

# COVID-19 Scientific Advisory Group Rapid Evidence Report

**Transmission of COVID-19 in Taxis and Ride-Sharing Vehicles:  
Evidence around risk, current guidelines, and preventive measures**

**June 22, 2021**



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## Lay Summary

### BACKGROUND

- Alberta Health and Alberta Health Services had previously issued COVID-19 guidance documents for Taxis, Limos, Rideshares and Commuting (updated in June 2020).
- In consideration of the increased transmissibility of some new Variants of Concern, and evolving knowledge about factors influencing transmission, a literature review around driver risk and mitigation strategies was requested to inform updates to these documents.

### KEY FINDINGS

- There is very little high quality specific research that directly assesses risk factors for transmission within vehicles or how best to reduce risk.
- Taxi and ride-sharing drivers might have a higher risk of COVID-19 infection based on limited studies of poor quality from multiple countries but separating work-related risk from specific background community risk is very challenging given the quality of the studies.
- Existing guidelines currently draw on basic infection prevention and control practices customized for taxi and other ride-sharing settings, and include screening passengers for symptoms, transporting higher risk of COVID-19 passengers alone or only with their household cohort, hand hygiene, and sanitizing the vehicle. Masking and barriers within vehicles are commonly mentioned but details vary.
- General recommendations include not working while ill, consistent masking, hand hygiene, physical distancing as best can be achieved, possible use of barriers, cleaning and disinfection of high touch surfaces and improving the ventilation within the vehicle
- Optimal protection of individuals, especially essential workers such as drivers, is accomplished with COVID-19 vaccination.

### RECOMMENDATIONS AND GUIDANCE

- Taxi, limo, and ride-share drivers should receive COVID-19 vaccination, and employers should be encouraged to provide time off/sick leave if needed in order to accomplish this. If transporting a known COVID-19 case or person at high risk of COVID-19 (i.e., an exposed person attending for diagnostic testing), priority should be given to fully immunized drivers.
- Drivers who are carrying high risk individuals (such as travelers, persons under isolation and quarantine, and individuals with symptoms compatible with COVID-19) should use medical masks or high thread count cotton masks with a middle polypropylene insert and continue to follow hand hygiene and cleaning guidance.
- Drivers should consider using eye protection in interactions involving face-to-face contact with symptomatic individuals.
- The feasibility of an analysis of Alberta based data around driver risk should be assessed, to evaluate the effectiveness of the existing guidelines and serve as a baseline to follow changes to policies.

## Authorship and Committee Members

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## Topic:

- 1. What is the degree of risk of acquiring COVID-19 to taxi and ride-share drivers transporting people at community-based risk; or transporting people with or at higher risk of COVID-19 (e.g. exposed, symptomatic, or documented to have COVID-19)? Are there specific factors associated with a higher transmission risk?**
- 2. What is the current evidence on best practices to reduce risk of transmission in vehicles/during ride sharing, and what are the optimal mitigation strategies to reduce risk?**

## Context

Alberta Health and Alberta Health Services had previously issued COVID-19 guidance [documents](#) for Taxis, Limos, Rideshares and Commuting (updated in June 2020) (Government of Alberta, 2020). This guidance document affirmed symptom and contact isolation and quarantine rules, handwashing, and disinfection precautions; suggested that drivers consider the use of non-medical masks and the use of physical barriers between driver and passengers; and suggested only ride-sharing with household cohorts. If transporting people who are on isolation or quarantine, additional measures such as passenger masking, driver personal protective equipment (PPE), seat covers, and extra sanitizing are recommended. In consideration of the increased transmissibility of some new Variants of Concern (VOCs) and evolving knowledge about factors influencing transmission factors a literature review around driver risk and mitigation strategies was requested to inform updates to these documents.

## Key Messages from the Evidence Summary

- There might be an increased risk of COVID-19 transmission in taxi and ride-share settings to both commercial drivers and passengers, but there is little high quality evidence available on the topic. National occupation based COVID-19 analyses have suggested an elevated risk of COVID-19 infection in taxi and ride-sharing drivers compared to other occupational groups although separating occupational risk from community acquisition risk, given exposures outside occupational settings, is very challenging based on the quality of available studies.
- Primary literature on evidence for specific mitigating interventions for vehicle based transmission is limited with guidelines based on other published guidance and on expert opinion, often extrapolating from other COVID-19 transmission settings.
- Examples of existing guidelines currently are summarized, and draw on basic infection prevention and control practices customized for taxi and other ride-sharing settings, and commonly include not working while ill, screening passengers for symptoms, transporting higher risk of COVID-19 passengers alone or only with their household cohort, distancing as possible, hand hygiene, and cleaning/disinfection of high touch surfaces. Consistent masking, possible use of barriers within vehicles, and mitigating any airflow dependent issues within the vehicle are commonly mentioned but details vary.

