StatCan COVID-19:
Data to Insights for a Better Canada

COVID-19 mortality among racialized populations in Canada and its association with income

by Shikha Gupta and Nicole Aitken

Statistics Canada   Statistique Canada

Canada

How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca.

You can also contact us by

Email at infostats.@statcan.gc.ca

Telephone, from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following numbers:

- Statistical Information Service   1-800-263-1136
- National telecommunications device for the hearing impaired   1-800-363-7629
- Fax line   1-514-283-9350

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under "Contact us" > "Standards of service to the public".

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

COVID-19 mortality among racialized populations in Canada and its association with income

by **Shikha Gupta and Nicole Aitken**

A person's ethno-cultural background along with their socioeconomic status are associated with their health. Research has shown that racialized groups face disadvantages especially in the areas of income, employment, and housing which can lead to poor health outcomes. The current COVID-19 pandemic highlights the health risks faced by racialized populations in Canada.

Area-based studies have shown higher COVID-19 mortality rates in low income neighbourhoods and neighbourhoods with high ethno-cultural composition compared to neighbourhoods of high income or lower ethno-cultural composition (Public Health Agency of Canada, 2021; Subedi, Greenberg & Turcotte, 2020). However, only a few studies have disaggregated COVID-19 mortality rates by racialized populations and low income status. Previous studies on COVID-19 among racialized and low income populations measure these two factors in isolation (Gold et al., 2020; Rogers et al., 2020; Xu et al., 2021; Hou, Frank & Schimmele, 2020).

Currently, it is unknown in Canada if the higher rates of COVID-19 mortality among racialized populations are associated with the higher proportion of racialized groups living in low income or if there is a combined effect which puts them at a higher risk for COVID-19 mortality. This study estimated COVID-19 mortality rates among racialized populations in Canada in 2020 and further explored the impact of individual's low income status on the mortality for racialized populations after accounting for other known risk factors such as age, sex, dwelling type and housing suitability.

The study uses the newly released 2016 Canadian Census Health and Environmental Cohort (CanCHEC) data which combined the long-form 2016 Census with the Canadian Vital Statistics-Death Database from 2016-2020. Age-standardized COVID-19 mortality rates were calculated for individuals living in private dwellings (98% of the population) at the time of 2016 Census disaggregated by sex, low income status based on after tax income, and racialized group (e.g. South Asian, Black, Chinese). Additionally, a moderated multivariable logistic regression was used to model the direct effects and interaction between low income status and different racialized populations on the likelihood of COVID-19 death. Please refer to the Data source, Concepts and Methods section for a more detailed explanation of this technique.

Some racialized populations in Canada had significantly higher mortality rates due to COVID-19 than non-racialized and non-Indigenous populations in 2020

Overall, the COVID-19 mortality rate was significantly higher for racialized populations (31 deaths per 100,000 population) compared to the non-racialized and non-Indigenous population (22 deaths per 100,000 population). The analysis of COVID-19 mortality rates among different racialized populations revealed that Black people had the highest age-standardized COVID-19 mortality rate (49 deaths per 100,000 population), followed by South-Asians (31 deaths per 100,000 population), and Chinese (22 deaths per 100,000 population). The mortality rate ratio between Black people and the non-racialized and non-Indigenous population was more than two times higher (2.2 times). The mortality rate among Chinese people was similar to the non-racialized and non-Indigenous population.

Within the total Canadian population, males had 1.6 times higher age-standardized COVID-19 mortality rates than females. Among the male population, Black males had the highest COVID-19 mortality rate (62 deaths per 100,000 population), followed by South Asian males and Chinese males (Chart 1). A similar pattern was observed among females. Among the female population, Black females had the highest rate of mortality (41 deaths per 100,000 population) due to COVID-19, followed by South Asian females. Chinese females had the lowest mortality rate (16 deaths per 100,000 population).

