insurance works as either complementary or supplementary measures on top of the universal health insurance schemes in these countries, except in the United States. The outlier has private health insurance as a standalone support for individuals excluded from public schemes and residual programs. While Japan has the highest share of government compulsory healthcare expenditure, among the selected countries, South Korea has the lowest share of compulsory spending on health system, and thus, its population incur highest out-of-pocket expenditure.

Migrants, mainly temporary and refugees, have limited or no right to access public schemes. For instance, in the United States, legal and undocumented migrants are generally excluded from public schemes such as Medicare, Medicaid and Affordable Care Act, and the insurance gap between migrants and citizens has been increasing since 2018 [37]. The estimate suggests that 28% of the non-citizens and 45% of the undocumented immigrants were uninsured in 2018 [37]. The COVID-19 pandemic also delimited access to (private) health insurance due to the economic crisis and associated job loss, as well as growing unemployment. Also, in Australia, Medicare covers only Australian citizens and permanent visa holders, while visitors are recommended, thus not required, to obtain private health insurance at their own costs [38]. In the absence of insurance, excluded services or cost sharing arrangements, patients are required to cover their healthcare costs out-of-pocket, which may increase their risk of financial hardship [38]. In Canada, refugees can seek private health insurance, which is subject to pre-existing conditions, and may limit their ability to apply for any private health insurance plan [39]. Additionally, the insurance benefits for refugees have limited financial coverage, leaving them likely to remain uninsured [39]. Conversely, in Japan, foreigners are eligible to enroll under the universal healthcare system [40]. However, asylum seekers and migrant workers with expired visas are denied access to care with strict controls, posing high barriers to access adequate care for these vulnerable groups [41]. Similarly, in South Korea, as access to universal services depends on different types of visa holders, migrants with irregular status or short-term visa are ineligible to equal rights to care [42]. Furthermore, while some countries, such as the United States [41] and Australia [43], provide medical interpretation services for foreigners with limited proficiency of the host country language, other countries such as Japan do not have such a requirement in place [41]. In addition to the systematic barriers, the general anti-migrant climate created during the pandemic, adding another layer of Sinophobia and

Table 2
Migrant demographics in the five selected countries.

	United States	Australia	Canada	Japan	South Korea	OECD
Percentage of migrant population [23]	13.7%	30%	21.3%	2.2%	3.8%	–
Foreign-born population [23]	44.9 million	7.7 million	7.9 million	2.7 million	1.2 million	136.1 million
Changes in foreign-born population [23]	+17% since 2010	+30% since 2010	+22% since 2008	+23% since 2010	+39% since 2010	–
Most common permanent migrants (2019–2020) [23]	Mexico; Cuba; China; India; Dominican Republic; Philippines; Vietnam; El Salvador; Haiti; Jamaica (2018)	India; People's Republic of China; United Kingdom; Philippines; Vietnam; Nepal; New Zealand; Pakistan; South Africa; United States	India, China, Philippines, Nigeria, Pakistan, Syria, Eritrea, South Korea, Iran, Brazil	Vietnam, China, Philippines, South Korea, Indonesia, US, Thailand, Brazil, Chinese Taipei, Nepal	China, Vietnam, Thailand, Uzbekistan, US, Russia, Kazakhstan, Cambodia, Indonesia, Philippines	
Most common source countries of humanitarian entrants [23]	Guatemala, Honduras, Venezuela.	Iraq; Democratic Republic of the Congo; Syria (2019–2020)	Mexico, India, Nigeria, Democratic People's Republic of Korea	–	Russia, Egypt, Kazakhstan	
Fiscal ratio of immigrants 2006–2018 average [23]	1.39	1.69	1.44	–	–	1.53
Relative expenditure per capita in health 2006–2018 average [23]	0.84	0.97				
	1.03	–	–	0.88		
Net fiscal contribution of foreign-born 2006–2018 average (% GDP) [23]	1.00	3.46	2.16	–	–	1.56
2019/2020 changes in inflows of permanent migrants [23]	−44%	−15%	−46%	−37%	−29%	−31%
2019/2020 changes in inflows of temporary labor migrants [23]	−37%	−37%	−43%	−66%	−57%	–
2020 Immigrant unemployment gap with native born [23]	1.0	0.7	1.7	–	3.4	3.4
2020 Employment rate gap with native born [23]	1.2	−2.7	−2.1	–	−2.0	−1.8
Total foreign-born employed (thousands) [23]	24,332	14	17	–	168 [27]	–
Foreign-born population in total employment [23]	18.2	30.3	–	–	–	–
Major industries hiring foreign-born population [23]	Services (24.6%), Health (13.2%), Wholesale and retail trade (12.8%), Mining, manufacturing and energy (12.6%), and Construction (11.1%)	Services (29.1%), Health (14.8%), Mining, manufacturing and energy (11.0), and Hotels and restaurants (9.0%)	–	–	Mining, manufacturing and energy (81.6%), Agriculture (12.9%), Construction (3%), and Retail, Restaurants and hotels (1.4%) [28]	–
Inflows of newly enrolled international students in 2020 (thousands) [23]	111.4	122.6	50.9	49.7	28.2	–
2019/2020 changes in the inflow of newly enrolled international students (%) [23]	−69	−29	−70	−59	−20	–
Inflows of international seasonal workers in 2020 (thousands) [23]	213.4	9.8	31.5	–	–	(427.3)
2019/2020 changes in the inflow of	+4	−19	−15	–	–	−9

