

## Research Letters







**Cite this article:** Coulaud P, Débarre F, Bolduc N, et al. Examining how young adults perceive, understand, and respond to SARS-CoV-2 variants in Canada and France: Implications for public health preparedness efforts. *Disaster Med Public Health Prep.* 17(e462), 1–5. doi: <https://doi.org/10.1017/dmp.2023.125>.

### Keywords:

COVID-19 variants; young adults; perceptions; awareness; Canada; France

**Corresponding author:** Pierre-Julien Coulaud;  
Email: [pierre-julien.coulaud@bccsu.ubc.ca](mailto:pierre-julien.coulaud@bccsu.ubc.ca)

# Examining How Young Adults Perceive, Understand, and Respond to SARS-CoV-2 Variants in Canada and France: Implications for Public Health Preparedness Efforts

Pierre-Julien Coulaud PhD<sup>1</sup> , Florence Débarre PhD<sup>2</sup> , Naseeb Bolduc MSc<sup>3</sup>, Devon Greyson PhD<sup>4</sup> , Jeffrey V. Lazarus PhD<sup>5</sup> , Marie Jauffret-Roustide PhD<sup>6</sup> , and Rod Knight PhD<sup>7</sup> 

<sup>1</sup>Department of Medicine, University of British Columbia, Vancouver, BC, Canada; <sup>2</sup>Institute of Ecology and Environmental Sciences of Paris (IEES-Paris, UMR 7618), CNRS, Sorbonne Université, UPEC, IRD, INRAE, Paris, France; <sup>3</sup>British Columbia Centre on Substance Use, Vancouver, BC, Canada; <sup>4</sup>School of Population and Public Health, University of British Columbia, Vancouver, BC, Canada; <sup>5</sup>Barcelona Institute for Global Health (ISGlobal), Hospital Clinic, University of Barcelona, Barcelona, Spain; <sup>6</sup>Centre d'Étude des Mouvements Sociaux (EHESS/CNRS UMR8044/INSERM U1276), Paris, France and <sup>7</sup>École de Santé Publique de l'Université de Montréal, Montréal, QC, Canada

How young adults (ages 18–29) perceive, understand, and respond to the emergence of new Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) variants has significant implications for how public health practitioners and decision makers should prepare for possible new variants of concern.<sup>1</sup> For example, previous research involving young adults from early phases of the pandemic showed that risk perception, personal affective responses (eg, protection of family/friends), and knowledge about coronavirus disease (COVID-19) are predictors for engagement with COVID-19 preventive behaviors (eg, social distancing), including willingness to be vaccinated.<sup>2–4</sup> These previous findings underscore the need for targeted public health campaigns that can increase young adults' knowledge about COVID-19 risks to improve their adherence to public health guidelines.

In the spring of 2021, a time at which the more severe Delta variant had become dominant,<sup>5</sup> most public health communication efforts continued to focus on increasing vaccination coverage over disseminating up-to-date information about the Delta variant.<sup>6,7</sup> At this time, even nations with well-resourced public health systems, including Canada and France, experienced significant difficulties in accurately tracking and communicating the spread of the Delta variant in *real time* (eg, difficulties in sequencing).<sup>8</sup> As a consequence, and especially at the beginning of the spread of the variant in these countries, we hypothesized that the resulting lack of public health communication messaging about the Delta variant meant that individuals needed to seek out information about risks on their own.

