BMC Public Health

RESEARCH

Open Access

Changes in long-term employment and income following COVID-19 (SARS-CoV-2) infection among Jewish and Arab populations in Israel

Haneen Shibli[1*], Paul Kuodi[1], Amiel Dror[1,2], Hiba Zayyad[1,3], Ofir Wertheim[3], Kamal Abu Jabal[1,2], Saleh Nazzal[3], Daniel Glikman[1,3] and Michael Edelstein[1,4]

Abstract

Background The impact of Coronavirus disease-2019 (COVID-19) extends beyond health, potentially affecting long-term income and employment dynamics. In Israel, disparities exist between Jewish and Arab populations across many dimensions, including socioeconomic. The study's primary aim was to compare changes in employment and income among COVID-19-infected and non-infected participants among Jews and Arabs, the two main population groups comprising the population of Israel.

Methods We conducted a cross-sectional study between March 2021 and June 2022 among adults employed prior to the pandemic, whose SARS-CoV-2 polymerase chain reaction test was processed in three hospitals in Israel's Northern District. Using a validated online survey, we collected information about socio-demographics, SARS-CoV-2 infection, vaccination, employment (full-time, part-time, unemployed, retired), and income status by income bracket. Multivariate binary logistic regression models were used to estimate the associations between SARS-CoV-2 infection and (1) changes in employment status and (2) income decreases among Jewish and Arab participants.

Results Of the 7741 respondents, 1468 met our inclusion criteria (fully answered employment questions, employed pre-pandemic). Of these, 19% were Arabs, and 36% ($n=523$) reported SARS-CoV-2 infection. High-income earners were less likely to experience employment and income changes than low-income earners (OR = 0.4 for both, $p<0.01$). After adjusting for age, gender, vaccination, income level, and other socio-economic factors, Arab participants who reported SARS-CoV-2 infection were more likely to report employment change and income loss (OR = 7.0 and 4.2 respectively, $p<0.01$). No association between infection and changes in employment or income was found among Jewish participants.

Conclusions After adjusting for potential socio-economic confounders, SARS-CoV-2 Infection was a significant determinant of employment changes and income loss among Arabs, but not Jews, in Israel. This finding suggests the pandemic has exacerbated pre-existing inequalities and highlights the need for economic recovery policies specifically targeting vulnerable groups.

Keywords COVID-19, Employment, Income, Socio-economic, Israel, Infectious disease, Inequalities

*Correspondence:
Haneen Shibli
haneen.shib@hotmail.com
Full list of author information is available at the end of the article

Background

The Coronavirus disease-2019 (COVID-19) pandemic was formally declared a global pandemic by the World Health Organization (WHO) on March 11, 2020 [1], and has had a significant acute and long-term impact on individual and population health and wellbeing [2, 3]. Governments globally took several measures to mitigate the spread of the virus, including imposing lockdowns and movement restrictions, mandating masks and adherence to social distancing, rolling out mass vaccination campaigns, and promoting remote work and online education [4]. Despite these measures, the morbidity and mortality attributable to the pandemic are unprecedented [5], and their consequences extend beyond immediate health implications, impacting economic structures and employment markets [6, 7]. In the United States (US), millions of people filed new unemployment claims in early 2020 due to the COVID-19 pandemic [7]. The short-term economic disruption included immediate job losses, particularly in sectors like hospitality, retail, and tourism, directly affected by lockdowns and travel restrictions. As the pandemic progressed, some of these short-term disruptions began to resolve, especially with the reopening of borders and the gradual revival of the tourism industry [8]. The availability of vaccines also played a pivotal role in this recovery, enabling safer travel and a return to social interactions. However, as the acute phase of the pandemic subsided, it became apparent that it would cause a long-term economic impact [9].

One significant long-term effect is the disruption of global supply chains such as the pharmaceuticals, food, electronics, and automotive industries, which occurred globally throughout 2020 as the COVID-19 pandemic started. The impacts were observed globally, with significant effects in Asia (Specifically China), Europe, and North America [10, 11]. This disruption was characterized by delays throughout all stages with major turbulences in manufacturing, processing, transport, and logistics, as well as significant shifts in demand due to lockdowns and workforce shortages in manufacturing centers worldwide [11]. Furthermore, the COVID-19 pandemic exacerbated pre-existing socioeconomic inequalities [12], With lower-wage and less-educated workers more affected by job losses and income instability [13]. For example, a study conducted in Germany highlighted that low-wage workers were more affected by furloughs and job loss [14]. Similarly, in the US, the pandemic exacerbated inequalities, leading to significant variations in vulnerability to economic shocks related to the pandemic, especially among those in lower-income brackets and lower-paying occupations and industries, leading to heightened financial instability and job insecurity [15, 16].

Importantly, beyond these societal-level disruptions, individual-level SARS-CoV-2 infections have directly impacted employment and income prospects, creating a strong link between health and economic stability. In addition to the broad societal disruptions, individuals who contracted the virus had to deal with the direct consequences of the illness, including mandatory isolation and quarantine, potential long-term health issues [3, 17], extended absences from work, reduced working hours, or inability to continue their occupational roles due to severe illness or long-term health complications that further exacerbated personal economic and psychological challenges [18]. Additionally, some individuals suffer long-term health complications associated with 'Long COVID,' a multisystemic condition comprising sometimes severe symptoms that follow up to 10–30% of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) infections [19], further impacting their ability to work and perform daily activities [20].

In Israel, the first reported SARS-CoV-2 infection was in February 2020 [21], several weeks before the formal declaration of a pandemic by the WHO. To mitigate the spread of the virus, the Israeli government implemented a range of measures aimed at promoting social distancing, such as the closure of educational institutions and shopping centers and limitations on public and private gatherings. These measures caused widespread job disruptions and shifts to remote work where possible [22]. In March 2020, Israel's Prime Minister declared a national state of emergency, leading to a series of emergency regulations that significantly impacted the employment of many people across various sectors. All non-essential government services and local authorities were closed. Companies with more than ten employees in the private sector were mandated to reduce in-office staff by 70% [23].

The COVID-19 pandemic caused significant disruptions in the Israeli labor market, with unemployment peaking at 35% during the early stages of the crisis [24]. Sectors like hospitality, retail, and tourism, which employ a large proportion of low-wage workers, were hit the hardest. In addition to job losses, structural changes in the labor market emerged, including an increase in remote work and widespread reductions in work hours, which did not affect all populations equally [24]. These disruptions deepened pre-existing inequalities, leaving low-income and minority workers particularly vulnerable to financial instability.