(*continued on next page*)

Table 2 (*continued*)

	United States	Australia	Canada	Japan	South Korea	OECD
international seasonal workers (%) [23]						
Inflows of working holidaymakers in 2020 (thousands) [23]	5.0	149.2	13.6	3.3	0.9	(175.4)
2019/2020 changes in the inflow of working holidaymakers (%) [23]	−95	−29	−71	−82	−67	−58
Inflows of international trainees in 2020 (thousands) [23]	–	–	–	79.0	–	(84.1)
2019/2020 changes in the inflow of international trainees (%) [23]	–	–	–	−58	–	−58
Inflows of intra-company transferees in 2020 (thousands) [23]	35.9	1.8	6.1	3.2	–	(72.7)
2019/2020 changes in the inflow of intra-company transferees (%) [23]	−53	−35	−59	−68	–	−53
Asylum seeker and refugee population per million in 2020 [23]	758	754	505	31	130	623
2019/2020 changes in asylum seeker applications (%) [23]	−17	−30	−67	−62	−57	−34

Source: (OECD, 2021) [23].

Table 3
Categorization of migrants.

	Voluntary Economic activities	Education	Family reunion	Involuntary Safety
Temporary	Skilled migrants; Missionaries and religious workers; Social workers for non-governmental organizations and international organizations; Working holiday makers; Employer-initiated expatriates.	International Students	Family migrants (e.g. parents, partners, children)	Asylum seekers
Permanent	Skilled migrants; Employer-sponsored migrants; State- or government-sponsored migrants		Family migrants (e.g. parents, partners, children)	Refugees

Source: (Lee et al., 2021) [36].

xenophobia, also hinders adequate access to diagnosis and treatment, and thus, contributes to the deterioration of migrants' health over time [44].

It is also important to understand the health profiles of the migrant groups. Extensive evidence has demonstrated that voluntary migrants were relatively healthier in Western destination countries [49]. This phenomenon – the healthy migrant hypothesis, found in the United States [50], Canada [51], Australia [52], and many other Western countries – is speculated to be due to selection bias; those who managed to migrate to these countries are younger with higher health and educational resources, leading to similar trends for mental health issues [53]. It is also known that this health advantage decreases over time as migrants adjust to Westernized lifestyles – also called the acculturation hypothesis [49], but can also be attributed to the multiple barriers to health and adequate care [54]. While research on migrant's health and healthcare access in Asian countries is less abundant [44], the countries examined here provide very limited access to the most vulnerable migrants (e.g., those without current official visas). In Japan, moreover, immigration policy places migrant control over migrant rights, in turn discouraging access to health care [55]. Similarly, the Trump administration in the United States and its Zero Tolerance Policy has been known for being particularly aggressive towards migrants [56], placing, altogether, migrants' health far from national priorities.

Response to the pandemic and implications for migrants

Following predecessors [57], we divide the governmental responses to the pandemic into three categories and added one more on vaccination: mitigation and containment, health-related, economic and vaccination-roll out strategies (see Table 5).

First, many countries shared similar approaches to mitigate and contain the virus by, for example, declaring the state of emergency, closing schools and prohibiting mass gatherings [59]. Of the five selected countries, South Korea was the only country that did not enforce lockdowns or border closure, despite enhancing restrictions to entering into the country by amending regulations around visa applications. Furthermore, Canada and the United States imposed curfew limiting movement of people at night. Japan, South Korea and the United States also restricted business hours in retail stores, restaurants,

Table 4
The health care systems for the five selected countries.

	United States	Australia	Canada	Japan	South Korea
Health system typology# [45]	Mixed: National Public Schemes; Employer Sponsored Private Insurance; Individual Private Insurance	National Health Insurance	National Public Health Insurance	Statutory Health Insurance	National Health Insurance
Type of coverage and eligible population [45]	Adults aged 65+, certain residents with disability, low-income adults and children, veterans	Universal for Australian Citizens	Universal for Citizens and permanent resident	Universal for Citizens and resident	Universal for Citizens
Private health insurance [45]	Standalone	Complementary & Supplementary	Complementary coverage	Supplementary	Supplementary
Healthcare expenditure (% GDP) [26]	16.8	9.4	10.8	11	8.4
Health expenditure per capita [26]	10,623.85	5425.34	4994.90	4266.59	2542.82
Government or compulsory expenditure / total health expenditure (%) [26]	82.7	68.7	70.2	83.9	62.2
Out-of-pocket health expenditure (OOP) / THE (%) [26]	11.3	17.8	14.9	13	29.2
Number of medical doctors per 1000 inhabitants [46]	2.64	3.83	2.8	2.49	2.46
Number of nurses per 1000 inhabitants [46]	11.79	12.22	9.98	11.76	7.94
Foreign trained doctors stock [26]	21 5630	31 579	25 531		
Share of foreign trained doctors [26]	25.0	32.1	24.6	–	–
Foreign trained doctors annual inflow [26]	7 483	–	–	–	–
Foreign trained nurses stock [26]	198 058	56 220	33 370		
	–	–			
Share of foreign trained nurses [26]	6.7	18.4	8.1	–	–
Foreign trained nurses annual inflow [26]	6 470	–	3 096	–	–
Availability of medical interpreters [100,43,101, 102]	Free only for patients with federal public scheme	Available and free of charge	Free of charge only for eligible patients or if service provided by volunteers' organization	–	Available
	924 107	92 826	94 784	1 620 040	643 440
Hospital beds per 1000 [26]	2.8	3.8	2.5	13.3	12.3
Acute care – Hospital beds per 1000 inhabitants [48]	2.46	–	1.97	7.74	7.08
ICU beds per 100,000 [103–106]	29.4+	9.3++	13.5+++	–	10.6 ++++
Ventilators per 100,000 [47]	48	–	14	–	19