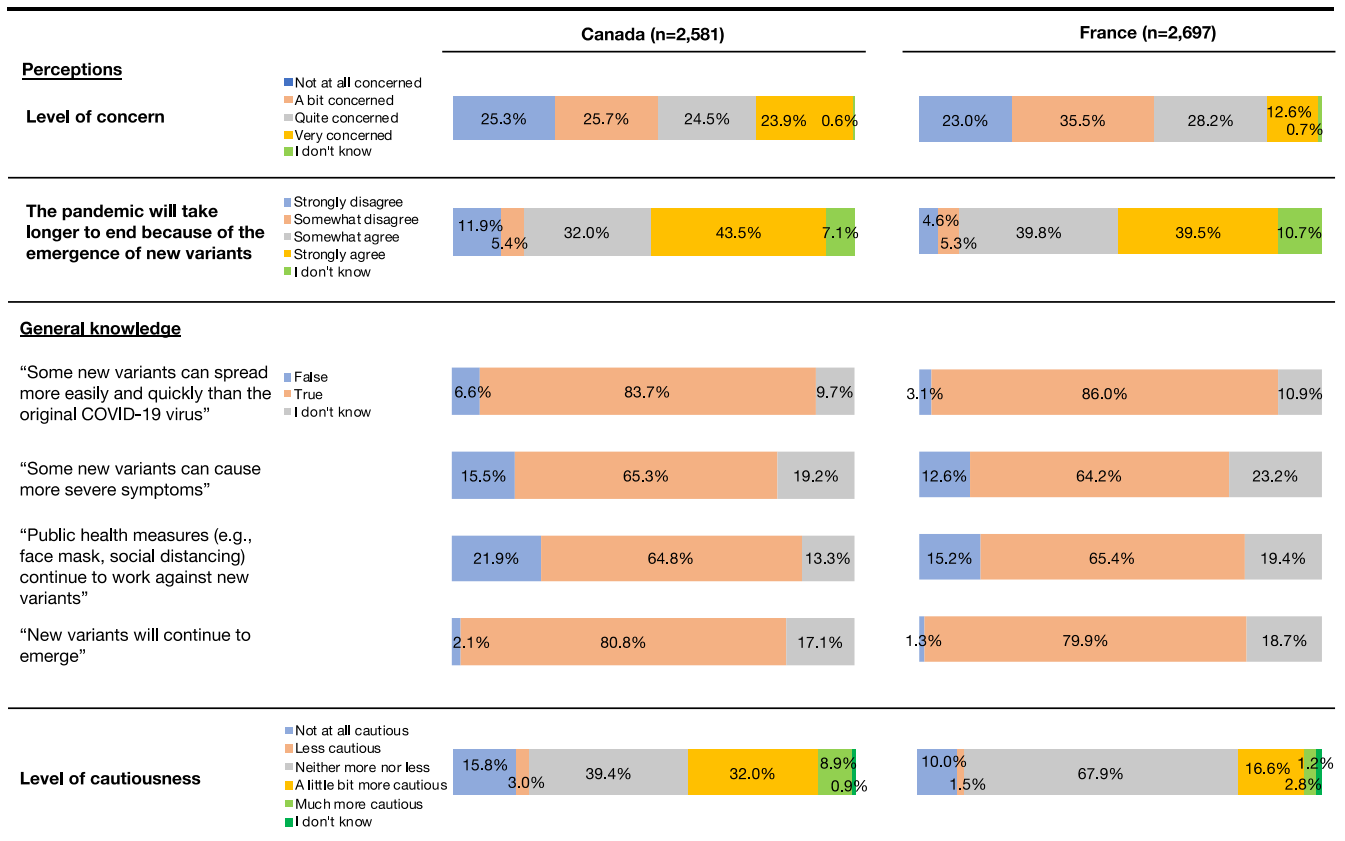
The objectives of this research letter are to describe the perceptions and understandings of young adults toward the emerging SARS-CoV-2 variants, and to examine how young adults' frequency of seeking COVID-19 information during this time influenced their level of cautiousness with regard to emerging variants.

