COVID

Article

Impact of the COVID-19 Pandemic on Sleep, Mental Health, Physical Activity, and Diet, and of Misinformation on Vaccination Decisions Among Adults Employed in Different Work Sectors in Poland

Katarzyna Kieruzal [1,*], Joanna Ciećwierz [1] and Daniel Śliż [2]

[1] Students' Scientific Group of Lifestyle Medicine, 3rd Department of Internal Medicine and Cardiology, Medical University of Warsaw, 04-749 Warsaw, Poland
[2] 3rd Department of Internal Diseases and Cardiology, Medical University of Warsaw, 04-749 Warsaw, Poland
* Correspondence: ulaszewska.k@gmail.com

Abstract

The COVID-19 pandemic revealed substantial variation in vaccine attitudes and susceptibility to misinformation, raising concerns from an occupational health perspective about potential differences across employment sectors. This study examined associations between employment category and pandemic-related changes in mental health, and vaccine-related misinformation among adults in Poland. Data were collected between 13 January and 14 February 2022 using a cross-sectional online survey. Complete questionnaires from 7018 respondents were analyzed. Employment category (services, industry, agriculture, unemployed) was examined in relation to self-reported changes in sleep, mental health, physical activity, and diet. A misinformation index was constructed based on agreement with eight vaccine-related misinformation statements. Overall, 81.8% of participants reported being vaccinated. Employment category was significantly associated with perceived changes in sleep, mental health, and diet. The misinformation index was consistently higher among unvaccinated individuals across all employment groups, with the largest differences observed among the unemployed and agricultural workers. These findings show a strong link between vaccine misinformation and remaining unvaccinated, highlighting the need for targeted occupational health education and reliable health information. Increasing vaccination coverage therefore requires not only vaccine availability but also systematic efforts to counteract misinformation and strengthen digital health literacy across occupational groups.

Keywords: COVID-19; pandemic; occupation; lifestyle; misinformation; vaccines

Academic Editor: Luigi Vimercati

Received: 12 January 2026
Revised: 16 February 2026
Accepted: 18 February 2026
Published: 24 February 2026

1. Introduction

In December 2019, the world faced the new SARS-CoV-2 virus, which causes COVID-19 with a wide range of illnesses. Vaccines were developed at record speed and proved effective in preventing severe disease and deaths, as shown in many studies. Large nationwide observational studies have demonstrated that mRNA COVID-19 vaccination significantly reduced hospitalizations and deaths at the population level [1]. Despite this, some people were hesitant to get vaccinated. Vaccine hesitancy has been defined as a delay in acceptance or refusal of vaccination despite the availability of vaccination services and is recognized as a complex and context-specific public health challenge [2].

In May 2023, the World Health Organization (WHO) declared the end of the COVID-19 public health emergency [3]. Infections still occur, especially in the autumn season, but they no longer cause the same level of fear as before. Since the start of the pandemic in Poland (as of November 2025), more than 6.8 million COVID-19 cases and almost 121,000 deaths have been recorded. In October 2025 were 995 people hospitalized with COVID-19 [4]. Reports for 2024 indicate that about 2.1% people in Poland received a primary or booster COVID-19 vaccination that year [5].

COVID-19 was not only a medical challenge; it was also a test of how misinformation spreads. With the arrival of vaccines, many false claims appeared, e.g., about DNA changes, microchips, or that the disease was harmless. Some people accepted these ideas, others rejected them. As a result, attitudes ranged from full acceptance of vaccination to strong opposition. Empirical analyses of online platforms have shown that social media played a major role in amplifying COVID-19-related misinformation and facilitating the formation of polarized communities [6].

Previous research has demonstrated that exposure to COVID-19-related misinformation is strongly associated with lower vaccination intent and increased vaccine hesitancy across different populations [7,8]. Experimental evidence indicates that exposure to misinformation about COVID-19 vaccines significantly decreases individuals' stated intention to vaccinate [7]. Experimental and survey-based studies have shown that even brief exposure to false claims can significantly reduce willingness to vaccinate, highlighting the public health consequences of misinformation in digital environments.

Beyond vaccination attitudes, the pandemic has been associated with substantial changes in lifestyle and mental health. Numerous studies reported increased levels of anxiety, depressive symptoms, and psychological distress during lockdown periods [9]. Global modeling studies have estimated a substantial increase in the prevalence of major depressive disorder and anxiety disorders during the first year of the pandemic [10]. Sleep disturbances became more prevalent, often linked to stress, uncertainty, and changes in daily routines [11]. A systematic review and meta-analysis reported a high prevalence of sleep problems during the COVID-19 pandemic, particularly among individuals experiencing psychological distress [12]. Reductions in physical activity and unfavorable dietary changes were also widely documented, particularly during periods of social restrictions [13,14]. A systematic review of lockdown studies demonstrated consistent decreases in physical activity levels and increases in sedentary behavior during confinement periods [15]. Evidence from observational studies also indicates that pandemic-related restrictions were associated with changes in dietary patterns, including increased consumption of energy-dense or processed foods in some populations [16]. These behavioral changes may have long-term implications for chronic disease risk and overall well-being.