Source: (Tikkanen et al. 2020) [45]; OECD (2021) [26]; (OECD, 2021) [46]; (Juckett & Unger, 2014) [100]; (Department of Home Affairs, 2021) [43]; center de Ressources Multiculturelles en Santè Mentale. (2021) [101]; (Han-joo, 2016) [102]; (OECD, 2021) [48]; (Halpern & Tan, 2020) [103]; (Litton et al., 2020) [104]; (Adhikari, et al. 2010) [105]; (Phua et al., 2020) [106]; (OECD, 2019) [47].

bars and cafes.

Research shows that migrants are more exposed to the risks of COVID-19 because of their living conditions, such as overcrowded housing, insecure accommodation, asylum centers or refugee camps, as well as higher dependence on public transportations [60], making, for instance, physical distancing an issue [61]. For example, with a dramatic spike in case numbers in Singapore in 2020, thousands of the cases were linked to the clusters of migrant workers living in dormitories. Similar concentrated outbreaks among migrant communities were present in Thailand, Malaysia and the Maldives [62]. Furthermore, a survey result published by WHO revealed that around 20% of their 30,000 respondents with refugee and migrant backgrounds had difficulties avoiding to take public transportation or to stay at home for work [63], as an important share of migrants are also key workers in occupations that are less likely to be amenable to work from home [64].

School closures require both availability of technology, internet broadband and language proficiency for children and adolescents to undertake distance learning which may have caused exclusion for migrant families with lower education and socio-economic background, or those recently arrived in the host country [65,66]. Additionally, younger children need parental support to fill the gaps of virtual learning, which can be limited by parents' scarcer knowledge of the host country language. Remote learning may shift the burden of education on those members of the households who deal with duties of care, usually women, as well as challenge the newcomers' integration into local communities or multiply the layers of discriminations and inequalities [67].

Second, in terms of health-related response that complement the mitigation and containment strategy, all countries in the sample declared health emergency and utilized health alert systems, allocated extra-governmental funds to support the health sector, and adopted extensive tracing to track the spread of the virus. South Korea was the first to adopt a massive testing approach, which was deemed appropriate and effective to trace the spread, and then a similar approach was implemented in other countries.

Despite these efforts, the response of governments has not impacted the community homogeneously, rising equity concerns. The COVID-19 pandemic has revealed migration status as one of the key

Table 5
Summary of measures taken in each country by type.

Type	Measure	United States	Australia	Canada	Japan	South Korea
Mitigation and containment	State of emergency declared	Y	Y	Y	Y	Y
	Borders closing	Y	Y	Y	Y	
	Lockdown	Y	Y	Y	Y	
	National curfew (night)	Y		Y		
	Home schooling	Y	Y	Y	Y	Y
	Restriction of business hours	Y			Y	Y
	Prohibition of mass gatherings	Y	Y	Y	Y	Y
Health	Health alert/emergency	Y	Y	Y	Y	Y
	Additional health funds (on top of health sector budget)	Y	Y	Y	Y	Y
	Massive testing	Y	Y	Y	Y	Y
	Extensive tracing/ tracking	Y	Y	Y	Y	Y
Economic	National interest rate reduction	Y	Y	Y	Y	Y
	Support for small businesses	Y	Y	Y	Y	Y
	Support for particular sector			Y – tourism, infrastructure, aerospace, transportation, producers, energy, fisheries, sports, agribusinesses and food processors		Y – digital and green industries
	(Un)Employment support	Y	Y	Y		Y
	Support for low income households	Y	Y	Y	Y	Y
	Children's daycare support or general support for families with young children		Y	Y		Y
	Tax relief			Y		
vaccination	prioritization of elderly population	Y	Y	Y	Y	Y
	prioritization of critical sector workers	Y	Y	Y	Y	Y
	Vaccination campaigns in multiple languages	Y	Y	Y	Y	Y
	Vaccination campaigns targeting different social/ ethnic groups	Y	Y	Y	Y	Y
	Equitable access to vaccination	Y	N – temporary migrants are not eligible to be vaccinated by private healthcare providers, and can only access vaccines via some pharmacies and public vaccination sites	Y	Y	N - temporary migrants staying for less than 90 days are excluded; illegal migrants need to register
	Free vaccination	Y	Y	Y	Y	Y
	Fees to COVID testing				Y	Y - unless identified as close contacts