As of 2023, Israel's population was approximately 9.65 million citizens [25]. Jews of various backgrounds constitute about 73.6% of the population, while Arabs, including the Druze minority, are approximately 21.1%. The remaining 5.3% of the population is comprised of other smaller minority groups [25]. The Arab population in

Israel (hereafter Arabs) is an indigenous and largely disadvantaged minority that suffers from low socioeconomic status [26], limited access to healthcare services [27], and a lower rate of higher educational attainment [28]. The Arab population was disproportionately affected by COVID-19 [29] and the COVID-19 pandemic in Israel exposed notable disparities between the Arab and Jewish populations. By April 2024, Israel had reported approximately 53 cases/100 people and 12,700 deaths [30]. While Arab communities initially reported lower rates of infection and mortality compared to Jewish localities [31, 32], this pattern shifted in later waves of the pandemic, with Arab localities surpassing Jewish ones in infection rates and mortality [32]. These health disparities were further compounded by pre-existing socioeconomic inequalities. While Investment in education in the Arab sector has narrowed gaps in educational attainment between Jewish and Arab populations in secondary school and higher education, inequalities in employment persist [33]. Even before the pandemic, Arabs had a lower participation rate in the workforce (41.1%) compared to the national average (58.7%) [34]. They were often employed in sectors that offered less employment stability and were characterized by wages that were generally below the national average. For example, 17.1% of Arabs worked in construction, compared to only 5.3% of the general population. Similarly, 7.2% were employed in transportation and storage, and 5.4% in accommodation and food services, both higher than the national averages of 4.4% and 4.3%, respectively [35]. In contrast, Arabs were underrepresented in more stable and higher-paying sectors such as professional, scientific, and technical services (3.8% vs. 7.6%) and information and communication (1.1% vs. 5.3%) [35]. As of 2021, the employment rate for Arabs was 39.4%, a decrease compared to the pre-COVID-19 period. In the same time period, employment in the non-ultra-Orthodox Jewish population declined from 65.0% to 63.0% [36, 37]. This decline disproportionately affected sectors with high concentrations of Arab workers which were among the hardest hit by pandemic-related shutdowns and reduced demand. For example, the unemployment rate in hospitality reached 46.7%, transportation 34.5%, and wholesale and retail trade 32.1%, all of which are industries where Arab employment is notably high (17.4%, 22.7%, and 17.9%, respectively) [38]. This situation of the Arab population in Israel is reflective of global trends, where deprived communities faced exacerbated inequalities during the pandemic. Similar to the experiences of the Arab minority in Israel, a study in the United States showed how the COVID-19 pandemic has disproportionately impacted individuals from marginalized backgrounds, emphasizing inequities in access to decent work [39]. While existing evidence suggests that at the societal level, similar to global trends, the COVID-19 pandemic has impacted the economic condition of Israel's diverse populations, it is not known whether, at the individual level, COVID-19 infection has exacerbated pre-existing economic inequalities.

To determine the impact of COVID-19 infection on employment and income inequality, the study's primary aim was to compare changes in employment and income among COVID-19-infected and non-infected participants among Jews and Arabs, the two main population groups comprising the population of Israel.

Methods

Study design and sampling methods

We conducted a cross-sectional study among individuals 18 years old and over who were tested for SARS-CoV-2 either in hospital or in the community and whose test was processed in one of the government hospitals in the Northern District of Israel (Ziv Medical Centre, Tzafon Medical Centre, and The Galilee Medical Centre) regardless of the test result. The Northern District is one of the most socioeconomically diverse regions in Israel, with a higher proportion of the Arab population compared to the national average [40]. This region is characterized by significant variations in income levels and employment opportunities and sustained the greatest drop in the employment rate (13%) during the pandemic across all other geographic districts in Israel [24]. Survey responses used in this study were collected between March 2021 and June 2022. The data was obtained via an online validated anonymous questionnaire available in Hebrew, Arabic, English, and Russian and distributed through Short Message Service (SMS). Two reminders were sent via SMS if invited individuals did not respond. The sampling frame included all individuals who had a SARS-CoV-2 PCR test processed at one of Northern Israel's hospitals. All individuals over the age of 18 who had a test result (positive or negative) recorded and a phone number registered received an invitation to participate. Since the study team did not have access to the medical records, the total number of invitations sent is unknown but is in the tens of thousands. It is important to know that the sampling frame does not represent hospitalized patients, but mainly community patients whose PCR test was sent to hospital laboratories for testing. While this approach does not guarantee representativeness of the entire population, widespread, regular, and universal testing in the early phases of the pandemic means the sample includes representatives from Israel's various populations.

Inclusion and exclusion criteria

Inclusion criteria

Participants were eligible to participate in the study if they (a) completed the questionnaire and provided information on their employment status before COVID-19, (b) answered the question about their infection status, (c) reported that they worked prior to answering the questionnaire and (d) were over the age of 18.

By focusing on participants who worked prior to answering the questionnaire, we ensured that the study captured changes in employment and income during the pandemic, which are central to understanding the impact of SARS-CoV-2 on the labor force. Furthermore, requiring information on infection status allowed us to examine the relationship between health and employment outcomes, a critical aspect of the study.

Exclusion criteria

Participants were excluded from the study if they (a) did not complete the questionnaire or failed to provide information on their employment status before COVID-19, (b) did not answer the question about their infection status, (c) reported that they were not employed prior to completing the questionnaire or (d) were under the age of 18.

Measurement tool

The research questionnaire was developed by the International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC) [41] and adapted to the Israeli setting. The development of the original questionnaire is described in the ISARIC protocol [42]. The survey tool was originally developed by the ISARIC COVID-19 global follow-up working group, combining validated tools such as the MRC dyspnea scale [43], EuroQol-5 Dimension-5 Level (EQ-5D-5L) [44], and the UN Washington disability scale [45]. The final tool was informed and approved by a wide range of global stakeholders with expertise in clinical research, outbreak research, infectious disease, epidemiology, respiratory, critical care, rehabilitation, neurology, psychology, rheumatology, cardiology, oncology, and public health medicine. In addition, we piloted the localized version with 5–10 speakers of each of the four languages we made our questionnaire available in, for accuracy, simplicity, clarity, and validity. The survey includes a diverse array of questions. Survey variables relevant to this study included socio-demographics, SARS-CoV-2 infection status, COVID-19 vaccination status, and employment and income status at the beginning of the pandemic and 3–18 months later. A more detailed description of the tool and methods has been published [46].

Measurements

The survey assessed change in employment by asking the participants about their employment status at the beginning of the pandemic and again at the time of answering the survey, 3–18 months later during the COVID-19 pandemic. Participants were also asked about the nature of this change. Participants indicated whether their initial employment was full-time or part-time and whether they were working full-time, part-time, retired, or unemployed at the time of answering.