Numerous studies have examined mental health, lifestyle behaviors, and vaccine attitudes during the COVID-19 pandemic. However, these domains have typically been investigated separately rather than within a single analytical framework. As a result, relatively few studies have simultaneously analyzed pandemic-related lifestyle changes and vaccine-related misinformation within the same population sample, particularly from an occupational health perspective. Most large-scale studies have focused either on mental health outcomes or on vaccine attitudes separately, rather than integrating lifestyle changes and misinformation exposure within a single analytical framework [17]. For example, systematic reviews have synthesized evidence on mental health and behavioral changes during the pandemic without examining vaccination-related beliefs [9], while other reviews have focused specifically on vaccine hesitancy and misinformation without simultaneously addressing lifestyle determinants [18]. There remains a gap in understanding how misinformation acceptance and lifestyle changes coexist across different employment sectors and how these factors jointly relate to actual vaccination behavior rather than stated intentions.

In this study, we used a broad questionnaire covering beliefs about vaccines, lifestyle, information sources, health status, and actual vaccination decisions. Our goals were to assess how the pandemic affected lifestyle among people working in different sectors, and to examine how exposure to misinformation relates to COVID-19 vaccination decisions among both working and non-working adults.

From an occupational health perspective, these findings can help explain what shapes pro-health attitudes in the workplace. This knowledge may support education and prevention efforts led by occupational health services, aimed at strengthening trust in vaccination and promoting reliable health information among employees.

2. Materials and Methods

2.1. The Survey

The study was cross-sectional and conducted among adult residents of Poland between 13 January and 14 February 2022. Data were collected using an online questionnaire during the COVID-19 pandemic, distributed mainly through social media. Participants were informed about the purpose of the study, the voluntary nature of participation, and the anonymous handling of data before accessing the questionnaire. Informed consent was obtained electronically prior to participation. No personal identifying data were collected, and responses were stored in a secure database accessible only to the research team. The questionnaire was designed specifically for this study and distributed through multiple online channels, including the Polish Society of Lifestyle Medicine newsletter, university students' groups, and social media platforms such as Instagram, Facebook, and LinkedIn. The online survey format was chosen to enable rapid dissemination, reach a large and diverse group of respondents, and reduce face-to-face contact during the pandemic.

The minimum required sample size was estimated using the standard formula for cross-sectional and survey-based studies. The calculation was conducted to ensure adequate precision for estimating proportions related to COVID-19 vaccination status in the adult population in Poland. A reference sample size of $n = 371$ participants was obtained based on the following assumptions: a standard normal variate corresponding to a 95% confidence level ($Z = 1.96$), a type I error (α) of 5%, an expected population proportion of 59%, reflecting the estimated proportion of vaccinated individuals in Poland at the time of survey design, and an absolute precision (margin of error) of 5%.

We included only complete responses without internal contradictions. In total, 7018 questionnaires were analyzed. The questionnaire is provided as Supplementary Materials to this manuscript.

2.2. Etics

On 11 September 2023, the Bioethics Committee of the Medical University of Warsaw confirmed that the study meets ethical research standards and therefore does not require additional authorization. The project was registered under the reference number AKBE/259/2023.

2.3. Data Analysis

Source data were archived in Microsoft Excel (Microsoft Corporation, Washington, DC, USA). Categorical measures are expressed as percent distributions. Survey data were processed in Python 3.8 (pandas, SciPy).

Perceived changes in sleep quality, mental health, physical activity, and dietary habits during the COVID-19 pandemic were treated as ordinal variables and assessed using an 11-point Likert-type scale ranging from −5 (significant worsening) to +5 (significant improvement), with 0 indicating no change compared with the pre-pandemic period. Each domain (sleep, mental health, physical activity, and diet) was measured using a single-item question referring to the respondent's subjective perception of change during the pandemic compared with the pre-pandemic period. The scale allowed respondents to indicate both the direction and magnitude of perceived change. These measures were designed to assess population-level perceived impact rather than clinical symptom severity. For analytical purposes, distributions of responses were compared across employment categories (services, industry, agriculture, unemployed).

Associations between employment category and perceived changes in sleep, mental health, physical activity, and diet were examined using chi-squared tests of independence applied to contingency tables. Exposure to COVID-19 vaccine-related misinformation was quantified using a misinformation exposure index (IE), constructed as the sum of "agree" responses to eight false vaccine-related statements, with one point assigned per statement (range: 0–8). Higher scores indicated greater acceptance of misinformation. Due to the non-normal distribution of the index, differences between vaccinated and unvaccinated participants were assessed using the Mann–Whitney U test, conducted separately for each employment category and for the total sample. A two-sided significance level of $p \leq 0.05$ was adopted; exact *p*-values are reported.

To control for potential confounding factors, a multivariable logistic regression analysis was performed with COVID-19 vaccination status (vaccinated vs. unvaccinated) as the dependent variable. Independent variables included the misinformation exposure index (IE), age group (≤29, 30–44, 45–59, ≥60 years), sex, education level, and employment sector. Independent variables were selected a priori based on theoretical relevance and previously reported associations with vaccination behavior, including sociodemographic characteristics and exposure to misinformation. All variables were entered simultaneously into the model. The misinformation exposure index (IE) was included as a continuous variable. Odds ratios (ORs) with 95% confidence intervals (95% CI) were calculated. The reference categories were age ≤ 29 years, female sex, secondary education, and employment in the services sector. Only complete cases were included in the regression analysis; observations with missing data in variables included in the model were excluded using listwise deletion. Model fit was assessed using the likelihood ratio test and pseudo R^2. A two-sided *p*-value ≤ 0.05 was considered statistically significant.