Source: International Monetary Fund [58].

determinants of health [68]. Limited health insurance eligibility and fear of negative consequence on immigration status are system factors that contribute to worse COVID-19 outcomes for migrant populations, leading to heath disparities. In Ontario, Canada, free COVID-19 testing and treatment to uninsured patients is covered under federal funding initiatives [68,69]. However, these were not in place throughout all the states in the country, and required submission of applications, introducing additional bureaucratic and linguistic challenges to migrants. Moreover, as already mentioned, migrants may have not sought medical attention due to concerns of consequences on their immigration status. In the United States and Australia, legislation has not impeded medical facilities to share information with immigration authorities, deterring undocumented migrants from seeking medical attention due to concerns of repatriation [68,70]. Furthermore, while preventative and promotion strategies for healthcare increasingly relied on the use of digital health technologies such as telemedicine, mobile phone applications and online websites during the height of the pandemic, migrant communities are more susceptible to digital exclusion due to a lack of stable internet access, greater digital divide and scarce e-health literacy [71]. This, in turn, prevents seeking online COVID-19 updates and healthcare access, when digital tools were the only way to access healthcare services and the main source of real time information related to the pandemic. In Australia, telehealth consultation was subsidized by the Federal Government exclusively under Medicare and, therefore, not provided to people with a temporary visa [72].

A third area of response corresponds to the economic support. Many migrants lost jobs in hospitality, tourism, agriculture and food-processing, contributing to a larger gap in (un)employment rates in comparison to the local population [73]. Evidence from Canada also show that skilled migrant women also experienced unemployment, lower-skilled or less stable employment [74]. Traditionally, migrant populations in these countries have filled positions in services, manufacturing, construction, retail trade, hospitality and healthcare, all of which were highly impacted by the (economic) consequences of the COVID-19 pandemic. Furthermore, these jobs typically cannot be performed remotely, thus the employment position in these sectors might

increase COVID-19 related risk factors and adverse outcomes among migrant populations.

All five countries provided a variety of supports targeting different groups, such as small and medium businesses, businesses in particular sectors, unemployed individuals, low-income households, and families with children. The countries provided a different set of the above-mentioned support schemes, with various financial supports, including reduction of interest rates for business and personal loans [58]. Children's daycare support was the most unique, and was only supplied in Australia and in South Korea. Some of these supports were provided to citizens and permanent residents of the countries only, where temporary migrants were systematically excluded. For instance, contrary to the United States, Canada or Japan, temporary migrants in Australia have been excluded from the JobKeeper and JobSeeker support packages although they were not necessarily able to leave the country (e.g., no flight available, flights were unaffordable, borders were closed) [70]. Japan and Canada had the most extensive support available with a unique approach to provide tax relief. In Japan, all residents irrespective of their legal status received Government subsidy of 100,000 yen [7]. As individuals should have earned a minimum of CAD$5000 in the previous year to qualify for the Canada Emergency Response Benefit (CERB), this income requirement may exclude those migrants that experience the highest unemployment rate [69]. In the United States, some migrants were excluded from the Coronavirus Aid, Relief, and Economic Security (CARES) Act that required a Social Security Number as eligibility criteria [68].

Lastly and most importantly, vaccination schemes were implemented early 2021 (and late 2020 in the case of Canada and the United States), as a preventative and control measure to mitigate and contain the spread of the virus. In an effort to vaccinate their population, all five countries prioritized elderly and those working in critical sectors in the beginning of their vaccination roll outs. In relation to migrants more specifically, all countries used multiple languages in their vaccination campaigns and targeted a wide range of social and ethnic groups residing in their countries. Yet, the lack of details in these translated campaigns and inadequacy of the diversity of languages covered, was consistently criticized as major hurdles in vaccinating migrant, and associated vaccine hesitancy. For instance, in Canada and the United States, delays in translating official guidelines influenced the poor dissemination among migrant communities [13].

In Australia and South Korea, there was systemic discrimination posing inequitable access to vaccination. For example, in Australia, temporary migrants could not be vaccinated in private general practices, and only had options to go through public sites, where the wait time was the longest [75]. In South Korea, temporary migrants staying less than 90 days were not eligible to be vaccinated for free, which was problematic as South Korea never closed its international borders. There was a constant flow of temporary migrants, who may not necessarily be vaccinated; later in 2021, South Korea implemented an extra restriction in only granting visa to those vaccinated. Furthermore, illegal migrants also needed to register in many countries, including South Korea and Australia, which caused hesitancy among them to get vaccinated. There were, therefore, clear calls for a better approach to vaccinate undocumented migrants. Although all countries gave vaccination for free, Japan and South Korea charged fees for COVID-19 testing in some cases. For instance, in South Korea, some employers and school dormitories required COVID-19 testing results, but they were not free unless the person had been identified as a close contact [76].