## Methods

We conducted an online cross-sectional survey with young adults (ages 18–29) in Canada and France from July to November 2021, a period when the Delta variant had become dominant and preceding the spread of the Omicron variant that occurred in late 2021, early 2022.<sup>5</sup> Most participants (84.4%) were recruited via a spectrum of diverse online ads on social media platforms (Facebook, Instagram, Reddit). This study was approved by the University of British Columbia's Behavioral Research Ethics Board (H20-02053) and is reported following the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) guideline. Using both Canada and France census data, survey weights were applied to produce young adults' population-level estimates by age, gender, and province of residence to improve the representativeness of our sample.

Perceptions and attitudes toward the emerging SARS-CoV-2 variants at the time of the survey were self-reported measures. Change in level of cautiousness was assessed by asking the following question: *Has the emergence of new COVID-19 variants (since December 2020) made you more cautious around preventing your chance of getting or transmitting COVID-19?* The 5 response options were recoded into 2 categories: *decreased/no change* (“not at all,” “less,” and “neither more nor less cautious”) and *increased level of cautiousness* (“a little bit more,” and “much more cautious”). Participants who reported seeking for information about COVID-19 in

© The Author(s), 2023. Published by Cambridge University Press on behalf of the Society for Disaster Medicine and Public Health. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.



**Figure 1.** Perceptions, general knowledge, and level of cautiousness regarding the emergence of new COVID-19 variants among young adults in Canada and France.

the past 6 months daily were classified as regular information seekers and those who did on a weekly/monthly basis were classified as occasional. In each country, weighted multivariable logistic regression was performed to examine the association between seeking for COVID-19 information and increased level of cautiousness about emerging variants, controlling for demographics (eg, age, gender, education, living arrangements) and potential confounders (eg, COVID-19 testing, vaccination status).

## Results

A total of 5278 young adults (51.1% from France) were included. One quarter (23.9%) in Canada and 12.6% in France reported being very concerned about the emergence of SARS-CoV-2 variants (Figure 1). In both countries, more than 75% agreed that the COVID-19 pandemic will take longer to end because of new variants. High levels of general knowledge about new variants were observed in both countries (see Figure 1).

Overall, 41.3% in Canada and 19.7% in France indicated that they were more cautious with regard to COVID-19 risks due to the emerging variants (Table 1). After demographic adjustment, participants were more likely to report increased level of cautiousness about emerging variants when having a high level of concern (adjusted odds ratio [AOR], Canada: 95% CI: 5.56 [4.57-6.75]; France: 95% CI: 2.93 [2.42-3.55]) and occasionally or regularly seeking for COVID-19 information (AORs > 2 in both countries). However, those who reported not being vaccinated nor intended to be vaccinated against COVID-19 (Canada: 0.16 [0.10-0.27], France: 0.26 [0.19-0.35]) had lower odds of being more cautious due to the emerging variants. In both countries, we also

observed significant differences in terms of geography, gender, and sexual orientation, including those living in Quebec, those who self-identified as men, and those who self-identified as heterosexual as being less likely to be more cautious. In the French sample, those living in the northern regions and overseas, those who had attained lower education, and those living with their parents had higher odds of being more cautious.

## Discussion

While the cross-sectional study design does not allow us to infer causation, our findings provide a helpful snapshot into the perceptions, understandings, and responses regarding emerging SARS-CoV-2 variants among young adults during a time at which a more severe and transmissible variant became dominant. Specifically, we found that those who actively sought information about COVID-19 were more likely to report being cautious. As such, these findings suggest that acquiring information about SARS-CoV-2 variants might influence individual risk behavior change, thereby underscoring the importance for public health preparedness with regard to risk communication as new SARS-CoV-2 variants emerge. Consistent with previous studies conducted among health care workers,<sup>9,10</sup> young adults who were not vaccinated at the time of our survey and who intended to stay unvaccinated were less likely to be cautious as new variants emerged, highlighting how social patterns in risk perception may continue to replicate along lines of vaccination status—a particularly important finding given that future variants may disproportionately burden those who are not vaccinated (eg, via ease of transmission or severity of illness). Regardless, these