3. Results

3.1. Characteristics

Females made up the majority of the sample, 76.9% (n = 5396), while males accounted for 22.4% (n = 1575), and 0.7% (n = 47) did not report their sex. Regarding infection prevention, 81.8% (n = 5742) of respondents were vaccinated against COVID-19, and 18.2% (n = 1276) were not. Participants were mainly from younger and middle-aged bands: ≤29 years, 44.1% (n = 3096), and 30–44 years, 47.0% (n = 3300). Older groups were less represented (45–59 years, 8.1%, n = 568; ≥60 years, 0.8%, n = 54), which reflects the working-age profile of the sample and fits the occupational health perspective.

Regarding the family status, the largest share reported being married 41.6% (n = 2916), followed by single 29.3% (n = 2054) and cohabiting 25.8% (n = 1808); divorced 3.2% (n = 227) and widowed 0.2% (n = 13) were less common. Educational attainment was high: tertiary 72.5% (n = 5087) and secondary 25.1% (n = 1764) dominated over other levels. This pattern may correspond to greater health awareness and more frequent use of reliable health information sources, which is relevant when interpreting attitudes toward vaccination and misinformation.

https://doi.org/10.3390/covid6030032

Most participants worked in the services sector, 75.4% (n = 5291). Smaller shares were unemployed, 13.9% (n = 975); worked in industry, 10.1% (n = 711); and worked in agriculture, 0.6% (n = 41). This mix mirrors employment in large urban areas and may be linked to different occupational risks and information channels at the workplace. Place of residence also shows a strong urban profile: cities >500,000 residents 45.2% (n = 3170), with notable shares from 150,000–500,000 16.5% (n = 1158), ≤50,000 13.2% (n = 925), and 50,000–150,000 12.1% (n = 846); rural areas 13.1% (n = 919). This urban-centered composition often implies different access to health services and a different information environment compared with rural settings. Table 1 shows sociodemographic characteristics of the study population.

Table 1. Sociodemographic characteristics of the study population (n = 7018).

Variable	Category	n	%
Sex	Female	5396	76.9
	Male	1575	22.4
	Not reported	47	0.7
Age group	≤29 years	3096	44.1
	30–44 years	3300	47.0
	45–59 years	568	8.1
	≥60 years	54	0.8
Education	Tertiary	5087	72.5
	Secondary	1764	25.1
	Other/not reported	167	2.4
Employment sector	Services	5291	75.4
	Industry	711	10.1
	Agriculture	41	0.6
	Unemployed	975	13.9
Place of residence	>500,000 residents	3170	45.2
	150,000–500,000	1158	16.5
	50,000–150,000	846	12.1
	≤50,000	925	13.2
	Rural	919	13.1
Vaccination status	Vaccinated	5742	81.8
	Unvaccinated	1276	18.2

In terms of lifestyle, 57.8% (n = 4056) reported leading a healthy lifestyle. Self-rated health was generally positive: very good 42.7% (n = 3000) and good 43.9% (n = 3079) together formed the majority, with smaller shares for excellent 6.6% (n = 461), fair 6.2% (n = 435), and poor 0.6% (n = 43). Compared with the previous year, 57.8% (n = 4058) rated their health as "the same or almost the same", 19.5% (n = 1369) as "somewhat worse", 13.6% (n = 954) as "somewhat better", 6.4% (n = 452) as "much better", and 2.6% (n = 185) as "much worse". This overall stability suggests adaptation to post-pandemic conditions, while acknowledging persisting individual differences in perceived health.

3.2. Impact of the COVID-19 Pandemic on Sleep, Mental Health, Physical Activity, and Diet

The collected information on the impact of the COVID-19 pandemic on sleep, mental health, physical activity, and diet is presented in Table 2. Statistical analysis showed that the employment category was significantly associated with how participants rated the pandemic's impact on sleep quality, mental health, and diet. Differences in physical activity did not reach statistical significance. Worsening sleep was most often reported by the unemployed, among whom more than half noted a negative impact. Mental health also differed by employment sector; declines were most frequently reported by the unemployed and least often by those working in agriculture. For physical activity, the pandemic reduced activity to a similar degree across sectors. Worsening of dietary habits was most common among the unemployed and industry workers, whereas respondents in agriculture most often reported no change or even improvement.

Table 2. Impact of the COVID-19 pandemic on sleep, mental health, physical activity, and diet.

Employment	Lifestyle	−5	−4	−3	−2	−1	0	1	2	3	4	5
Unemployed	Mental health	16.5%	11.4%	15.3%	15.0%	14.7%	16.3%	3.0%	2.9%	1.5%	1.2%	2.3%
	Sleep	4.1%	4.0%	8.7%	10.3%	7.8%	43.8%	5.7%	6.1%	4.4%	2.8%	2.4%
	Physical activity	9.7%	8.8%	13.8%	13.5%	10.8%	23.1%	5.3%	5.3%	4.1%	2.4%	3.1%
	Diet	2.6%	5.0%	9.0%	9.0%	8.2%	37.0%	8.9%	7.8%	6.4%	3.5%	2.6%
Industry	Mental health	9.4%	7.3%	13.5%	16.6%	18.3%	23.5%	2.7%	2.7%	2.1%	2.7%	1.3%
	Sleep	3.1%	2.8%	6.8%	7.3%	6.8%	58.4%	3.8%	3.4%	3.1%	2.4%	2.3%
	Physical activity	8.9%	6.3%	12.2%	13.6%	11.3%	28.0%	5.3%	5.9%	3.4%	2.1%	3.0%
	Diet	1.8%	3.2%	5.1%	8.6%	8.4%	44.4%	8.4%	8.2%	5.6%	3.1%	3.1%
Agriculture	Mental health	14.6%	4.9%	19.5%	14.6%	4.9%	22.0%	2.4%	4.9%	4.9%	2.4%	4.9%
	Sleep	4.9%	2.4%	2.4%	12.2%	7.3%	48.8%	2.4%	4.9%	4.9%	0.0%	9.8%
	Physical activity	9.8%	2.4%	14.6%	4.9%	14.6%	26.8%	7.3%	4.9%	2.4%	2.4%	9.8%
	Diet	7.3%	0.0%	2.4%	4.9%	7.3%	41.5%	4.9%	19.5%	4.9%	4.9%	2.4%
Services	Mental health	9.2%	8.4%	13.8%	18.7%	17.4%	22.4%	2.6%	2.2%	1.8%	1.9%	1.7%
	Sleep	2.9%	2.7%	6.2%	8.1%	8.0%	56.1%	3.2%	4.1%	3.0%	2.4%	3.4%
	Physical activity	7.7%	6.8%	10.6%	15.6%	11.6%	27.6%	5.3%	5.5%	3.8%	2.4%	3.2%
	Diet	1.9%	3.1%	5.2%	7.5%	8.5%	46.5%	7.7%	7.7%	5.4%	3.1%	3.3%