In turn, migrants are less likely to have access to vaccination for several reasons. First, except the frontline workers, migrants are rarely 'prioritized groups' in the host countries, despite being at higher risk of contracting the virus [77]. Second, migrants face institutional barriers in understanding the public health systems of the host countries, as well as linguistic challenges to interpret vaccination policies and consult doctors. Migrants also encounter unique sets of challenges linked with their income, race and status, due to the lack of entitlement to public health care, exclusion from welfare programs, and fear of stigmatization and/or arrest and deportation in the local host society. For example, many undocumented migrants are hesitant to be vaccinated as they feared punitive action and deportation [78]. Third, an example of a systemic exclusion of migrants can be found in Australia, where migrants only have an option of public vaccination sites, which has longer wait times, as they are systematically excluded from accessing vaccination through private healthcare providers. At last, to make things more complicated, migrants show higher hesitancy to vaccination based on their cultural beliefs, religion, and lack of understanding and information about vaccination. While people with low-income status and those living in disadvantaged areas have already shown grater resistance to receive the vaccine, for instance, in the United Kingdom [14] and Australia [15], perceived exclusion in the context of the pandemic reinforced vaccine hesitancy among migrant populations, especially among undocumented migrants, asylum seekers and refugees [13,16]. Therefore, there is an ever more important role that governmental organizations need to play in order to reduce barriers related to the migrants' (negative) socio-cultural perception towards vaccination by implementing more active and tailored vaccination campaigns along with equity-based vaccination policies.

All five countries have been observed to have an increasing trend in vaccination accumulation (see Fig. 2 and Table 6). The United States and Canada were the first to start vaccination in late 2020, and yet, only the former had a sharp increase in early 2021. Canada's vaccination rates only started to increase sharply in mid-2021, when the other countries also saw a surge, due to initial limited supply and delivery delays of Pfitzer and Moderna vaccines. Japan tried to increase the number of vaccinated population, as they were expecting an inflow of temporary migrants partaking in the 2021 Olympic Games. Although South Korea was the last one among the selected countries to start vaccination and had a relatively unstable growth in vaccination rates, the country reached the highest vaccination rate, close to 80% by November 2021, illustrated by the sharp increase in the slope of the graph in Fig. 2. When compared to stringency index, which illustrates the restrictions within the countries, South Korea was the fastest to ease the stringency among all five countries, followed by the United States and Australia (See Fig. 3). Australia recently had a sharp ease of the restrictions, given the high vaccination rate targets reached recently. Japan has been relatively steady with its stringency index, compared to Australia and Canada, throughout the pandemic. Canada has also started to ease the restrictions slowly as more of the population gets vaccinated. All five countries have also recently started advocating for booster shots to ensure the effectiveness of the vaccines continue and thus, be able to better manage the pandemic. All countries are currently advocating particular socio-demographic groups for the booster shots, mostly

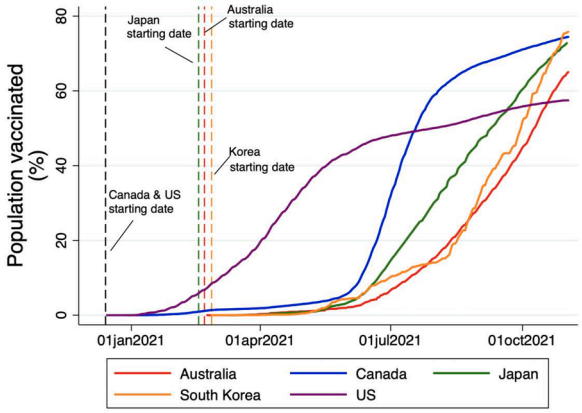

Fig. 2. Vaccination accumulation graphs
Authors' elaboration.
Source: Koh [82].

Table 6
Summary of COVID vaccination statistics taken in each country.

Measure	United States	Australia	Canada	Japan	South Korea
Vaccination financing source (s) [79]	Fully funded by the government	Fully funded by the government	Fully funded by the government	Fully funded by the government	Fully funded by the government
Number of vaccination available [81]	3	3	5	4	5
Vaccinations available [81]	Janssen - Ad26.COV 2-S,Moderna - Spikevax, Pfizer BioNTech - Comirnaty	AstraZeneca - Vaxzevria,Novavax - Covavax,Pfizer BioNTech - Comirnaty	AstraZeneca - Vaxzevria, Janssen - Ad26.COV 2-S,Moderna - Spikevax,Pfizer BioNTech - Comirnaty,SII - Covishield	AstraZeneca - Vaxzevria, Moderna - Spikevax, Novavax - Covavax,Pfizer BioNTech - Comirnaty	AstraZeneca - Vaxzevria,Janssen - Ad26.COV 2-S,Moderna - Spikevax,Novavax - Covavax, Pfizer BioNTech - Comirnaty
Vaccination start date [81]	13 Dec 2020	21 Feb 2021	14 Dec 2020	17 Feb 2021	26 Feb 2021
Total vaccinations* [81]	434,528,145	34,238,479	58,511,813	183,344,047	75,262,801
Person vaccinated with 1st dose per 100 * [81]	73.38	73.15	78.95	76.23	79.51
Person fully vaccinated per 100 * [81]	62.65	60.72	74.68	68.74	70.17
Booster administered per 100** [79]	20.67	8.32	17.15	0.42	32.40

*as at 23rd October **as at 28 December.
Source retrived from: UNDP [79], Ritchie [81].