**Table 1.** Factors associated with level of caution with regard to the emerging COVID-19 variants among young adults in Canada and France: Results from weighted multivariable logistic regression models

	Canada		Level of cautiousness, n (column %)		P-value <sup>1</sup>	Multivariable analysis	France		Level of cautiousness, n (column %)		P-value <sup>1</sup>	Multivariable analysis
	N	Total	Decreased/ no change	Increased			N	Total	Decreased/ no change	Increased		
<b>All participants</b>	<b>2559</b>	<b>2559 (100)</b>	<b>1503 (58.7)</b>	<b>1056 (41.3)</b>			<b>2664 (100)</b>	<b>2140 (80.3)</b>	<b>524 (19.7)</b>			
Age (years)	2559				0.001		2664				< 0.001	
18-19		371 (14.5)	206 (13.7)	164 (15.6)		Ref.	454 (17.0)	345 (16.1)	109 (20.8)			Ref.
20-24		1080 (42.2)	606 (40.3)	475 (45.0)		1.18 [0.87-1.6]	1100 (41.3)	877 (41.0)	223 (42.5)			0.93 [0.69-1.24]
25-29		1108 (43.3)	691 (46.0)	417 (39.5)		0.97 [0.7-1.33]	1110 (41.7)	918 (42.9)	192 (36.7)			0.87 [0.63-1.21]
Gender identity	2559				< 0.001		2664				< 0.001	
Woman		984 (38.4)	462 (30.8)	521 (49.4)		Ref.	1228 (46.1)	950 (44.4)	278 (53.1)			Ref.
Man		1272 (49.7)	929 (61.8)	343 (32.5)		<b>0.55 [0.45-0.68]</b>	1312 (49.3)	1092 (51.0)	220 (42.0)			<b>0.7 [0.58-0.85]</b>
Non-binary/other gender minority <sup>§</sup>		303 (11.8)	111 (7.4)	192 (18.1)		1.01 [0.77-1.33]	124 (4.7)	99 (4.6)	25 (4.8)			0.95 [0.64-1.43]
Province or territory of residence <sup>¶</sup>	2559				< 0.001							
Ontario		989 (38.6)	537 (35.7)	452 (42.8)		Ref.						
Atlantic		155 (6.1)	68 (4.5)	87 (8.3)		<b>1.48 [1.07-2.05]</b>						
British Columbia and North Territories		349 (13.6)	176 (11.7)	173 (16.4)		<b>1.9 [1.4-2.59]</b>						
Prairies		503 (19.7)	318 (21.1)	186 (17.6)		1.05 [0.82-1.33]						
Quebec		563 (22.0)	405 (26.9)	158 (15.0)		<b>0.51 [0.4-0.64]</b>						
Region of residence <sup>^</sup>							2664				< 0.001	
Île-de-France							652 (24.5)	516 (24.1)	136 (25.9)			Ref.
North East							524 (19.7)	425 (19.9)	99 (18.8)			<b>1.38 [1.02-1.87]</b>
North West							442 (16.6)	351 (16.4)	90 (17.3)			<b>1.37 [1-1.86]</b>
Overseas departments							89 (3.3)	59 (2.8)	30 (5.7)			<b>2.46 [1.8-3.36]</b>
South East							534 (20.1)	443 (20.7)	92 (17.5)			1.01 [0.79-1.29]
South West							424 (15.9)	346 (16.2)	78 (14.9)			1.11 [0.85-1.45]
Area of living	2559				< 0.001		2664				0.002	
Urban		1959 (76.6)	1089 (72.4)	871 (82.5)		Ref.	1812 (68.0)	1433 (66.9)	379 (72.4)			Ref.
Rural		599 (23.4)	414 (27.6)	185 (17.5)		1.09 [0.86-1.38]	853 (32.0)	708 (33.1)	145 (27.6)			0.84 [0.68-1.04]
Sexual orientation	2499				< 0.001						< 0.001	
Straight/heterosexual		1385 (55.4)	990 (67.6)	395 (38.2)		Ref.	2572	1882 (73.1)	1535 (74.4)	346 (67.8)		Ref.
Bisexual		460 (18.4)	197 (13.5)	263 (25.4)		<b>1.51 [1.18-1.93]</b>	298 (11.6)	224 (10.8)	74 (14.5)			1.14 [0.89-1.46]
Gay/lesbian		256 (10.3)	111 (7.6)	145 (14.0)		<b>1.7 [1.19-2.43]</b>	200 (7.8)	146 (7.1)	54 (10.6)			<b>1.72 [1.24-2.38]</b>
Other sexual minority <sup>£</sup>		397 (15.9)	166 (11.3)	231 (22.4)		<b>1.32 [1.02-1.71]</b>	194 (7.5)	158 (7.6)	36 (7.1)			0.77 [0.54-1.1]
Ethno-racial identity (Canada only) <sup>§</sup>	2,502				< 0.001							
No racialized		2001 (80.0)	1196 (82.5)	806 (76.6)		Ref.						
Racialized		501 (20.0)	254 (17.5)	247 (23.4)		1.23 [0.97-1.56]						
Descendants of immigrants (France only) <sup>*</sup>							2664				0.3	