Notably, 2014 (28.7%) people reported that all four aspects worsened, while 1175 (16.75%) said that all four improved.

3.3. Impact of Misinformation on Vaccination Decisions

An index of exposure (IE) to misinformation was constructed as the sum of "Agree" responses (1 point each) to eight misinformation statements about COVID-19 vaccines (range 0–8; higher scores indicate greater acceptance of misinformation). The analysis was performed across four employment groups: services, industry, agriculture, and unemployed. For each group, mean IE scores were compared between vaccinated and unvaccinated respondents. In univariate logistic regression analysis, the misinformation exposure index (IE) was strongly associated with vaccination status (OR = 0.32; 95% CI: 0.30–0.34; $p < 0.001$). The magnitude and direction of the association remained virtually unchanged in the multivariable model adjusted for age, sex, education, and employment sector (adjusted OR = 0.32; 95% CI: 0.30–0.34; $p < 0.001$), suggesting that adjustment for potential confounders did not materially change the association. Detailed data are presented in Table 3.

Table 3. Impact of misinformation on vaccination decisions (IE—index of exposure; V—vaccinated; UV—unvaccinated).

Employment	Vaccinated	IE (V)	Unvaccinated	IE (UV)	Difference	95% CI	*p*-Value
Services	4345	0.65	946	2.34	1.69	1.60–1.78	<0.001
Industry	574	0.68	137	2.34	1.65	1.38–1.92	<0.001
Agriculture	30	0.9	11	3.18	2.28	0.25–2.40	<0.001
Unemployed	793	0.7	182	2.16	1.46	1.15–1.77	<0.001
Summary	5742	0.66	1276	2.32	1.66	1.57–1.75	<0.001

In every employment group, unvaccinated individuals had higher mean misinformation scores than those who were vaccinated. The largest differences were observed among the unemployed and in agriculture, with moderate gaps in services and industry. These findings indicate a strong association between misinformation acceptance and being unvaccinated across all employment sectors.

3.4. Multivariable Logistic Regression Analysis Decisions

Multivariable logistic regression analysis was performed to examine whether acceptance of COVID-19 vaccine-related misinformation remained independently associated with vaccination status after adjustment for age group, sex, education level, and employment sector. Results are shown in Table 4. Higher misinformation exposure index (IE) scores were strongly and independently associated with lower odds of COVID-19 vaccination (OR = 0.32; 95% CI: 0.30–0.34; $p < 0.001$). Each additional misinformation statement accepted was associated with a substantial reduction in the likelihood of being vaccinated.

Table 4. Multivariable logistic regression analysis of factors associated with COVID-19 vaccination.

Variable	OR	95% CI	*p*-Value
Misinformation index (IE)	0.32	0.30–0.34	<0.001
Age 30–44 vs. $\leq$29	1.06	0.90–1.25	0.478
Age 45–59 vs. $\leq$29	1.52	1.11–2.09	0.010
Age $\geq$ 60 vs. $\leq$29	2.71	0.92–7.92	0.069
Male vs. Female	0.78	0.66–0.92	0.004
Education: Primary vs. Secondary	3.67	0.75–17.93	0.108
Education: Higher vs. Secondary	1.50	0.84–2.69	0.169
Education: Vocational vs. Secondary	1.95	0.80–4.75	0.139
Employment: Industry vs. Services	0.95	0.69–1.30	0.741
Employment: Agriculture vs. Services	0.83	0.32–2.13	0.695
Employment: Unemployed vs. Services	0.99	0.79–1.25	0.957

(Reference categories: age $\leq$ 29 years; female; secondary education; services sector. Model adjusted for all variables listed. Pseudo R^2 = 0.27. All tests two-sided.

Participants aged 45–59 years had significantly higher odds of vaccination compared with those aged $\leq$29 years (OR = 1.52; 95% CI: 1.11–2.09; $p = 0.010$), whereas a similar trend was observed for participants aged $\geq$60 years, although it did not reach statistical significance. Male participants were less likely to be vaccinated compared with females (OR = 0.78; 95% CI: 0.66–0.92; $p = 0.004$). Education level and employment sector were not independently associated with vaccination status after adjustment for other variables. The model demonstrated good overall fit (Pseudo $R^2 = 0.27$; likelihood ratio test $p < 0.001$).