In addition to employment change, we also measured participants' income changes. Participants were asked about household income prior to the pandemic and whether their household income had changed at the time of response. These changes in income were categorized as decreased, increased, or unchanged.

Our study's independent variables included infection status, vaccination status, age (calculated from birth year), gender, ethnicity, education level, and household income. "Low earners" were defined as those earning less than 8,000 New Israeli Shekels (NIS) net (approximately USD 2218) per month, and "high earners" were defined as individuals with net monthly incomes over 15,000 NIS (approximately USD 4100). Supplementary Page #1 details the categorization of these variables.

Data analysis

Data were cleaned using MS Excel and analyzed using IBM's Statistical Package for Social Sciences (version 29.0). We described the distribution of the sample in terms of age, gender, ethnicity, household income, infection, and vaccination status using means and proportions.

We compared the characteristics of the infected and uninfected participants at baseline using t-tests for differences in means and Chi-square tests for differences in proportions. Additionally, we conducted a baseline comparison between Jewish and Arab participants. A key focus of the analysis was on the changes in employment status following COVID-19 infection. We conducted a univariate analysis to identify associations between [1] changes in employment status and [2] income change and COVID-19 infection, as well as other variables. Change of income included going from part-time to full-time, from full-time to part-time, from working to unemployed, or from working to retired. With regards to income change, we focused on those reporting a loss of income, i.e. a lower income at the time of answering than their reported income pre-pandemic. We then used multivariate binary logistic regression models to estimate the Odds ratios (ORs)

for the associations between change in employment (Yes/No) and COVID-19 infection status (Infected/noninfected) while adjusting for the other independent variables including gender, ethnicity, income, age, education, and vaccination status, detailed in supplementary file #1, associated with change in employment and income. To identify a differential effect according to ethnicity, we conducted stratified analyses separately for each population group, Jewish and Arab. Statistical significance was set at $p < 0.05$ for the analysis.

Ethical considerations

Ethical approvals for this study were obtained from the Ziv Medical Centre, Padeh-Poriya (Tzafon) Medical Centre, and Galilee Medical Centre ethical committees, reference numbers 0007–21-ZIV, 009–21-POR, and 0018–21-NHR, respectively. Consents were obtained electronically from participants. Prior to accessing the questionnaire, all participants were presented with detailed information about the study's purpose, procedures, and confidentiality measures, ensuring they understood the study before agreeing to participate. Only after they had confirmed they had read, understood, and agreed with the information were they able to access the survey.

Results

Between March 2021 and June 2022, 7,441 individuals answered the baseline survey, of which 1932 (25.9%) completed the employment section. Of these, 464 did not meet the inclusion criteria (Fig. 1), resulting in 1468 eligible participants (19.7% of the initial respondents). Of these, 523 participants were infected with SARS-CoV-2 (36%) (Fig. 1).

Of the 1468 participants included in the analysis, 1095 (81%) were Jewish, aligning closely with the country's national average (Table 1). Compared to Arab participants, Jewish participants were older, less likely to have been infected with SARS-CoV-2, and more likely to earn over 15,000 NIS monthly, similar to national trends. Employment and vaccination status were similar in both groups (Table 1).

Overall, in our sample, 122 (8.3%) participants changed employment status: from full-time to part-time ($n = 18$), from part-time to full-time ($n = 3$), or from working to not working ($n = 8$). Among low earners earning less than 8,000 NIS, the proportion who reported change was 13.8%, vs 4.3% among high earners ($p < 0.001$, Table 2). Of the Arab participants, 12.5% changed their employment status, compared with 7.3% of Jewish participants ($p < 0.05$, Table 2). Regarding income loss, overall, 14.8% of participants reported losing income (Table 3). The proportion was higher among Arab Participants than

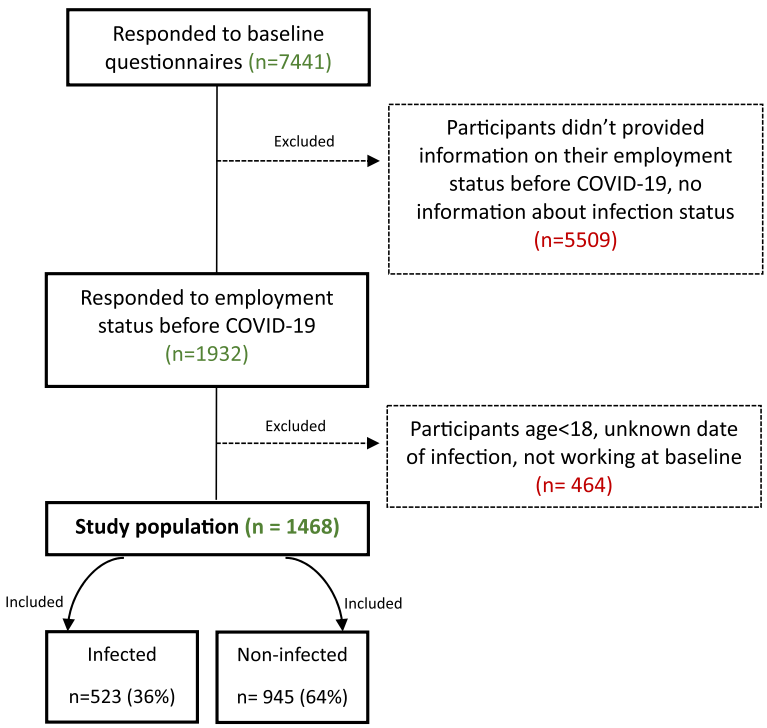

Fig. 1 Selection of the study population

Table 1 Characteristics of study participants, stratified by infection status ($n=1468$)