(Continued)

**Table 1.** (Continued)

	Canada		Level of cautiousness, n (column %)			Multivariable analysis	France		Level of cautiousness, n (column %)			Multivariable analysis
	N	Total	Decreased/ no change	Increased	P-value <sup>1</sup>	AOR [95% CI] <sup>2</sup>	N	Total	Decreased/ no change	Increased	P-value <sup>1</sup>	AOR [95% CI] <sup>2</sup>
No							1094 (41.0)	882 (41.2)	212 (40.4)			Ref.
Yes							880 (33.0)	696 (32.5)	184 (35.1)			0.87 [0.66-1.14]
Not reported							691 (25.9)	563 (26.3)	128 (24.5)			0.88 [0.72-1.07]
Education	2528				< 0.001		2620				0.008	
University		1327 (52.5)	675 (45.4)	652 (62.6)		Ref.	1785 (68.1)	1455 (69.1)	330 (64.2)			Ref.
High school or college		1201 (47.5)	812 (54.6)	389 (37.4)		0.92 [0.76-1.11]	835 (31.9)	652 (30.9)	184 (35.8)			<b>1.39 [1.11-1.74]</b>
Living arrangements	2441				0.7		2455				< 0.001	
Alone		348 (14.2)	209 (14.5)	138 (13.8)		Ref.	761 (31.0)	620 (31.5)	140 (29.0)			Ref.
Parents/family members		886 (36.3)	516 (35.8)	370 (37.0)		1.22 [0.93-1.6]	706 (28.8)	540 (27.4)	167 (34.5)			<b>1.41 [1.1-1.81]</b>
Partner/roommate/other		1207 (49.4)	715 (49.6)	492 (49.2)		1.04 [0.82-1.32]	989 (40.3)	812 (41.2)	176 (36.5)			0.99 [0.8-1.24]
COVID-19 testing	2530				< 0.001		2642				0.2	
Not tested		1520 (60.1)	916 (61.9)	604 (57.5)		Ref.	751 (28.4)	614 (29.0)	137 (26.2)			Ref.
Tested negative		941 (37.2)	517 (34.9)	424 (40.4)		1 [0.83-1.2]	1584 (59.9)	1258 (59.4)	326 (62.3)			1.14 [0.92-1.41]
Tested positive		69 (2.7)	47 (3.2)	22 (2.1)		1.05 [0.58-1.89]	308 (11.6)	248 (11.7)	60 (11.5)			1.04 [0.76-1.42]
COVID-19 vaccination status	2492				< 0.001		2509				< 0.001	
Vaccinated or would definitely/probably be		2008 (80.6)	1000 (68.3)	1007 (98.0)		Ref.	2058 (82.0)	1581 (78.6)	477 (95.7)			Ref.
No, definitely or probably not be vaccinated		484 (19.4)	463 (31.7)	21 (2.0)		<b>0.16 [0.1-0.27]</b>	452 (18.0)	430 (21.4)	22 (4.3)			<b>0.26 [0.19-0.35]</b>
Level of concern about COVID-19 variants	2547				< 0.001		2649				< 0.001	
Not at all/a bit concerned		1306 (51.3)	1088 (72.7)	218 (20.7)		Ref.	1560 (58.9)	1388 (65.3)	172 (33.0)			Ref.
Quite/very concerned		1241 (48.7)	408 (27.3)	834 (79.3)		<b>5.56 [4.57-6.75]</b>	1089 (41.1)	739 (34.7)	350 (67.0)			<b>2.93 [2.42-3.55]</b>
Seeking for COVID-19 information	2558				< 0.001		2663				< 0.001	
Never		172 (6.7)	158 (10.5)	14 (1.3)		Ref.	265 (9.9)	245 (11.4)	20 (3.9)			Ref.
Occasionally		1561 (61.0)	939 (62.5)	622 (58.9)		<b>2.12 [1.23-3.65]</b>	1849 (69.4)	1496 (69.9)	354 (67.5)			<b>2.26 [1.35-3.8]</b>
Regularly		825 (32.3)	404 (26.9)	420 (39.8)		<b>2.89 [1.66-5.02]</b>	549 (20.6)	399 (18.7)	150 (28.7)			<b>3.05 [1.79-5.22]</b>