4. Discussion

The results of our study show that the COVID-19 pandemic has a major impact on key lifestyle areas among Polish adults, such as sleep quality, mental health, physical activity, and dietary habits. The scale of these changes varied depending on employment status. At the same time, a strong and consistent association was found between acceptance of the vaccine disinformation and the decision not to get vaccinated against COVID-19, regardless of the employment sector. These findings highlight the importance of an occupational health perspective, which allows for assessment of how working conditions, job stability, and the information environment shape health-promoting behaviors.

Sleep disturbances and worsening of mental health are among the most frequently mentioned phenomena describing the consequences of the COVID-19 pandemic in the literature [19–21]. Our results confirm these observations and indicate that the negative impact of the pandemic on sleep was particularly intensified among unemployed individuals. Lockdown-related disruptions to daily routines, increased screen exposure, emotional stress, and financial insecurity may all explain this decline. The loss of regular time structure and increased economic vulnerability can disturb circadian rhythm regulation, increasing the risk of insomnia symptoms [11,22]. Professional activity, even when performed remotely, may have acted as a stabilizing factor by imposing a daily routine and limiting the escalation of sleep problems [23]. The obtained results are consistent with both international and national studies reporting a high prevalence of sleep disorders during the pandemic [24] and emphasizing the role of employment status in their severity [22,25,26]. At the same time, the distinction observed between studies conducted in different countries [27,28] may result from the lockdown conditions, the scope of social support, as well as cultural factors that modulated the population's response to pandemic stress.

During the first year of the pandemic, an increased incidence of depressive symptoms and anxiety disorders was observed [10]. Longitudinal meta-analyses comparing data from before and during the pandemic confirmed an overall deterioration in the population's mental health, especially during the period of strict restrictions [17]. Studies show that this deterioration in mental health may have resulted from increased stress and anxiety related to the virus outbreak, forced lockdowns, and economic instability [9].

Against this background of overall psychological burden, employment status appears to have played an important modifying role. In our study, mental well-being worsened most often among unemployed individuals and least often among farmers. Similar patterns were observed in international studies, where unemployment correlated with worsening mental health [9,29]. These results can be interpreted in light of chronic stress theory, according to which job loss, financial insecurity, and reduced social contact are strong stressors that increase the risk of depressive and anxiety symptoms [30,31]. In addition, unemployment may have been associated with greater exposure to social media, which previous studies have identified as an important source of information overload and mental distress during the pandemic [32].

In contrast to sleep and mental health, levels of physical activity deteriorated to a similar extent across all analyzed employment sectors. This suggests that the pandemic acted as a universal limiting factor in this area. Sanitary restrictions, the closure of sports facilities, remote work, and reduced daily mobility affected broad social groups, regardless of occupation [33]. The lack of significant sectoral differences may also indicate that factors such as previous exercise habits, gender, and education levels played a greater role than the employment category itself [34]. At the same time, numerous studies emphasize the protective role of physical activity for mental health [35], suggesting that its reduction may have indirectly contributed to the observed deterioration in mental well-being during the pandemic.

Changes in the consumption of specific food products during the pandemic varied across countries and populations, but concerned the consumption of fruits and vegetables, processed meat, dairy, grains, frozen products and ready-made meals [36]. A trend toward a deterioration in eating habits [37] and weight gain [38] was observed worldwide. In our study, negative dietary changes were most frequently reported by unemployed individuals and industrial workers, while farmers had a relatively high proportion of responses indicating no change or even improvement in their diet. It can be assumed that people working in agriculture, who usually maintain a more regular lifestyle and have easier access to fresh foods, were less exposed to negative dietary changes during the pandemic. A similar relationship was observed in Italy, where people sourcing food more frequently from local farmers had lower BMI levels [14].

The pandemic affected the food environment by changing product availability, purchasing behaviors, and the frequency of home cooking [39]. Stress, financial instability, and changes in work organization may have encouraged people to reach highly processed foods and increase their alcohol consumption, as observed in many countries [36]. Our results are consistent with these observations, while emphasizing that job stability and access to local food sources may have acted as protective factors against negative dietary changes.

One of the key findings of this study is the consistently higher level of acceptance of misinformation about vaccinations among unvaccinated individuals, regardless of the employment sector. This suggests that misinformation is an important factor influencing health decisions, operating across professional boundaries. The mechanisms behind this phenomenon can be interpreted in light of cognitive simplification theory and decision-making heuristics [40]. In conditions of uncertainty and information overload, simple, emotionally charged messages—characteristics of misinformation—may be easier to absorb than complex scientific information. Social media platforms have facilitated the formation of so-called information bubbles, in which false content has been repeatedly reinforced, potentially leading to the persistence of vaccine skepticism [41].

Both our results and evidence from other countries suggest that employment status and work environment can modify exposure to misinformation, while the underlying mechanism of its impact on vaccination decisions remains similar [42,43]. This highlights the need for information strategies that not only correct false messages but also strengthen trust in public health institutions and reliable sources of information.

5. Limitations

The study has several limitations. Firstly, its cross-sectional design does not allow for conclusions about causal relationships. Therefore, the observed associations between misinformation acceptance, lifestyle changes, and vaccination status should be interpreted as correlational rather than causal. Secondly, the data are based on self-reported statements, which carry the risk of memory errors and biased responses. This may have led to over- or underestimation of perceived changes in sleep, mental health, physical activity, and diet, as well as socially desirable reporting of vaccination status. Thirdly, the survey was conducted online and distributed via social media, resulting in a convenience sample that is not nationally representative and may be subject to selection bias, as reflected in the overrepresentation of women and individuals with higher education. As a result, the findings may not be fully generalizable to the entire adult population of Poland, particularly to groups less active on social media or with lower digital literacy. These limitations should be considered when interpreting the results, while emphasizing the large sample size and wide range of variables analyzed.