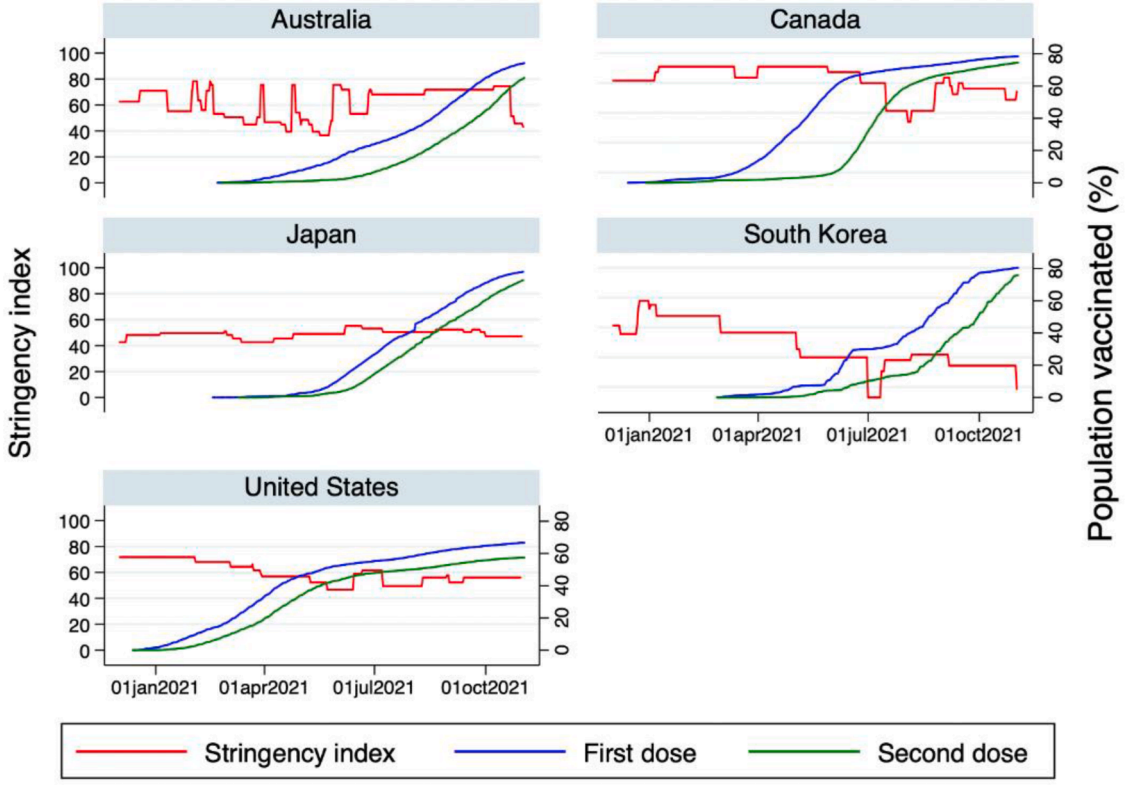

Fig. 3. Stringency index and vaccination roll-out
Authors' elaboration.
Source: Koh [82].

elders.

The impact of COVID-19 and migrants: a vicious circle

Among the five countries, the United States had the highest case fatality and positivity rate in the beginning of the pandemic, which may be the result of the higher population density compared to Australia and Canada (see Table 1), and the case numbers stabilized throughout the pandemic. As the vaccination rates of the United States' population gets closer to 20%, as of April 2021 their positivity rate stabilized, although it had a surge again in late 2021 (see Fig. 4). Japan had unstable ups and downs in their positivity rate since the beginning of the pandemic, and