Chart 1

Age-standardized COVID-19 mortality rates in Canada between January 1, 2020 and December 31, 2020, by sex and racialized groups in 2016

Age standardized mortality rate (per 100,000)
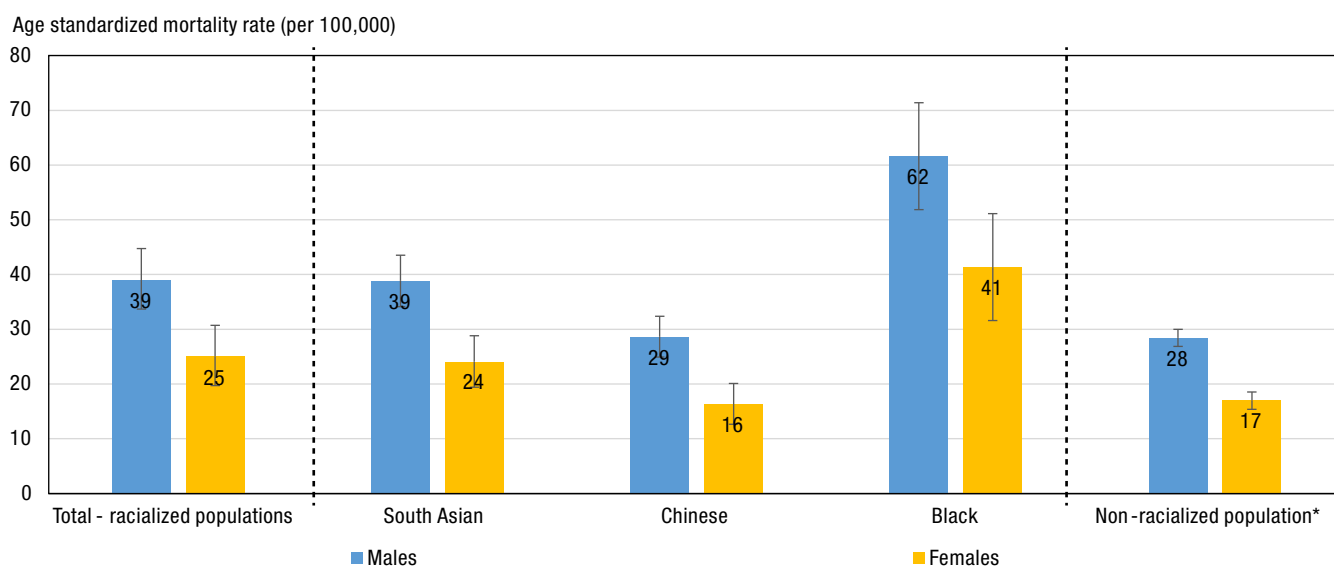
Note: *Non-racialized population excludes Indigenous people[1].
1. People belonging to Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean, Japanese, "Visible minority not included elsewhere," and "Multiple visible minorities" were combined into the category "Racialized population not included elsewhere". This data is suppressed in chart 1 and 2.
Source: Canadian Census Health and Environmental Cohort 2016 linked to Canadian Vital Statistics – Death Database from 2016-2020 (#3233).

These findings are consistent with results of other studies conducted in the USA and elsewhere that reported a higher burden of COVID-19 cases, hospitalizations, and deaths among people belonging to racialized populations, even after accounting for other clinical risk factors (Karmakar, Lantz, Tipirneni, 2021; Williamson et al., 2020).

The Black population living in low income was disproportionally at a higher risk of dying from COVID-19

The COVID-19 mortality rates for racialized populations were further disaggregated by low income status. Results showed that except for the Chinese population, low income status increased the risk of COVID-19 mortality for all populations. Black people had the highest difference of COVID-19 mortality risk between those not living in low income and those living in low income (Chart 2). The mortality rates due to COVID-19 for Black people living in low income were almost 3 times higher compared to Black people not living in low income and 3.5 times higher compared to the non-racialized and non-Indigenous population living in low income. The Chinese population had similar COVID-19 mortality rates between the low income and not in low income groups.