Characteristic		Infection status			Ethnicity		
	Total $n=1468$ **(100%)**	**Infected** $n=523$ **(35.6%)**	**Not Infected** $n=945$ **(64.4%)**	***P*-value**	**Jews** $n=1095$ **(81.0%)**	**Arab and Others** $n=257$ **(19.0%)**	***P*-value**
Age, yr, mean ± SD	48.48 ± 13.05	45.68 ± 12.12	50.02 ± 13.29	$p<0.001$	50.02 ± 13.12	42.05 ± 11.27	$p<0.001$
Ethnicity ($n=1352$)				$p=0.008$			
Jews	1095 (81.0%)	372 (77.2%)	723 (83.1%)		-	-	
Arabs and others	257 (19.0%)	110 (22.8%)	147 (16.9%)		-	-	
COVID-19 Infection							$p=0.008$
Yes	523 (35.6%)	-	-		372 (34%)	110 (42.8%)	
No	945 (64.5%)	-	-		723 (66.0%)	147 (57.2%)	
Gender ($n=1453$)				$p=0.001$			$p<0.001$
Female	874 (60.2%)	344 (65.8%)	530 (57%)		676 (61.8%)	128 (49.8%)	
Male	579 (39.8%)	179 (34.2%)	400 (43%)		418 (38.2%)	129 (50.2%)	
Marital Status ($n=1424$)				$p=0.015$			p = 0.308
Married	1111 (78%)	417 (81.6%)	649 (76%)		849 (78%)	208 (80.9%)	
Single and others	313 (22%)	94 (18.4%)	219 (24%)		239 (22%)	49 (19.1%)	
Education level ($n=1329$)				$p=0.030$			$p=0.084$
Up to 12 years of school	256 (19.3%)	110 (22.9%)	146 (17.2%)		204 (20%)	37 (15.5%)	
Professional certificate	193 (14.5%)	71 (14.8%)	122 (14.4%)		151 (14.8%)	28 (11.8%)	
Academic	880 (59.9%)	299 (62.3%)	581 (68.4%)		663 (65.1%)	173 (72.7%)	
Household income ($n=1315$)				$p=0.01$			$p<0.001$
Less than 8000 NIS	348 (26.5%)	124 (26.2%)	224 (26.6%)		241 (24.5%)	77 (32.9%)	
8001–15,000 NIS	479 (36.4%)	196 (41.4%)	283 (33.7%)		342 (34.7%)	99 (42.3%)	
Over 15,000 NIS	488 (37.1%)	154 (32.5%)	334 (39.7%)		402 (40.8%)	58 (24.8%)	
COVID-19 Vaccination ($n=1465$)				$p<0.001$			$p=0.699$
Yes	1312 (89.6%)	425 (81.3%)	887 (94.2%)		986 (90.3%)	230 (89.5%)	
No	153 (10.4%)	98 (18.7%)	55 (5.8%)		106 (9.7%)	27 (10.5%)	
Employment Status prior to COVID-19 ($n=1468$)				$p=0.1$			$P=0.416$
Working full-time	1176 (80.1%)	431 (82.4%)	745 (78.8%)		870 (79.5%)	210 (81.7%)	
Working part-time	292 (19.9%)	92 (17.6%)	200 (21.2%)		225 (20.5%)	47 (18.3%)	

Jewish(21.1% compared to 13.2%respectively, $p<0.01$, Table 3), and lower among high earners (over 15,000 NIS) compared to those earning less than NIS 8,000 (8.3% vs 21.9%, respectively, $p<0.001$, Table 3).

Employment change

Our analysis showed that after adjusting for gender, ethnicity, income, age, education, and vaccination status, infected individuals were more likely than uninfected ones to report employment change (OR = 2.0, 95% CI 1.2–3.1; $p<0.01$). When stratifying by ethnicity, infection was strongly associated with a change in employment among Arab participants (OR = 7.0, 95% CI 2.4–20.2; $p<0.01$) but not among Jewish ones (OR = 1.3, 95% CI 0.8–2.9; $p=0.3$) (Table 2).

Income change

Overall, after adjusting for gender, ethnicity, income, age, education, and vaccination status, we did not find an association between SARS-CoV-2 infection and income loss (OR = 1.6, 95% CI 1.1–2.3; $p=0.1$). However, when stratifying by ethnicity, infection status was strongly associated with a decrease in income among Arab participants (OR = 4.2, 95% CI 1.9–9.1; $p<0.01$) but not Jewish ones (OR = 1.2, 95% CI 0.8–1.8; $p=0.4$) (Table 3).

Discussion

This study aimed to compare changes in employment and income among COVID-19-infected and non-infected Jews and Arabs, the two main population groups comprising the population of Israel. By focusing on these groups, the study sought to shed light on the economic impact of SARS-CoV-2 infection at the individual level

Table 2 Association between SARS-CoV-2 infection and employment change according to ethnicity and household income

	Participant numbers		All Participants analysis (*n*=1468)				Jewish participants (*n*=1095)		Arab/Other participants (*n*=257)	
	n	Change (%)	Crude OR	*P* value	aOR	P value	aOR	*P* value	aOR	*P* value
COVID-19 infection										
No	945	55 (5.8)	1	-	1		1		1	
Yes	523	67 (12.8)	2.4 (1.6-3.5)	<0.001	2.0 (1.2-3.1)	0.005	1.3 (0.8-2.9)	0.3	7.0 (2.4-20.2)	<0.01
Household Income										
Less than 8,000 NIS	348	48 (13.8)	1		1		1		1	
8001-15,000 NIS	479	37 (7.7)	0.5 (0.3-0.8)	<0.01	0.6 (0.4-1)	0.07	0.9 (0.5-1.7)	0.8	0.2 (0.07-0.6)	0.004
Over 15,000 NIS	488	21 (4.3)	0.3 (0.2-0.5)	<0.001	0.4 (0.2-0.8)	0.01	0.6 (0.3-1.2)	0.1	0.2 (0.05-0.8)	0.02
Ethnicity										
Arab/other	257	32 (12.5)	1		1		-		-	
Jewish	1095	80 (7.3)	0.6 (0.4-0.9)	0.008	0.5 (0.3-0.9)	0.2	-		-	
Education							-			
Professional certificate	193	22 (5.2)	1		1				1	
Up to 12 years of school	256	35 (13.7)	1.2 (0.7-2.2)	0.5	1.1 (0.6-2.1)	0.8	0.4 (0.2-0.8)	0.1	1.1 (0.3-4.8)	0.9
Academic	880	50 (5.7)	0.5 (0.3-0.8)	<0.01	0.5 (0.3-0.9)	0.03	1 (0.5-2)	0.9	2.0 (0.4-9.4)	0.4
Vaccination Status										
No	153	22 (14.4)	1		1		1		1	
Yes	1312	100 (7.6)	0.5 (0.3-0.8)	<0.01	0.5 (0.3-1)	0.05	0.4 (0.2-0.8)	0.008	1.4 (0.3-5.9)	0.6
Gender										
Female	874	73 (8.3)	1		1		1		1	
Male	579	47 (8.1)	1 (0.6-1.4)	0.9	0.9 (0.5-1.5)	0.6	0.8 (0.4-1.4)	0.4	1.5 (0.5-4.3)	0.4
Age (mean)	48.48	47.43	1 (0.9-1)	0.4	1 (0.9-1.03)	0.1	1 (0.9-1)	0.2	1 (0.9-1.1)	0.5

and on economic inequalities among the two largest population groups in Israel. Our findings showed that for large segments of the population, COVID-19 affected job stability and was associated with a reduced income. This was particularly true for Arabs and low earners.