Notes: Survey weights were used in the calculation of all percentages. 1: P-values calculated from Chi-squared test with Rao & Scott's second-order correction. 2: AOR = Adjusted Odds Ratio, CI = Confidence Interval. Bold: Statistically significant (p<0.05). \$Other gender identity included intersex, Two-spirit (only for Canada), and other gender identity with an open-text box. £Other sexual minority included asexual, pansexual, queer, Two-spirit (only for Canada) and other sexual identity with an open-text box. §Participants who selected any ethno-racial identity (one or more) other than white and those who selected Indigenous were classified as racialized. The category "non-racialized" includes those who selected "white" only. \*Due to the prohibition of collecting ethno-racial identity data in France, we created the variable "descendants of immigrants" based on the definition from the French National Institute of Statistics and Economic Studies (INSEE) as a proxy for ethno-racial identity. French participants who reported that at least one of their parents or two of their grandparents from the same side were born outside France or Europe were considered as descendants of immigrants. †Atlantic: New Brunswick, Newfoundland and Labrador, Prince Edward Island, Nova Scotia; Prairies: Alberta, Manitoba, Saskatchewan; Territories: Nunavut, Yukon, Northwest Territories. ^Nord Est: Grand-Est, Hauts-de-France, Bourgogne Franche-Comté; Sud Est: Auvergne-Rhône-Alpes, Provence-Alpes-Côte-d'Azur, Corse; Sud Ouest: Nouvelle Aquitaine, Occitanie; Ouest: Bretagne, Centre Val-de-Loire, Pays de la Loire, Normandie. Participants from overseas departments were included in the sub-category Sud Est.

findings underscore the importance of continuing to assess how social and behavioral patterns will impact future public health preparedness efforts regarding the risks of SARS-CoV-2 variants.

**Acknowledgments.** We thank the young adults who took part in the FOCUS survey as well as the current and past researchers and staff involved with this survey.

**Author contributions.** RK and MJR are the principal investigators of the FOCUS study from which these data were derived (<https://www.focus-study.me>). PJC and NB were responsible for data collection and survey administration. PJC conducted the statistical analysis. PJC and RK drafted the manuscript, and FD, DG, JVL, and MJR critically revised the manuscript. All authors read and approved the final manuscript.