Statistics Canada   Statistique Canada

Chart 2

Age-standardized COVID-19 mortality rates in Canada between January 1, 2020 and December 31, 2020, by racialized groups and low income status (low-income measure (LIM) – after tax) in 2016

Age standardized mortality rate (per 100,000)

■ Not in low income   ■ In low income
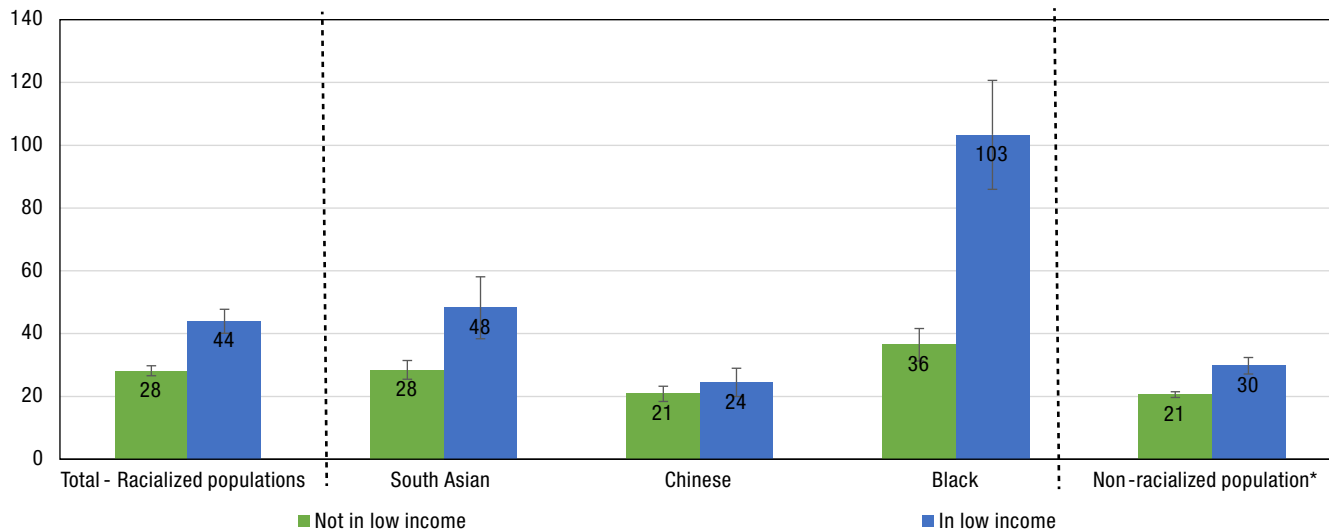
Note: *Non-racialized population excludes Indigenous people[2].
2. People belonging to Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean, Japanese, "Visible minority not included elsewhere," and "Multiple visible minorities" were combined into the category "Racialized population not included elsewhere". This data is suppressed in chart 1 and 2.
Source: Canadian Census Health and Environmental Cohort 2016 linked to Canadian Vital Statistics – Death Database from 2016-2020 (#3233).

Logistic regression was used to determine if the differences in COVID-19 death between the racialized populations[1] remained significant when other factors were accounted for including sex, age, low income status, housing suitability and the type of private dwelling people resided in on Census day (May 10) in 2016.

Controlling for other factors included in the model, the likelihood of dying from COVID-19 remained significantly higher for the Black and South Asian populations compared to the non-racialized population (Table 1, Model 1).

However, model 1 only tells part of the story. The age-standardized mortality rate results indicate that the pattern of risk is different for racialized populations who were living in low income and those who were not. A second model tested this interaction between racialized populations and their low income status.

A moderated logistic regression model (Table 1, Model 2) assessed if the likelihood of dying from COVID-19 among racialized populations is conditional on their low income status, controlling for sex, age, housing suitability and the type of private dwelling.[2] A significant moderation was found indicating that the results from model 1 do not tell the complete story and interpretation should focus on model 2.