6. Conclusions

Our findings have practical value. Communication efforts should not only debunk false claims, but also stress that a healthy lifestyle and vaccination are complementary, not competing, strategies. Framing them together may help reach people who care about their health yet undervalue the role of vaccines. In our study, acceptance of misinformation was strongly linked to being unvaccinated; across all employment groups, unvaccinated respondents scored higher on the nine-point misinformation index than vaccinated respondents.

Importantly, multivariable logistic regression analysis confirmed that misinformation acceptance remained a strong and independent predictor of vaccination status even after adjustment for age, sex, education level, and employment sector. This indicates that the observed association cannot be explained solely by basic sociodemographic differences.

The largest gaps appeared among the unemployed and those working in agriculture, with smaller—though still present—differences in services and industry. This pattern suggests that exposure to false claims meaningfully influences vaccination decisions be-

https://doi.org/10.3390/covid6030032

yond basic demographics and supports targeted workplace information and education, especially in sectors with the highest misinformation burden. From a broader public health perspective, increasing vaccination coverage should therefore involve not only improving vaccine accessibility but also strengthening digital health literacy and resilience to misinformation in the general population. Public health authorities should consider systematic monitoring of circulating misinformation and implement rapid, evidence-based responses to emerging false narratives, particularly in online and social media environments.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/covid6030032/s1, File S1: Questionnaire form.

Author Contributions: Conceptualization, K.K.; methodology, K.K. and J.C.; software, K.K.; validation, D.Ś.; formal analysis, K.K., J.C. and D.Ś.; investigation, K.K.; resources, K.K.; data curation, K.K.; writing—original draft preparation, K.K. and J.C.; writing—review and editing, D.Ś.; visualization, K.K.; supervision, D.Ś.; project administration, K.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and the Bioethics Committee of the Medical University of Warsaw confirmed that the study meets ethical research standards and does not require additional ethical approval. The project was registered under reference number AKBE/259/2023 on 11 September 2023.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data availability available from the 3rd Department of Internal Diseases and Cardiology, Międzylesie Specialist Hospital in Warsaw, Medical University of Warsaw, upon reasonable written request.

Acknowledgments: The authors would like to thank all individuals who contributed to the development of the study concept and questionnaire design, in particular Artur Mamcarz, Alicja Monika Jodczyk, Piotr Długołęcki, Sara Emerla, Wiktoria Stańska, Przemysław Seweryn Kasiak, Jakub S. Gąsior, and Damian Parol, for their valuable input and support in the preparatory phase of the project.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Haas, E.J.; Angulo, F.J.; McLaughlin, J.M.; Anis, E.; Singer, S.R.; Khan, F.; Brooks, N.; Smaja, M.; Mircus, G.; Pan, K.; et al. Impact and effectiveness of mRNA BNT162b2 vaccine against SARS-CoV-2 infections and COVID-19 cases, hospitalisations, and deaths following a nationwide vaccination campaign in Israel. *Lancet* **2021**, *397*, 1819–1829. [CrossRef]
2. MacDonald, N.E. Vaccine hesitancy: Definition, scope and determinants. *Vaccine* **2015**, *33*, 4161–4164. [CrossRef]
3. Statement on the Fifteenth Meeting of the IHR (2005) Emergency Committee on the COVID-19 Pandemic. Available online: https://www.who.int/news/item/05-05-2023-statement-on-the-fifteenth-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-coronavirus-disease-(covid-19)-pandemic (accessed on 16 November 2025).
4. WHO COVID-19 Dashboard, Summary. Available online: https://data.who.int/dashboards/covid19/summary (accessed on 16 November 2025).
5. Ogólnopolski Program Zwalczania Chorób Infekcyjnych, Raport Epidemiologiczny—Wrzesień 2025. Available online: https://opzci.pl/materialy/ (accessed on 16 November 2025).
6. Cinelli, M.; Quattrociocchi, W.; Galeazzi, A.; Valensise, C.M.; Brugnoli, E.; Schmidt, A.L.; Zola, P.; Zollo, F.; Scala, A. The COVID-19 social media infodemic. *Sci. Rep.* **2020**, *10*, 16598. [CrossRef]
7. Loomba, S.; de Figueiredo, A.; Piatek, S.J.; de Graaf, K.; Larson, H.J. Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nat. Hum. Behav.* **2021**, *5*, 337–348. [CrossRef]
8. Roozenbeek, J.; Schneider, C.R.; Dryhurst, S.; Kerr, J.; Freeman, A.L.J.; Recchia, G.; van der Bles, A.M.; van der Linden, S. Susceptibility to misinformation about COVID-19 around the world. *R. Soc. Open Sci.* **2020**, *7*, 201199. [CrossRef]