**Funding statement.** This study (The FOCUS Study) is supported by the Canadian Institutes of Health Research (CIHR, Funding Reference Numbers: VR5 172673 and AWD-017639) and by the French National Research Agency (ANR-21-COVR-011).

PJC is supported by a Postdoctoral Fellowship Award from the CIHR (Grant # MFE – 176609), as well as funding was received by RK from CIHR (VR5-172673 and AWD-017639). NB's salary was supported by CIHR Grants VR5-172673 and AWD-017639. RK held a Scholar Award from the Michael Smith Foundation for Health Research (Grant # 16808), which supported their time and contributions to the study. The funders had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

**Competing interests.** The authors declare no conflicts of interest.

## References

1. **Yang XY, Gong RN, Sassine S, et al.** Risk perception of COVID-19 infection and adherence to preventive measures among adolescents and young adults. *Children*. 2020;7(12):311. doi: [10.3390/children7120311](https://doi.org/10.3390/children7120311)
2. **Nivette A, Ribeaud D, Murray A, et al.** Non-compliance with COVID-19-related public health measures among young adults in Switzerland: insights from a longitudinal cohort study. *Soc Sci Med*. 2021;268:113370. doi: [10.1016/j.socscimed.2020.113370](https://doi.org/10.1016/j.socscimed.2020.113370)
3. **Borges J, Byrne M.** Investigating COVID-19 risk perception and preventive behaviours in third-level students in Ireland. *Acta Psychol (Amst)*. 2022;224:103535. doi: [10.1016/j.actpsy.2022.103535](https://doi.org/10.1016/j.actpsy.2022.103535)
4. **Kollmann J, Kocken PL, Syurina EV, Hilverda F.** The role of risk perception and affective response in the COVID-19 preventive behaviours of young adults: a mixed methods study of university students in the Netherlands. *BMJ Open*. 2022;12(1):e056288. doi: [10.1136/bmjopen-2021-056288](https://doi.org/10.1136/bmjopen-2021-056288)
5. **World Health Organization.** Tracking SARS-CoV-2 Variants. Published 2021. Accessed November 22, 2022. <https://www.who.int/activities/tracking-SARS-CoV-2-variants>
6. **Del Rio C, Malani PN, Omer SB.** Confronting the Delta variant of SARS-CoV-2, summer 2021. *JAMA*. 2021;326(11):1001-1002. doi: [10.1001/jama.2021.14811](https://doi.org/10.1001/jama.2021.14811)
7. **Blanquart F, Abad C, Ambroise J, et al.** Characterisation of vaccine breakthrough infections of SARS-CoV-2 Delta and Alpha variants and within-host viral load dynamics in the community, France, June to July 2021. *Eurosurveillance*. 2021;26(37):2100824. doi: [10.2807/1560-7917.ES.2021.26.37.2100824](https://doi.org/10.2807/1560-7917.ES.2021.26.37.2100824)
8. **Maxmen A.** Why US coronavirus tracking can't keep up with concerning variants. *Nature*. 2021;592(7854):336-337. doi: [10.1038/d41586-021-00908-0](https://doi.org/10.1038/d41586-021-00908-0)
9. **Temsah MH, Barry M, Aljamaan F, et al.** SARS-CoV-2 B.1.1.7 UK variant of concern lineage-related perceptions, COVID-19 vaccine acceptance and travel worry among healthcare workers. *Front Public Health*. 2021;9:686958. doi: [10.3389/fpubh.2021.686958](https://doi.org/10.3389/fpubh.2021.686958)
10. **Sawan HM, Al Omari SM, Al Bahar F, Karasneh R, Kumar N, ed.** Assessment of Jordanian health care professionals' perception towards new COVID-19 variants of concern. *PLoS One*. 2022;17(11):e0265797. doi: [10.1371/journal.pone.0265797](https://doi.org/10.1371/journal.pone.0265797)