---

1. People belonging to Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean, Japanese, "Visible minority not included elsewhere," and "Multiple visible minorities" were combined into the category "Racialized population not included elsewhere".
2. Immigrant status was tested in a multivariable logistic regression model to determine if this was an important factor associated with the relationship between racialized populations, low income and COVID-19 mortality along with other factors. After accounting for racialized groups, low income, age, sex, dwelling type and housing suitability, immigrant status, including recent verses long-term immigrants, did not have a significant association with COVID-19 death among the study cohort. Therefore, immigrant status was not included in the final model.

StatCan COVID-19:
Data to Insights for a Better Canada

Table 1
Likelihood of dying from COVID-19 in 2020 by racialized populations, low income status (low income measure (LIM) – after tax) and other characteristics, Canada

	Model 1				Model 2: Moderation			
	Odds	95% confidence		p-value	Odds	95% confidence		p-value
	Ratio	interval			Ratio	interval		
Variable		from	to			from	to	
Sex								
Male versus Female	1.7	1.6	1.9	<.05	**1.7**	1.6	1.9	<.05
Age	1.1	1.1	1.1	<.05	**1.1**	1.1	1.1	<.05
Housing Suitability								
Not suitable housing versus suitable housing	1.5	1.3	1.9	<.05	**1.5**	1.2	1.9	<.05
Type of Dwelling								
Apartment versus house	2.1	1.9	2.3	<.05	**2.1**	1.9	2.3	<.05
Low Income Status After Tax								
In low income versus not in low income	1.3	1.1	1.4	<.05	**1.3**	1.1	1.4	<.05
Racialized Groups								
South Asian versus non- racialized population *	1.4	1.1	1.7	<.05	**1.5**	0.8	2.8	0.22
Chinese versus non- racialized population *	0.9	0.8	1.2	0.59	**1.4**	0.7	2.8	0.27
Black versus non- racialized population *	2.1	1.7	2.7	<.05	**0.9**	0.5	1.9	0.83
Racialized population not indicated elsewhere versus non- racialized population *	1.4	1.1	1.7	<.05	**1.7**	1	3	0.06
Moderation								
South Asian x Low Income Status	-	-	-	-	**1**	0.6	1.6	0.88
Chinese x Low Income Status	-	-	-	-	**0.7**	0.5	1.2	0.18
Black x Low Income Status	-	-	-	-	**1.8**	1.1	3	<.05
Racialized population not indicated elsewhere x Low Income Status	-	-	-	-	**0.8**	0.6	1.3	0.42

Note: Statistically significant results were identified by a p-value of less than 0.05 in all the analyses. *Non-racialized population excludes Indigenous people.
Source: Canadian Census Health and Environmental Cohort 2016 linked to Canadian Vital Statistics – Death Database from 2016-2020 (#3233).

Results from the moderated logistic regression (Table 1, Model 2) showed that overall the likelihood of dying from COVID-19 was significantly higher for men, older adults, those living in a dwelling that does not have enough bedrooms for the size and composition of the household, those living in an apartment, and those living in low income.

Living in an apartment was associated with the highest odds of dying from COVID-19. The odds were 2 times higher for individuals living in apartments compared to those who lived in other types of dwellings, even after controlling for income, sex, age, and housing suitability (Table 1, Model 2). This is consistent with previous reporting that showed the age-standardized COVID-19 mortality rates were over twice as high for those living in high-rise apartments compared to single detached houses (24 per 100,000 versus 9 per 100,000 population) (Yang & Aitken, 2021).

Results of the interaction between the racialized groups and low income status showed that after other factors were considered, being in low income did not significantly change the risk of dying due to COVID-19 for any of the racialized populations except for the Black population (Table 1, Model 2), as seen by the significant moderation for this group and the change in results between model 1 and 2. Consistent with the age-standardized results, the Black population living in low income was more likely to die from COVID-19 than the Black population not living in low income.

The relationship between low income, racialized populations and COVID-19 mortality could be explained by multiple pathways. Current literature suggests that people with non-White racial or ethnic backgrounds tend to have lower socio-economic status, less adequate housing, worse access to a health care provider and poorer healthcare provider experience (Williams, Priest & Anderson, 2016; Pan et al., 2020; Khanijahani et al. 2021).