Beyond physical and mental health, the COVID-19 pandemic has significantly impacted many areas of society and people's lives, including employment and income. This study examined the changes in long-term employment and income after COVID-19 infection among different population groups in northern Israel.

In analyzing the impact of the COVID-19 pandemic on employment and income among the study participants, it is noteworthy to mention that the majority of participants, regardless of their infection status, didn't experience a change in their employment status and income levels. However, for those who did, the pandemic exacerbated pre-existing disparities. Specifically, it mainly impacted Arab participants and low earners, who were more likely to face employment disruptions and income loss, highlighting the COVID-19 pandemic's disproportionate impact on marginalized ethnic groups such as the Arab minority in Israel.

Our findings indicate that regardless of infection status, Arabs and those with lower incomes were more likely to experience income loss. High-paid workers are more likely to have jobs that allow for remote work [47, 48]. This flexibility in job arrangements enables them to maintain employment continuity even through lockdowns or illness. In addition, those in higher-earning income brackets often hold positions that provide greater job stability and better employment conditions. Such positions typically include benefits such as paid sick leave, which may mitigate the financial and health-related consequences of COVID-19. Flexible working hours and paid time-off options were significant to employees during the pandemic [49].

Our findings are consistent with global studies showing that minority and low-income groups faced disproportionate economic impacts during the pandemic. A systematic review has highlighted that racial and ethnic minority groups had higher COVID-19 positivity and severity, associated with socioeconomic disparities [50]. For example, a study in the United Kingdom (UK) showed that during the COVID-19 pandemic, compared with White-British, Black, Asian, and minority ethnic (BAME) migrants were more likely to experience job loss during the COVID-19 lockdown [12].

In addition, SARS-CoV-2 infection was associated with changes in employment. While our study does not enable

Table 3 Association between SARS-CoV-2 infection and income decrease according to ethnicity and household income

	Participant numbers		All Participants analysis ($n=1468$)				Jewish participants ($n=1095$)		Arab/Other participants ($n=257$)	
	n	Income decrease (%)	Crude OR	*P* value	aOR	*P* value	aOR	*P* value	aOR	*P* value
COVID-19 infection										
No	882	100 (11.3)	1		1		1		1	
Yes	486	103 (21.2)	2.1 (1.6–2.8)	$p<0.001$	1.6 (1.1–2.3)	0.1	1.2 (0.8–1.8)	0.4	4.2 (1.9–9.1)	$p<0.01$
Household Income										
Less than 8,000 NIS	333	73 (21.9)	1		1		1		1	
8001–15,000 NIS	460	78 (16.9)	0.7 (0.5–1.0)	0.08	0.9 (0.6–1.3)	0.9	1.0 (0.6–1.6)	0.9	0.7 (0.3–1.5)	0.3
Over 15,000 NIS	480	40 (8.3)	0.3 (0.2–0.5)	$p<0.001$	0.4 (0.3–0.7)	0.001	0.5 (0.4–0.8)	0.009	0.4 (0.1–1.1)	0.07
Ethnicity										
Arab/other	232	49 (21.1)	1		1		-		-	
Jewish	1034	136 (13.2)	0.6 (0.4–0.8)	0.002	0.6 (0.4–0.9)	0.02	-		-	
Education										
Professional certificate	178	41 (23)	1		1				1	
Up to 12 years of school	236	52 (22)	0.9 (0.6–1.5)	0.9	0.4 (0.3–0.7)	$p<0.001$	0.5 (0.3–0.8)	0.006	0.3 (0.1–0.8)	0.01
Academic	839	90 (10.7)	0.4 (0.3–0.6)	$p<0.001$	0.8 (0.5–1.4)	0.5	0.9 (0.5–1.7)	0.7	0.5 (0.1–1.7)	0.3
Vaccination Status										
No	144	29 (20.1)	1		1		1		1	
Yes	1221	174 (14.2)	0.7 (0.4–1.0)	0.06	0.9 (0.5–1.5)	0.6	0.7 (0.4–1.2)	0.2	2.3 (0.6–8.4)	0.2
Gender										
Female	826	121 (14.6)	1		1		1		1	
Male	531	80 (15)	1.0 (0.8–1.4)	0.8	1.2 (0.8–1.8)	0.4	1.1 (0.7–1.8)	0.6	2.2 (0.8–8.4)	0.1
Age (mean)	48.4	46.9	0.9 (0.9–1.0)	0.08	1.0 (1.0–1.0)	0.9	1.0 (1.0–1.0)	0.7	1.0 (0.9–1.1)	0.5

us to determine why, there are several likely explanations, including not being allowed to work when infected, especially in low-paid jobs not amenable to distance working, in which Arab workers are more likely to be employed than Jewish ones. A study conducted in Portugal focuses on the effects of COVID-19 on job security and unemployment, noting that the impact of the pandemic is experienced disparately across different geographical regions, sectors, age groups, and types of employment [51]. Our study is compatible with these findings.

Another potential explanation for the impact of infection on employment is longer-term health implications such as Long COVID. Studies have shown that long-term COVID-19 can significantly impact an individual's ability to return to work [20, 52]. One study found that 61.5% of patients infected with SARS-CoV-2 delayed their return to work at least five weeks from symptom onset, primarily due to fatigue and weakness [53]. Evidence shows that the severity of infection and being unvaccinated was associated with Long-COVID [54, 55]. In Israel, compared to Jews, Arabs were disproportionally affected by COVID-19 and less vaccinated [56]. These findings may explain why infection was more associated with changes in employment and income in Arab participants compared to Jewish ones.

At the societal level, the differential impact of the pandemic on the economic situation of Arabs and Jews could be explained by the higher levels of community resilience among Israeli Jews compared to Arabs in Israel [57]. Such community resilience plays a role in enhancing the capacity to adapt to new workforce conditions quickly and in mitigating the impact of COVID-19 on employment [57]. Furthermore, the significant representation of Jews in sectors with varying levels of remote work adaptability [34] may also contribute to the diminished need for employment changes following infection during the pandemic, compared to the Arab minority in Israel characterized by employment in sectors less amenable to remote work [34]. Indeed, one study found that the percentage of Arabs working from home during the pandemic was significantly lower than that of Jews [58], aligning with a Canadian study showing that those in roles that could not be performed remotely faced greater job losses during the pandemic's early stages [59].

Our finding that minority groups are disproportionately affected by the socioeconomic impact of the COVID-19 pandemic is consistent with other studies [39, 60, 61]. A study in the United Kingdom (UK) showed that during the COVID-19 pandemic, compared with White-British, Black, Asian, and minority ethnic (BAME) migrants were more likely to experience job loss during the COVID-19 lockdown [12]. An analysis of housing and employment data in Manchester, UK, showed that disadvantages faced by ethnic minorities in terms of employment and housing were further exacerbated by the pandemic [62].