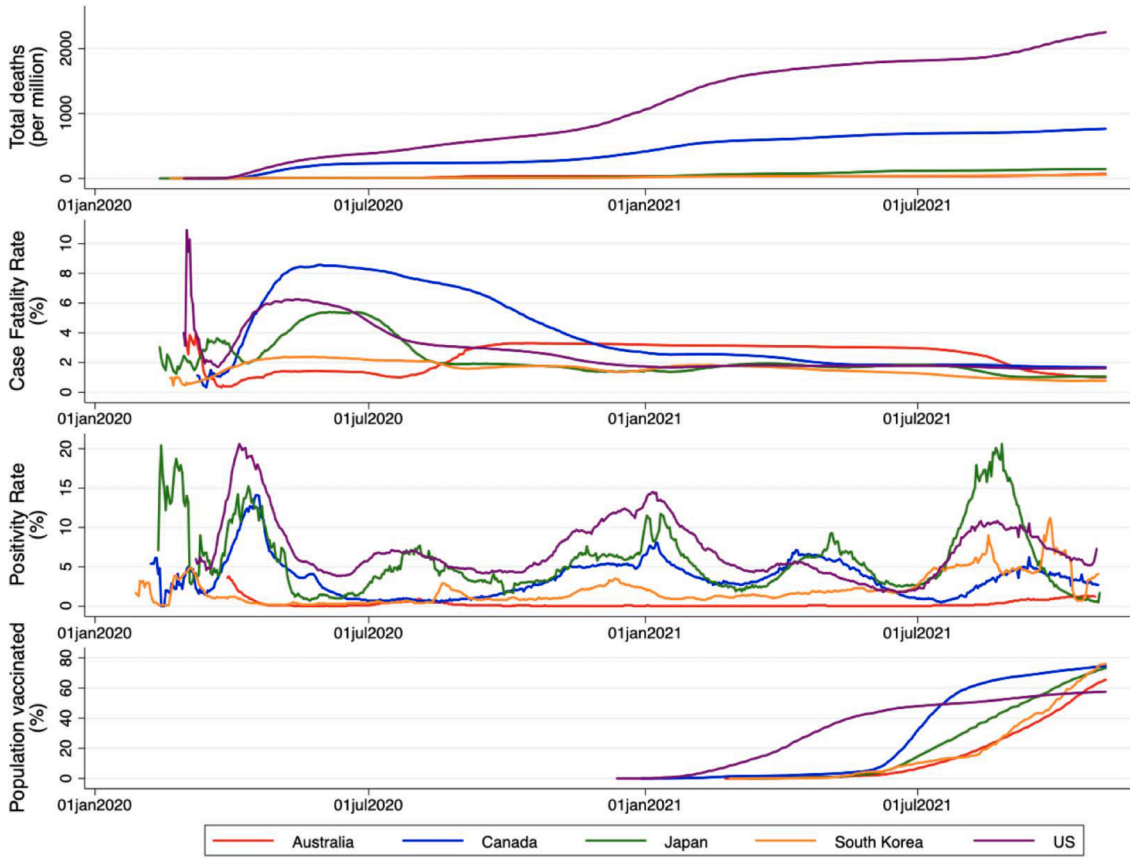

Fig. 4. Epidemiological evolution of COVID-19 & Vaccination rate
Authors' elaboration.
Source: Koh [82].

the sharpest increase in positivity rate since mid-2021, which could be a surge caused by opening up the border to allow temporary migrants in for the Olympic Games. Japan has observed a sharp decrease in positive cases when the Olympic Games were over, and their vaccinated population passed 40% as of September 2021 (see Fig. 4). It is also worth noting that although South Korea never imposed any lockdowns and actually started to ease restrictions, they saw an increase in positivity rates. However, their case fatality rates remained low as they hit 40% of vaccinated population in September 2021 and have a diversity in vaccinations, increasing availability of the vaccines. Australia has long closed their borders, observed low rates of positivity, and yet, the case fatality rates remained about 3%, higher than other countries that had started vaccination early. The case fatality rate only started to decrease to the level of other countries, such as the United States and Canada, when they started to pass over the 30% mark for vaccinated population around September 2021 (see Fig. 4).

Migrants are considered a particularly vulnerable population, in light of the COVID-19 pandemic [83]. For example, research suggests that almost 70% of people who contracted the virus in April 2020 in Singapore, were migrants living in the dormitories [84]. New York City had the most confirmed cases in the United States in 2020, while hosting above 24% (city-wide average) of foreign-born residents, with the top two areas with the most confirmed cases in New York City hosting over 60% of foreign-born residents [84]. Therefore, the COVID-19 pandemic is considered to have widened the existing health inequalities, affecting disproportionally the health of vulnerable socio-economic groups within a country, including migrants [63]. These barriers described above have increased the risk of community transmission and have resulted in ethnic minorities being systematically and disproportionally affected by COVID-19. As an illustration, in Ontario, Canada, 43% of COVID-19 cases were reported among racial minorities, despite the fact that they only represent 25% of the state's population [1]. In the United States, American Indians, Alaska Natives, and those from Asian, Black, Hispanic or Latino backgrounds were impacted by COVID-19 infections, hospitalizations and deaths more than their white counterparts [86]. For instance, 40% of COVID-19 hospitalizations were registered among African Americans, even though they make up only 13.4% of the population in the country [85]. In Australia, foreign-born age-standardized death rate doubled that of those locally born [86].

Therefore, as a general finding, migrants have limited access to appropriate care and show more severe symptoms accompanied by psychosocial and mental health issues [87,88]. About 50% of the WHO's research respondents, who were of migrant and refugee backgrounds, indicated that they felt greater levels of depression, anxiety and loneliness, than before the pandemic [60]. The increase in worries and anxieties were primarily about their future and financial security, as well as concerns about their family and friends overseas [60]. In Japan, where 30% of migrants experience discrimination and where evidence already shows worse migrant health outcomes [44], COVID-19 is exacerbating the processes of social marginalization [7]. Some relate the history of racism and colonial violence in Canada to the broader structural racism at play in the macro and micro social forces encountered by migrants [1]. Although race and migrant COVID-19 data is limited [89], the first evidence seems to confirm similar mechanisms in countries with similar profiles (young and high-income migration country), such as the United States or Australia, resulting from long standing structural inequities [90]. Research on migrants in South Korea stressed the impact of COVID-19 on the mental health of migrants [91] and the increased risk of psychological distress due to financial instability and job loss [92].