Statistics Canada

Statistique Canada

Canada

According to the 2016 Census, 21% of Black adults (aged 25 to 59 years) lived in low income, compared with 12% in the rest of the population. Almost 21% of the Black population reported living in unsuitable housing versus 7.7% of the White population (Public Health Agency of Canada, 2020; Statistics Canada, 2020). Both these factors have been identified to increase the risk of COVID-19 infection, hospitalizations or deaths (Mishra et al., 2021).

Some research also suggests that Black people tend to experience poor quality preventative health care in early life which contributes to the development of chronic health conditions in later years that can increase the risk of death due to COVID-19 (Beck et al., 2020). A systematic review and a meta-analysis found that individuals who experienced racism are significantly more likely to delay care, have unmet healthcare needs and increased odds of not following recommended medical treatment or advice (Ben, Cormack, Harris & Paradies, 2017).

This study focused on limited but crucial risk factors associated with health inequalities in COVID-19 outcomes. The results indicating an increased risk of COVID-19 mortality for the Black population living in low income will be useful for policy and decision makers to better understand the impacts on racialized populations and communities in Canada and create targeted interventions. In its commitment to keeping Canadians informed of the impacts of the pandemic, Statistics Canada will continue to explore the sociodemographic and socioeconomic factors associated with COVID-19 mortality in future analyses.

Data Source, Concepts and Methods

The CanCHEC 2016 is a population-based probabilistically linked dataset that combines 2016 long-form Census respondents with administrative health data (e.g. mortality, cancer, hospitalizations) and annual mailing address postal codes (Tjepkema et al., 2019). These data can be used to examine health outcomes by population characteristics measured by the long-form census (e.g., income, education, occupation, ethnicity, immigrant status, or Indigenous identity).

The CanCHEC data used for this analysis included the de-identified information from 2016 long-form Census (#3901) respondents linked to the Canadian Vital Statistics Death Database 2016-2020 (#3233). The cohort included the Canadian private household population who completed 2016 long-form Census with a valid link in Statistic Canada's Social Data Linkage Environment and excluding Indigenous People (n=8,366,690). The study cohort is representative of approximately 34 million Canadians. Within this cohort, approximately 8,126,300 people survived till December 31, 2020. The remaining population died, of which approximately 2,380 people died due to COVID-19.

The dataset included de-identified information on deaths attributed to various causes that occurred from 2016 to 2020 including COVID-19 deaths that occurred between January 1, 2020 and December 31, 2020.

There are different ways to measure mortality due to the pandemic. This analysis uses death certificates where COVID-19 is listed as the underlying cause of death. Statistics Canada and provincial and territorial vital statistics agencies use two codes to identify COVID-19 reported as a cause of death: U071 for COVID-19 specified as confirmed by a positive test result, and U072 for COVID-19 described as "possible," "probable," or "pending a (positive) test result."

Deaths that occurred prior to 2020 were removed from the cohort to accurately capture the population at risk of dying due to COVID-19 in 2020.

More information on data access, the linkage process and on the resulting de-identified census to death-linked analytical file is available upon request (infostats@statcan.gc.ca).

The term 'racialized population' is used to label the 'visible minority' concept from the Census. 'Visible minority' refers to whether or not a person belongs to one of the visible minority groups defined by the Employment Equity Act. The Employment Equity Act defines visible minorities as "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour." 'Visible minority 'is derived from the 'population group' variable available on the Census 2016. 'Population group' refers to the population group or groups to which the person belongs, for example, White, South Asian, Chinese, Black, Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean or Japanese.

In this article, only the three largest groups from the visible minority variable are analyzed (i.e., South Asian, Chinese, Black) due to sample size restrictions. People belonging to Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean, Japanese, "Visible minority not included elsewhere," and "Multiple visible minorities" were combined into the category "Racialized population not included elsewhere". The non-racialized and non-Indigenous population includes persons who were not considered to be members of a visible minority group but excludes persons who reported 'Yes' to the Aboriginal group question (Question 18 on Census 2016).