The association between COVID-19 infection and employment changes in the Arab population may also be partially attributed to the pre-existing inequities and disparities in access to resources and opportunities faced by the Arab minority in Israel. These inequities and disparities may include lower socioeconomic status [26], barriers to healthcare [27], low levels of community resilience [57, 63], and discrimination [64], which collectively and individually impacted the Arab population.

Strengths and limitations

This is the first study to examine the changes in employment and income among COVID-19-infected and non-infected participants in different population groups in Israel. While it demonstrates the economic vulnerability of low earners and the Arab minority in the face of COVID-19-related illness, the study has several limitations: since data was collected from testing centers in Northern Israel, the sample may overrepresent the North of the country, even though the Northern laboratories did not exclusively process samples from Northern residents. This peripheral region is socio-economically deprived compared to the center. In addition, conducting research via online surveys restricts inclusion to those with internet access and literacy, potentially excluding certain groups such as older individuals and the more stringent part of the ultra-orthodox minority who limits the use of smartphones and the internet. Furthermore, sampling was not random, which may introduce selection bias. However, utilizing everyone who tested for SARS-CoV-2, regardless of result, at a time when frequent and widespread testing ensured a comprehensive representation of Israeli society. An additional limitation of this study is the inability to examine the heterogeneity within the Arab population group. Although the sample includes various subgroups, such as Muslims, Christians, and Druze, the sample sizes were too small to allow for meaningful subgroup analyses. Moreover, a majority proportion of the Ultra-orthodox are not active on the labor market and do not use smartphones or the internet, and therefore those who do (and could answer our survey) may not be representative of that entire population. It is also important to note that all the information was self-reported and thus prone to recall bias and social desirability bias, especially around sensitive information such as employment status or income. To mitigate these concerns, we ensured anonymity and confidentiality in data collection to encourage honest responses and reduce social desirability bias.

Conclusion

While the vast majority of participants, maintained employment and income through the pandemic, low earners and the Arab minority were more vulnerable to employment and income change. In particular, the Arab population was more likely to experience employment change and income loss following COVID-19 infection. Because this group is also more likely to be employed in low-earning jobs, they face a double economic vulnerability. Our data suggests that the pandemic has exacerbated economic inequalities, disproportionally affecting minorities employed in low-earning positions and demonstrating low economic resilience to sickness in this group. The reasons are likely complex, including individual-level health status following SARS-CoV-2 infection and community-level resilience.

To strengthen economic resilience and reduce economic disparities during and after pandemics, policies should be specifically designed to support lower earners, with a focused effort on reaching minority groups. Practical measures could include interventions that directly target minority groups and low earners to access training, education, and skill development programs to transition into more stable and higher-paying sectors. Providing grants to minority small businesses can also support economic self-sufficiency and job creation within these communities. Tailored outreach awareness campaigns, to ensure that minority populations are informed about existing support programs and understand how to access them can also mitigate the exacerbation of inequalities seen during crises such as the COVID pandemic.

Abbreviations

COVID-19	Coronavirus disease-2019
WHO World	Health Organization
SARS-CoV-2	Syndrome Coronavirus-2
US	United States
SMS	Short Message Service
ISARIC	International Severe Acute Respiratory and Emerging Infection Consortium
NIS	New Israeli Shekels
ORs	Odds ratios
aOR	Adjusted Odds ratio
CI	Confidence interval
UK	United Kingdom
BAME	Black, Asian, and minority ethnic

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-22426-8.

Supplementary Material 1.

Acknowledgements

None.

Authors' contributions

ME conceptualized the original research idea, acquired the funding, designed the methodology, supervised the analysis and interpretation of the results, and critically revised the manuscript. HS was responsible for data extraction, cleaning, and preparation of the master file for analysis, formally analyzed the data, interpreted the findings, and wrote the first version of the manuscript. PK contributed to the formal analysis. AD, HZ, OW, KAJ, SN, and DG coordinated the data collection and curated the data from their respective hospitals and provided input on the methodology and clinical interpretation of the findings. All authors contributed to the article and approved the submitted version.

Funding

This study was funded by a grant from the Israeli Science Foundation (Grant# 2396/23). The funders did not have input into the study design and the collection, analysis, or interpretation of data.

Data availability

The datasets used and/or analyzed during the current study are available upon reasonable request from the corresponding author and with the permission of the regulating ethics committee.

Declarations

Ethics approval and consent to participate

Ethical approvals for this study were obtained from the Ziv Medical Centre, Padeh-Poriya (Tzafon) Medical Centre, and Galilee Medical Centre ethical committees, reference numbers; 0007–21-ZIV, 009–21-POR, and 0018–21-NHR, respectively. Consents were obtained electronically from participants. Prior to accessing the questionnaire, all participants were presented with detailed information about the study's purpose, procedures, and confidentiality measures, ensuring they understood the study before agreeing to participate. Only after they had confirmed they had read, understood, and agreed with the information were they able to access the survey.

Competing interests

The authors declare no competing interests.

Author details

[1]The Azrieli Faculty of Medicine, Bar Ilan University, P.O.B. 1589, Safed 1311502, Israel. [2]Galilee Medical Center, Nahariya, Israel. [3]Tzafon Medical Center, Poriya, Israel. [4]Ziv Medical Center, Safed, Israel.

Received: 23 April 2024 Accepted: 20 March 2025
Published online: 31 March 2025

References

1. Organization WH. Coronavirus disease 2019 (COVID-19): situation report, 51. 2020. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200311-sitrep-51-covid-19.pdf?sfvrsn=1ba62e57_10. Cited 2024 Jan 30.
2. Clemente-Suárez VJ, Dalamitros AA, Beltran-Velasco AI, Mielgo-Ayuso J, Tornero-Aguilera JF. Social and psychophysiological consequences of the COVID-19 pandemic: an extensive literature review. Front Psychol. 2020;11:1–15.
3. Del Rio C, Collins LF, Malani P. Long-term health consequences of COVID-19. JAMA. 2020;324(17):1723–4.
4. Ayouni I, Maatoug J, Dhouib W, Zammit N, Fredj SB, Ghammam R, et al. Effective public health measures to mitigate the spread of COVID-19: a systematic review. BMC Public Health. 2021;21(1):1–14.
5. Msemburi W, Karlinsky A, Knutson V, Aleshin-Guendel S, Chatterji S, Wakefield J. The WHO estimates of excess mortality associated with the COVID-19 pandemic. Nature. 2023;613(7942):130–7.
6. Fana M, Torrejón Pérez S, Fernández-Macías E. Employment impact of Covid-19 crisis: from short term effects to long terms prospects. J Ind Bus Econ. 2020;47:391–410.