9. Xiong, J.; Lipsitz, O.; Nasri, F.; Lui, L.M.W.; Gill, H.; Phan, L.; Chen-Li, D.; Iacobucci, M.; Ho, R.; Majeed, A.; et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *J. Affect. Disord.* **2020**, *277*, 55–64. [CrossRef] [PubMed]
10. Santomauro, D.F.; Mantilla Herrera, A.M.; Shadid, J.; Zheng, P.; Ashbaugh, C.; Pigott, D.M.; Abbafati, C.; Adolph, C.; Amlag, J.O.; Aravkin, A.Y.; et al. Global prevalence and burden of depressive and anxiety disorders in 2020 due to the COVID-19 pandemic. *Lancet* **2021**, *398*, 1700–1712. [CrossRef] [PubMed]
11. Cellini, N.; Canale, N.; Mioni, G.; Costa, S. Changes in sleep pattern, sense of time and digital media use during COVID-19 lockdown in Italy. *J. Sleep Res.* **2020**, *29*, e13074. [CrossRef] [PubMed]
12. Alimoradi, Z.; Broström, A.; Tsang, H.W.H.; Griffiths, M.D.; Haghayegh, S.; Ohayon, M.M.; Lin, C.-Y.; Pakpour, A.H. Sleep problems during COVID-19 pandemic and its association to psychological distress: A systematic review and meta-analysis. *eClinicalMedicine* **2021**, *36*, 100916. [CrossRef]
13. Ammar, A.; Brach, M.; Trabelsi, K.; Chtourou, H.; Boukhris, O.; Masmoudi, L.; Bouaziz, B.; Bentlage, E.; How, D.; Ahmed, M.; et al. Effects of COVID-19 Home Confinement on Eating Behaviour and Physical Activity: Results of the ECLB-COVID19 International Online Survey. *Nutrients* **2020**, *12*, 1583. [CrossRef]
14. Di Renzo, L.; Gualtieri, P.; Pivari, F.; Soldati, L.; Attinà, A.; Cinelli, G.; Leggeri, C.; Caparello, G.; Barrea, L.; Scerbo, F.; et al. Eating habits and lifestyle changes during COVID-19 lockdown: An Italian survey. *J. Transl. Med.* **2020**, *18*, 229. [CrossRef] [PubMed]
15. Stockwell, S.; Trott, M.; Tully, M.; Shin, J.; Barnett, Y.; Butler, L.; McDermott, D.; Schuch, F.; Smith, L. Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: A systematic review. *BMJ Open Sport. Exerc. Med.* **2021**, *7*, e000960. [CrossRef] [PubMed]
16. Mattioli, A.V.; Sciomer, S.; Cocchi, C.; Maffei, S.; Gallina, S. Quarantine during COVID-19 outbreak: Changes in diet and physical activity increase the risk of cardiovascular disease. *Nutr. Metab. Cardiovasc. Dis.* **2020**, *30*, 1409–1417. [CrossRef]
17. Robinson, E.; Sutin, A.R.; Daly, M.; Jones, A. A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic. *J. Affect. Disord.* **2022**, *296*, 567–576. [CrossRef]
18. Cascini, F.; Pantovic, A.; Al-Ajlouni, Y.; Failla, G.; Ricciardi, W. Attitudes, Acceptance and Hesitancy among the General Population Worldwide to Receive the COVID-19 Vaccines and Their Contributing Factors: A Systematic Review. *eclinicalMedicine* **2021**, *17*, 3477–3494. [CrossRef] [PubMed]
19. Talevi, D.; Socci, V.; Carai, M.; Carnaghi, G.; Faleri, S.; Trebbi, E.; di Bernardo, A.; Capelli, F.; Pacitti, F. Mental health outcomes of the CoViD-19 pandemic. *Riv. Psichiatr.* **2020**, *55*, 137–144. [CrossRef]
20. Alimoradi, Z.; Gozal, D.; Tsang, H.W.H.; Lin, C.-Y.; Broström, A.; Ohayon, M.M.; Pakpour, A.H. Gender-specific estimates of sleep problems during the COVID-19 pandemic: Systematic review and meta-analysis. *J. Sleep Res.* **2022**, *31*, e13432. [CrossRef]
21. Mamun, M.A.; Al-Mamun, F.; Hosen, I.; Kaggwa, M.M.; Sikder, M.T.; Muhit, M.; Gozal, D. Prevalence and risk factors of sleep problems in Bangladesh during the COVID-19 pandemic: A systematic review and meta-analysis. *Sleep Epidemiol.* **2022**, *2*, 100045. [CrossRef]
22. Salfi, F.; Lauriola, M.; D'Atri, A.; Amicucci, G.; Viselli, L.; Tempesta, D.; Ferrara, M. Demographic, psychological, chronobiological, and work-related predictors of sleep disturbances during the COVID-19 lockdown in Italy. *Sci. Rep.* **2021**, *11*, 11416. [CrossRef]
23. Greissl, S.; Mergl, R.; Sander, C.; Hensch, T.; Engel, C.; Hegerl, U. Is unemployment associated with inefficient sleep habits? A cohort study using objective sleep measurements. *J. Sleep Res.* **2022**, *31*, e13516. [CrossRef]
24. Mandelkorn, U.; Genzer, S.; Choshen-Hillel, S.; Reiter, J.; Meira ECruz, M.; Hochner, H.; Kheirandish-Gozal, L.; Gozal, D.; Gileles-Hillel, A. Escalation of sleep disturbances amid the COVID-19 pandemic: A cross-sectional international study. *J. Clin. Sleep Med.* **2021**, *17*, 45–53. [CrossRef]
25. Lipert, A.; Musiał, K.; Rasmus, P. Working Mode and Physical Activity as Factors Determining Stress and Sleep Quality during COVID-19 Pandemic Lockdown in Poland. *Life* **2021**, *12*, 28. [CrossRef] [PubMed]
26. Alharbi, A.S.; Alshahrani, S.M.; Alsaadi, M.M.; Al-Jahdali, H.H.; Wali, S.O.; BaHammam, A.S. Sleep quality and insomnia during the COVID-19 lockdown among the Saudi public: A cross-sectional study. *Saudi Med. J.* **2021**, *42*, 384–390. [CrossRef] [PubMed]
27. Sansone, V.; Angelillo, S.; Paduano, G.; Pileggi, C.; Nobile, C.G.A.; Di Giuseppe, G. Quality of sleep after COVID-19 infection: A cross-sectional study in the Southern Italy. *Front. Psychiatry* **2024**, *15*, 1428423. [CrossRef]
28. Kantor, J.; Kantor, B.N.; Fortgang, R.G.; Pace-Schott, E.F. Sleep Quality Impairment Is Associated with Pandemic Attitudes During the Coronavirus Disease 2019 (COVID-19) Circuit Breaker Lockdown in England: A Cross-Sectional Study. *Front Public Health* **2022**, *10*, 819231. [CrossRef]
29. Mazza, C.; Ricci, E.; Biondi, S.; Colasanti, M.; Ferracuti, S.; Napoli, C.; Roma, P. A Nationwide Survey of Psychological Distress among Italian People during the COVID-19 Pandemic: Immediate Psychological Responses and Associated Factors. *Int. J. Environ. Res. Public Health* **2020**, *17*, 3165. [CrossRef]
30. Blomqvist, S.; Högnäs, R.S.; Virtanen, M.; LaMontagne, A.D.; Magnusson Hanson, L.L. Job loss and job instability during the COVID-19 pandemic and the risk of depression and anxiety among Swedish employees. *SSM Popul. Health* **2023**, *22*, 101424. [CrossRef] [PubMed]