Household characteristics are a portrait of individuals' living arrangements on Census Day (May 10, 2016). Apartment is defined as living in an apartment in a building that has five or more storeys or an apartment in a building that has fewer than five storeys. Houses include detached, semi-detached and row houses. Low income was measured with the adjusted household income compared with the low income measure threshold from the 2016 Census. Refer to the 2016 Census Dictionary for detailed definitions of Census of Population concepts, variables, and geographic terms, as well as historical information.

This analysis is intended to better understand differences in mortality between populations. All the rates presented in this analysis are age-standardized mortality rates as per the 2011 Census of population. Age-standardization is used to control for differences in the age structures of the populations being compared. The ages of the population at risk were adjusted by adding the difference between the year of interest (2020) and the 2016 Census. Death age was calculated using the date of death from the Canadian Vital Statistics and the date of birth from the 2016 Census.

All the results were weighted using CanCHEC weights to better approximate the Canadian population and with 100 bootstrap weights for correct variance estimation. The confidence interval illustrates the degree of variability associated with a rate. Wide confidence intervals indicate high variability, thus, these rates should be interpreted with due caution. When comparing estimates, it is important to use confidence intervals along with p-value to determine if differences between values are statistically significant.

These results should not be used to estimate overall mortality due to COVID-19. The COVID-19 data in this study are preliminary, as they are not based on all deaths that occurred during the reference period because of reporting delays and because they do not include Yukon. A small portion of the deaths attributable to COVID-19 were not linked to the 2016 long-form census and were excluded from this study. Thus, data may not match figures from other sources (e.g., media reports), or from counts and estimates from provincial or territorial health authorities and other agencies. Collective dwellings are not included in these data; as a result, Canadians living in long-term care homes are excluded from the analysis.

Further caution should be used when interpreting the results because sociodemographic and socioeconomic information reported on the Census Day in 2016 may have changed over time.

A multivariable logistic regression analysis is a statistical method used to evaluate the relationship between various predictor variables and an outcome which is binary (dichotomous) (Menard, 2002). This study is predicting the likelihood of the outcome (i.e., dying or not dying from COVID-19) associated with different racialized populations and low income status, controlling for age, sex, dwelling type and housing suitability.

A moderation analysis is used to determine whether the relationship between a predictor variable and an outcome variable depends on (is moderated by or interacts with) the value of a third variable (Hayes, 2013). When a moderation exists the relation between the predictor and outcome will change in strength and/or direction and it is no longer appropriate to interpret the direct relationship between the predictor and the outcome. The moderation in this study tests if the pattern between racialized groups and the likelihood of dying from COVID-19 is conditional on whether or not they are living in low income.

References

Beck AF, Edwards EM, Horbar JD, Howell EA, McCormick MC, Pursley DM. (2020). The color of health: How racism, segregation, and inequality affect the health and well-being of preterm infants and their families. Pediatric research. Jan; 87(2):227-34. doi: 10.1038/s41390-019-0513-6.

Ben J, Cormack D, Harris R, Paradies Y. (2017). Racism and health service utilisation: A systematic review and meta-analysis. PloS One. Dec 18; 12(12):e0189900. doi: 10.1371/journal.pone.0189900.

Gold JA, Wong KK, Szablewski CM, et al. (2020). Characteristics and clinical outcomes of adult patients hospitalized with COVID-19 — Georgia, March. MMWR Morb Mortal Wkly Rep 2020; 69:545–550. doi: 10.15585/mmwr. mm6918e1external icon.

Hayes A. (2013). Introduction to mediation, moderation and conditional process analysis: A regression-based approach. The Guilford press.

Hou F, Frank K, Schimmele C. (2020). Economic impact of COVID-19 among visible minority groups. STATCAN COVID-19: Data to Insights for a Better Canada Series. Ottawa: Statistics Canada. Available at: https://www150. statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00042-eng.htm

Karmakar M, Lantz PM, Tipirneni R. (2021). Association of social and demographic factors with COVID-19 incidence and death rates in the US. JAMA Netw Open. Jan 4;4(1):e2036462. doi: 10.1001/jamanetworkopen.2020.36462.