7. Kniffin KM, Narayanan J, Anseel F, Antonakis J, Ashford SP, Bakker AB, et al. COVID-19 and the workplace: implications, issues, and insights for future research and action. Am Psychol. 2021;76(1):63.
8. Yu Z, Zhu X, Liu X, Wei T, Yuan H-Y, Xu Y, et al. Reopening international borders without quarantine: contact tracing integrated policy against COVID-19. Int J Environ Res Public Health. 2021;18(14):7494.
9. Arthi V, Parman J. Disease, downturns, and wellbeing: economic history and the long-run impacts of COVID-19. Explor Econ Hist. 2021;79: 101381.
10. Fonseca LM, Azevedo AL. COVID-19: outcomes for global supply chains. Manag Mark Challenges Knowl Soc. 2020;15(s1):424–38.
11. Xu Z, Elomri A, Kerbache L, El Omri A. Impacts of COVID-19 on global supply chains: facts and perspectives. IEEE Eng Manag Rev. 2020;48(3):153–66.
12. Hu Y. Intersecting ethnic and native–migrant inequalities in the economic impact of the COVID-19 pandemic in the UK. Res Soc Stratif Mobil. 2020;68: 100528.
13. Jiskrova GK, Bobák M, Pikhart H, Ksinan AJ. Job loss and lower healthcare utilization due to COVID-19 among older adults across 27 European countries. J Epidemiol Community Heal. 2021;75(11):1078–83.
14. Möhring K, Weiland A, Reifenscheid M, Naumann E, Wenz A, Rettig T, et al. Inequality in employment trajectories and their socio-economic consequences during the early phase of the COVID-19 pandemic in Bamberg, Germany: SocArXiv; 2021.
15. Gambau B, Palomino JC, Rodríguez JG, Sebastian R. COVID-19 restrictions in the US: wage vulnerability by education, race and gender. Appl Econ. 2022;54(25):2900–15.
16. Cortes GM, Forsythe E. Heterogeneous labor market impacts of the COVID-19 pandemic. ILR Rev. 2023;76(1):30–55.
17. Desai AD, Lavelle M, Boursiquot BC, Wan EY. Long-term complications of COVID-19. Am J Physiol Physiol. 2022;322(1):C1-11.
18. Arora T, Grey I, Östlundh L, Lam KBH, Omar OM, Arnone D. The prevalence of psychological consequences of COVID-19: a systematic review and meta-analysis of observational studies. J Health Psychol. 2022;27(4):805–24.
19. Davis HE, McCorkell L, Vogel JM, Topol EJ. Long COVID: major findings, mechanisms, and recommendations. Nat Rev Microbiol. 2023;21(3):133–46.
20. Kerksieck P, Ballouz T, Haile SR, Schumacher C, Lacy J, Domenghino A, et al. Post COVID-19 condition, work ability and occupational changes in a population-based cohort. Lancet Reg Heal. 2023;31:1–13.
21. Organization WH. Coronavirus disease 2019 (COVID-19) Situation Report – 33 . 2020. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200222-sitrep-33-covid-19.pdf?sfvrsn=c9585c8f_4. Accessed 21 Dec 2023.
22. Ministry of Health. The government approved emergency regulations to restrict activities in order to curb the spread of coronavirus in Israel [Press Releases]. 2020. Available from: https://www.gov.il/en/departments/news/25032020_01. Cited 2020 May 10.
23. The Knesset. Special regulations to deal with COVID-19 pandemic-restriction of activity at workplaces (In Hebrew) . 2020. Available from: https://main.knesset.gov.il/Activity/Legislation/Laws/pages/lawprimary.aspx?t=lawlaws&st=lawlaws&lawitemid=2141344. Accessed 22 Dec 2023.
24. Debowy M, Epstein G, Weiss A. The Israeli labor market in the wake of COVID-19: an overview. In: State nation Rep Soc Econ policy. 2021. p. 57–88.
25. Israel Central Bureau of Statistics. Media release: population of Israel on the eve of 2023. 2023. Available from: https://www.cbs.gov.il/he/mediarelease/pages/2022/אוכלוסייתי-לארשי-החתפב-של-תנש-2023.aspx. Accessed 20 Jan 2024.
26. Israel Central Bureau of Statistics. Characterization and classification of geographical units by the socio-economic level of the population, 2019. Jerusalem; 2023. Available from: https://www.cbs.gov.il/en/publications/Pages/2023/socio-2019-e.aspx. Accessed 22 Dec 2023.
27. Shibli H, Aharonson-Daniel L, Feder-Bubis P. Perceptions about the accessibility of healthcare services among ethnic minority women: a qualitative study among Arab Bedouins in Israel. Int J Equity Health. 2021;20(1):1–9.
28. Israel Central Bureau of Statistics. 4.77 Recipients of degrees from institutions of higher education, by degree, sex, age, and population group. 2021. Available from: https://www.cbs.gov.il/he/publications/doclib/2021/4.shnatoneducation/st04_77.pdf. Accessed 22 Dec 2023.
29. Muhsen K, Na'aminh W, Lapidot Y, Goren S, Amir Y, Perlman S, et al. A nationwide analysis of population group differences in the COVID-19 epidemic in Israel, February 2020–February 2021. Lancet Reg Heal. 2021;7:100130.
30. Mathieu E, Ritchie H, Rodés-Guirao L, Appel C, Gavrilov D, Giattino C, et al. COVID-19 pandemic. Our World in Data; 2020. Available from: https://ourworldindata.org/coronavirus#explore-our-data-on-covid-19. Accessed 22 Dec 2023.
31. Saban M, Myers V, Wilf-Miron R. Coping with the COVID-19 pandemic–the role of leadership in the Arab ethnic minority in Israel. Int J Equity Health. 2020;19(1):1–6.
32. Saban M, Myers V, Peretz G, Avni S, Wilf-Miron R. COVID-19 morbidity in an ethnic minority: changes during the first year of the pandemic. Public Health. 2021;198:238–44.
33. Fuchs H. Education and employment among young Arab Israelis. State nation Rep Soc Econ policy Isr. 2017;259–310.
34. Israel Central Bureau of Statistics. 9.12 Employed persons and employees, by industry, population group, and sex. 2023. Available from: https://www.cbs.gov.il/he/publications/doclib/2023/9.shnatonlabourmarket/st09_12x.pdf. Accessed 22 Dec 2023.
35. Israel Central Bureau of Statistics. 9.12 Employed persons and employees, by industry, population group, and sex. 2019. Available from: https://www.cbs.gov.il/he/publications/doclib/2019/9.shnatonlabourmarket/st09_12x.pdf. Accessed 22 Dec 2023.
36. Israel Central Bureau of Statistics. Labor force survey 2021- report number 1890 (In Hebrew) . Jerusalem; 2023. Available from: https://www.cbs.gov.il/he/publications/doclib/2023/lfs21_1890/h_print.pdf. Accessed 6 Jan 2024.
37. Israel Central Bureau of Statistics. Labour force survey data- quarter and annual data of 2019 (In Hebrew) . Jerusalem; 2020. Available from: https://www.cbs.gov.il/he/publications/doclib/2020/saka0419q/intro_a_h.pdf. Accessed 22 Dec 2023.
38. The Knesset Research and Information Center. The impact of the COVID-19 pandemic on employment and businesses in the Arab Sector (In Hebrew). Jerusalem; 2020. Available from: https://main.knesset.gov.il/activity/info/research/pages/default.aspx. Accessed 22 Dec 2023.
39. Kantamneni N. The impact of the COVID-19 pandemic on marginalized populations in the United States: a research agenda. J Vocat Behav. 2020;119: 103439.
40. Israel Central Bureau of Statistics. 2.15 Population by district, sub-district and religion. 2024. p. 1–4. Available from: https://www.cbs.gov.il/he/publications/doclib/2024/2.shnatonpopulation/st02_15x.pdf. Accessed 20 Jan 2025.
41. ISARIC. ISARIC Covid-19 long term follow-up study . 2020. Available from: https://isaric.org/research/covid-19-clinical-research-resources/covid-19-long-term-follow-up-study-old/. Cited 2023 Nov 3.
42. ISARIC COVID-19 Global Follow Up Working Group. ISARIC Global COVID-19 follow-up study protocol (v. 1.0) . 2020. Available from: https://isaric.org/wp-content/uploads/2020/11/ISARIC-Covid-19-follow-up-protocol.pdf. Accessed 22 Jan 2024.
43. Primary Care Respiratory Society. MRC Dyspnoea Scale . Available from: https://www.pcrs-uk.org/mrc-dyspnoea-scale.
44. Herdman M, Gudex C, Lloyd A, Janssen MF, Kind P, Parkin D, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). Qual Life Res. 2011;20:1727–36.
45. Washington Group on Disability Statistics. The Washington Group question sets on disability. Available from: https://www.washingtongroup-disability.com/. Cited 2025 Jan 21.
46. Kuodi P, Gorelik Y, Zayyad H, Wertheim O, Wiegler KB, Abu Jabal K, et al. Association between BNT162b2 vaccination and reported incidence of post-COVID-19 symptoms: cross-sectional study 2020–21, Israel. npj Vaccines. 2022;7(1):101.
47. Bartik AW, Cullen ZB, Glaeser EL, Luca M, Stanton CT. What jobs are being done at home during the COVID-19 crisis? Evidence from firm-level surveys. National Bureau of Economic Research; 2020. Report No.: 27422.
48. Irlacher M, Koch M. Working from home, wages, and regional inequality in the light of COVID-19. Jahrb Natl Okon Stat. 2021;241(3):373–404.
49. Shtembari E, Kufo A, Haxhinasto D. Employee compensation and benefits pre and post-COVID-19. Adm Sci. 2022;12(3):106.
50. Magesh S, John D, Li WT, Li Y, Mattingly-App A, Jain S, et al. Disparities in COVID-19 outcomes by race, ethnicity, and socioeconomic