All in all, our analysis demonstrates the vicious circle mechanism

through which migrants become entrapped. Although we have focused on developed countries in this research, inequitable access to vaccines in the world cannot be ignored. Even in our sample, countries, such as Australia and South Korea, struggled to access vaccines in its early stages, and we know such difficulty would have been worse in developing countries. In those developing countries, accessing vaccines even for their vulnerable population, such as elderly, frontline workers and other locals, continue to form a challenge, and thus, worsening the vicious cycle for migrants and refugee populations in these countries. We argue that not being able to resolve such inequity to vaccination and healthcare across the countries, as well as within countries, may contribute to a worse migration and/or refugee crisis. While the healthy migrant hypothesis is largely evidenced, healthy migrants capable of working will see their health deteriorating through the migration process itself. The restrictive immigration policies, although shown as increasing costs overall [93,94], reinforced with migrants' language, cultural, legal, educational, economic and religious barriers, all placed in a growing anti-immigration environment, contribute to compromised migrants' health [95]. COVID-19 is only the illustration of the health inequity faced by migrants and the multiple intersections between vulnerability and health in which is it rooted [96]. Discrimination, language constraints, and the difficulty to transfer experience and education often lead to migrant deskilling or unemployment. The lack of fair job opportunities, in turn, leads to jobs that require further and longer commuting using public transportations, that are more often in contact with people (e.g., frontline workers) and therefore with the virus. The lower economic background and the immigration policies leads to migrants clustering in smaller, more crowded, and less favorable environments (e.g., dormitories, co-renting), being ideal for a virus to spread. Yet, the media exposure and general fear of the virus create additional stigma associated with migration, and increases migrants' distrust in institutions and health campaigns, marginalizing migrants even further, putting the health of migrants and of the whole population at risk [97].

Conclusion and policy implications

In this research, we echo other scholars who suggest that the COVID-19 pandemic has highlighted the importance of health equity issues. Health inequity is not new to the COVID-19 pandemic, but has been re-highlighted through inequitable access to vaccination across developing and developed countries, and across different socio-economic groups within countries. The pandemic has led to the emergence of a new equity-based institutional discourse ("leave no one behind", "no one without the other", "migrant health is public health", "solidarity") in health and vaccination policymaking [98]. Yet, we suggest that a layer of historical and cultural experience with experimental medical research for some communities, such as those of migrants and refugees, results in a complex set of lenses through which a pandemic and vaccination policies may be viewed. Building, implementing and adapting effective community engagement for bidirectional communication and dialog are essential to the success of a COVID-19 vaccination program. In particular, we find that achieving migrants' health and vaccination equity is not without challenges, and a failure to address the multiplicity of concerns may result in a vicious cycle for the vulnerable population at the fringes of our economy. Overall, the pandemic has affected disproportionally the health of those low socio-economic communities, people with co-morbidities, individuals with pre-existing health conditions, and socially vulnerable groups, as they have higher risk of getting COVID-19.

We find that this health and vaccination inequity cannot be ignored, as it will result in a threat to the health and safety of the local population in migrant hosting countries. We argue in this sense, that there is a need for more inclusive and proactive vaccination policies, ensuring equity among all of the population regardless of their socio-economic, ethnic and visa status, to achieve a wider societal benefit of ensuring health and safety in the hosting communities. A discourse around inclusion of minorities is crucial in policymaking to achieve health and vaccination equity. These could be achieved by focusing on an inclusion strategy, such as vaccination campaigns targeting migrants and refugees, for minority groups. In doing so, culturally sensitive knowledge, information and communication methods in vaccination campaigns, policies and programs are highly recommended. Migration, indeed, intertwines complex layers of cultural experiences that need to be considered when building and implementing vaccination policies and governmental responses to the pandemic [99]. Another inclusion strategy could be enhancement of the health system to provide better support for the migrant population through, for example, training health professionals, such as doctors and nurses, to understand cross-cultural issues that could arise in consulting patients with migrant backgrounds, and supporting healthcare providers to recruit medical interpreters.

In an ever more connected and globalized world, health policies and vaccination programs that have traditionally been detached from multicultural and multi-ethnic issues, need to be considered outside of the box. With this paper, we initiate the conversation to link health policies to cultural studies, ethnic and migration studies, as well as international studies and international management to ensure equitable provision of healthcare supports. We urge for future research that addresses the concerns raised in the vicious cycle marginalizing migrant populations across the countries. In this sense, we call for collection and analysis of first-hand data using surveys and interviews to build on our findings, as our paper uses publicly available epidemiological data for analysis. Furthermore, the correlation between booster shot vaccination rates and migration trends in each country would be worth an investigation in the future. Overall, we reiterate the importance of reflecting on the contemporary migration trend and the composition of the local communities, that are becoming ever more diverse, in health policies and conclude that "*the Covid-19 pandemic is a powerful illustration that societies can only be as healthy as their weakest members*" [96].

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Ethical approval

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Patient consent

Not required.

Declaration of Competing Interest

None declared.

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