31. Grace, M.K. The Contributions of Social Stressors and Coping Resources to Psychological Distress Among Those Who Experienced Furlough or Job Loss Due to COVID-19. *Work. Occup.* **2022**, *50*, 212–254. [CrossRef]
32. Gao, J.; Zheng, P.; Jia, Y.; Chen, H.; Mao, Y.; Chen, S.; Wang, Y.; Fu, H.; Dai, J. Mental health problems and social media exposure during COVID-19 outbreak. *PLoS ONE* **2020**, *15*, e0231924. [CrossRef]
33. Herbolsheimer, F.; Peters, A.; Wagner, S.; Willich, S.N.; Krist, L.; Pischon, T.; Nimptsch, K.; Gastell, S.; Brandes, M.; Brandes, B.; et al. Changes in physical activity and sedentary behavior during the first COVID-19 pandemic-restrictions in Germany: A nationwide survey. *BMC Public Health* **2024**, *24*, 433. [CrossRef]
34. Aragón-Vela, J.; Delgado-Floody, P.; Guzmán-Guzmán, I.P.; Salas-Sánchez, J.; Martínez-Redondo, M.; Zurita, M.L.; Sánchez, J.H.; Linares, A.J.C.; González, P.J.C.; Campos, M.A.S.E.; et al. Effect of COVID-19 confinement on physical activity patterns in relation to sociodemographic parameters in Spanish population. *J. Sports Med. Phys. Fit.* **2022**, *62*, 830–837. [CrossRef]
35. Leão, L.L.; Valadares WGde, A.; Silva, N.S.S.E.; Duarte, S.F.P.; de Paula, A.M.B.; Haikal, D.S.A.; Santos, S.H.S.; Soares, J.; Cruz, J.; Santos, J.; et al. Increased Depression and the Worsening of Depressive Symptoms Associated with Physical Inactivity during the COVID-19 Pandemic: A Two-Phase Cross-Sectional Study. *Behav. Sci.* **2023**, *13*, 340. [CrossRef]
36. Skotnicka, M.; Karwowska, K.; Kłobukowski, F.; Wasilewska, E.; Małgorzewicz, S. Dietary Habits before and during the COVID-19 Epidemic in Selected European Countries. *Nutrients* **2021**, *13*, 1690. [CrossRef] [PubMed]
37. González-Monroy, C.; Gómez-Gómez, I.; Olarte-Sánchez, C.M.; Motrico, E. Eating Behaviour Changes during the COVID-19 Pandemic: A Systematic Review of Longitudinal Studies. *Int. J. Environ. Res. Public Health* **2021**, *18*, 11130. [CrossRef]
38. Chew, H.S.J.; Lopez, V. Global Impact of COVID-19 on Weight and Weight-Related Behaviors in the Adult Population: A Scoping Review. *Int. J. Environ. Res. Public Health* **2021**, *18*, 1876. [CrossRef]
39. Żurek, J.; Rudy, M. Impact of the COVID-19 Pandemic on Changes in Consumer Purchasing Behavior in the Food Market with a Focus on Meat and Meat Products-A Comprehensive Literature Review. *Foods* **2024**, *13*, 933. [CrossRef]
40. Fuławka, K.; Hertwig, R.; Pachur, T. COVID-19 vaccine refusal is driven by deliberate ignorance and cognitive distortions. *NPJ Vaccines* **2024**, *9*, 167. [CrossRef]
41. Quon, C.M.; Walker, M.; Graves, L. The Influence of Mass Media on the COVID-19 Vaccination Decision-making Process: Prospective Survey-Based Study. *J. Med. Internet Res.* **2023**, *25*, e45417. [CrossRef]
42. Raut, A.; Samad, A.; Verma, J.; Kshirsagar, P. Acceptance, hesitancy and refusal towards COVID-19 vaccination. *Clin. Epidemiol. Glob. Health* **2023**, *21*, 101283. [CrossRef]
43. Wang, J.; Jing, R.; Lai, X.; Zhang, H.; Lyu, Y.; Knoll, M.D.; Fang, H. Acceptance of COVID-19 Vaccination during the COVID-19 Pandemic in China. *Vaccines* **2020**, *8*, 482. [CrossRef]