status: a systematic review and meta-analysis. JAMA Netw open. 2021;4(11):e2134147–e2134147.
51. Almeida F, Santos JD. The effects of COVID-19 on job security and unemployment in Portugal. Int J Sociol Soc Policy. 2020;40(9/10):995–1003.
52. Gualano MR, Rossi MF, Borrelli I, Santoro PE, Amantea C, Daniele A, et al. Returning to work and the impact of post COVID-19 condition: a systematic review. Work. 2022;73(Preprint):405–13.
53. Cellai M, O'Keefe JB. Characterization of prolonged COVID-19 symptoms in an outpatient telemedicine clinic. In: Open forum infectious diseases. US: Oxford University Press US; 2020. p. ofaa420.
54. Marjenberg Z, Leng S, Tascini C, Garg M, Misso K, El Guerche SC, et al. Risk of long COVID main symptoms after SARS-CoV-2 infection: a systematic review and meta-analysis. Sci Rep. 2023;13(1):15332.
55. Watanabe A, Iwagami M, Yasuhara J, Takagi H, Kuno T. Protective effect of COVID-19 vaccination against long COVID syndrome: a systematic review and meta-analysis. Vaccine. 2023;41(11):1783–90.
56. Gorelik Y, Anis E, Edelstein M. Inequalities in initiation of COVID-19 vaccination by age and population group in Israel-December 2020-July 2021. Lancet Reg Heal. 2022;12:12.
57. Kimhi S, Eshel Y, Marciano H, Adini B. Distress and resilience in the days of COVID-19: comparing two ethnicities. Int J Environ Res Public Health. 2020;17(11):3956.
58. The Knesset Research and Information Center. The Arab society in the shadow of the coronavirus pandemic: a concentration of data (In Hebrew). Jerusalem; 2021. Available from: https://fs.knesset.gov.il/globaldocs/MMM/ec77910d-2dac-eb11-8111-00155d0aee38/2_ec77910d-2dac-eb11-8111-00155d0aee38_11_17972.pdf. Accessed 22 Dec 2023.
59. Gallacher G, Hossain I. Remote work and employment dynamics under COVID-19: evidence from Canada. Can Public Policy. 2020;46(S1):S44-54.
60. Khanijahani A, Iezadi S, Gholipour K, Azami-Aghdash S, Naghibi D. A systematic review of racial/ethnic and socioeconomic disparities in COVID-19. Int J Equity Health. 2021;20(1):1–30.
61. Galea S, Abdalla SM. COVID-19 pandemic, unemployment, and civil unrest: underlying deep racial and socioeconomic divides. JAMA. 2020;324(3):227–8.
62. Wiśniowski A, Allen R, Aparicio-Castro A, Olsen W, Islam M. The economic impact of the COVID-19 pandemic on ethnic minorities in Manchester: lessons from the early stage of the pandemic. Front Sociol. 2023;8:1–18.
63. Shapira S, Shibli H, Teschner N. Energy insecurity and community resilience: the experiences of Bedouins in Southern Israel. Environ Sci Policy. 2021;124:135–43.
64. Daoud N, Soskolne V, Mindell JS, Roth MA, Manor O. Ethnic inequalities in health between Arabs and Jews in Israel: the relative contribution of individual-level factors and the living environment. Int J Public Health. 2018;63(3):313–23.

Publisher's Note