Khanijahani A, Iezadi S, Gholipour K, Azami-Aghdash S, Naghibi D. (2021). A systematic review of racial/ethnic and socioeconomic disparities in COVID-19. Int J Equity Health. Nov 24; 20(1):248. doi: 10.1186/s12939-021-01582-4.

Menard S. (2002). Applied logistic regression analysis second edition. Quantitative applications in the social sciences. Sage publications.

Mishra V, Seyedzenouzi G, Almohtadi A, Chowdhury T, Khashkhusha A, Axiaq A, Wong WYE, Harky A. (2021). Health inequalities during COVID-19 and their effects on morbidity and mortality. J Healthc Leadersh. Jan 19; 13:19-26. doi: 10.2147/JHL.S270175.

Pan D, Sze S, Minhas JS, Bangash MN, Pareek N, Divall P, Williams CM, Oggioni MR, Squire IB, Nellums LB, Hanif W, Khunti K, Pareek M. (2020). The impact of ethnicity on clinical outcomes in COVID-19: A systematic review. EClinicalMedicine. Jun 3; 23:100404. doi: 10.1016/j.eclinm.2020.100404.

Public Health Agency of Canada. (2021). Social inequalities in COVID-19 deaths in Canada. Available at: https://health-infobase.canada.ca/covid-19/inequalities-deaths/index.html#h3

Public Health Agency of Canada. (2020). Social determinants and inequities in health for Black Canadians: A Snapshot. Available at: https://www.canada.ca/en/public-health/services/health-promotion/population-health/what-determines-health/social-determinants-inequities-black-canadians-snapshot.html

Rogers TN, Rogers CR, VanSant-Webb E, Gu LY, Yan B, Qeadan F. (2020). Racial disparities in COVID-19 mortality among essential workers in the United States. World Medical & Health Policy. Sep 1; 12(3):311-27. doi: 10.1002/wmh3.358.

Subedi R, Greenberg L, Turcotte M. (2020). COVID-19 mortality rates in Canada's ethno-cultural neighbourhoods (statcan.gc.ca). StatCan COVID-19: Data to Insights for a Better Canada. Ottawa: Statistics Canada. Available at: https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00079-eng.htm

Yang F-J, Aitken N. (2021). People living in apartments and larger households were at higher risk of dying from COVID-19 during the first wave of the pandemic. StatCan COVID-19: Data to Insights for a Better Canada. Ottawa: Statistics Canada. Available at: https://www150.statcan.gc.ca/n1/pub/45-28-0001/2021001/article/00004-eng.htm

Statistics Canada. (2020). Canada's Black population: Education, labour and resilience. Available at: https://www150.statcan.gc.ca/n1/pub/89-657-x/89-657-x2020002-eng.htm

Tjepkema M, Christidis T, Bushnik T, Pinault L. (2019). Cohort profile: The Canadian Census Health and Environment Cohorts (CanCHECs). Health Reports. Dec 1; 30(12):18-26. Available at: https://www150.statcan.gc.ca/n1/pub/82-003-x/2019012/article/00003-eng.htm

Williams DR, Priest N, Anderson NB. (2016). Understanding associations among race, socioeconomic status, and health: Patterns and prospects. Health Psychol. Apr; 35(4):407-11. doi: 10.1037/hea0000242.

Williamson EJ, Walker AJ, Bhaskaran K, et al. (2020). Factors associated with COVID-19-related death. OpenSAFELY. Nature. Aug; 584 (7821):430-436. doi: 10.1038/s41586-020-2521-4.

Xu JJ, Chen JT, Belin TR, Brookmeyer RS, Suchard MA, Ramirez CM. (2021). Racial and ethnic disparities in years of potential life lost attributable to COVID-19 in the United States: An analysis of 45 states and the district of Columbia. International Journal of Environmental Research and Public Health, 18(6), 2921. doi: 10.3390/ijerph18062921.