- There are specific evolving questions around mitigation strategies, for example a single modeling study suggesting fully opening all windows or right front/left back may optimize airflow within 4 door vehicles, and two low quality studies of barrier use in non-vehicle settings (school and offices) which do not support barrier usefulness in longer term exposures. There will be a need to reassess guidelines with evolving evidence.

## Committee Discussion

The committee reached consensus on the recommendations and practical considerations. The committee had a robust discussion on mitigation strategies of COVID-19 transmission between taxi and ride-share drivers and passengers. There was agreement among members the evidence is too limited for firm recommendations on all questions, and that practical considerations may need to be based on expert opinion and extrapolation from other settings. It was pointed out that the primary literature illustrated epidemiological patterns of elevated risk to taxi and ride-share drivers but generally couldn't separate elevated occupationally derived risk from possibly elevated community based risk in drivers based on societal disparities. There was no literature assessing specific mitigation interventions in vehicle transport. Mitigation strategies such as immunization, masking, eye protection, and need for local data analysis were determined to be listed in recommendations based on extrapolation of the evidence base in other settings; the need for further analysis for ventilation maneuvers and barrier installation in vehicles were agreed on as practical considerations.

## Recommendations

1. Taxi, limo, and ride-share drivers should receive COVID-19 immunization, and employers should be encouraged to provide time off/sick leave if needed in order to accomplish this. Fully immunized drivers should be prioritized if transporting a known COVID-19 case or person at high risk of COVID-19 (i.e., an exposed person attending for diagnostic testing).  
*Rationale:* Vaccination offers a very significant reduction of risk of COVID-19 infection, hospitalization and death from COVID-19, and reduces the risk of transmission to others (as discussed in this [SAG review](#)). If vaccine hesitancy is an issue, strategies to engage high risk essential workers such as drivers may be required.
2. Consistent mask use is recommended for those responsible for transporting individuals at higher risk of COVID-19 (such as persons under isolation and quarantine, individuals with symptoms compatible with COVID-19, and potentially travelers) by taxi or ride share, in accordance with [current public health guidelines for indoor masking](#). In higher risk situations with known COVID-19 or suspected COVID-19, medical masks are recommended. If cloth masks are used, they should be of high quality as described in [World Health Organization guidance](#) (i.e., high thread count cotton with middle polypropylene insert).  
*Rationale:* PPE should be optimized for drivers who are at higher risk of exposure to active COVID-19 cases and to travelers who may have elevated risk

of more highly transmissible Variants of Concern (VOC). This is consistent with public health recommendations for masking in indoor spaces, and with WHO recommendations for medical masks for those in shared airspace with suspected or confirmed COVID-19.

3. The feasibility of an analysis of Alberta based data around driver risk should be determined including assessment of whether data are available about both occupational and non-occupational (community based) risk, in order to determine the effectiveness of the existing guidelines and serve as a baseline to follow changes to policies.

## Practical Considerations

1. Drivers should consider eye protection in interactions involving face-to-face contact with symptomatic individuals.  
*Rationale:* In healthcare settings, the addition of eye protection appears to offer additional protection against short range droplet exposures. In vehicles, face-to-face contact is relatively limited but eye protection (such as safety glasses, face shields and goggles) can be considered in face-to-face interactions. Within the vehicles, a plexiglass barrier may provide adequate eye protection between a driver and passenger(s) although data are limited.
2. Existing guidance on risk reduction practices will require updates with evolving data on optimization of ventilation parameters within vehicles.  
*Rationale:* There is a need for further research to guide firm recommendations, but vehicle airflow modeling may support both avoidance of recirculating air and possible optimization of airflow patterns with specific ventilation maneuvers (preferentially opening all windows completely, or the right-front and left-rear windows if conditions permit, for example) to reduce the potential for air flow dependent transmission.
3. When individuals with COVID-19 are being transported, optimizing processes to allow for appropriate vehicle choice for distancing and ventilation, driver protection, and sanitizing processes between rides is recommended. There is no current evidence to inform further guidance about barriers within vehicles.  
*Rationale:* There is no current data to guide optimal mitigation strategies within vehicles specifically, with no literature on the effectiveness of plexiglass barriers in vehicles. The presence of such barriers may have an unpredictable effect on measures meant to improve ventilation, but also stand to provide potential protection from large droplet exposures and act as a substitute for eye protection. Further strategies may be informed by a combination of literature and local data to assess the association between general barrier implementation interventions and transmission rates.

## Research Gaps

1. There is little data on specific risk factors (type, duration of exposure, and risk mitigation measures in place) for COVID-19 transmission associated with vehicle

travel. There is also no direct assessment of the effectiveness of risk mitigation techniques, including both common general public health measures (high touch surface and hand hygiene, PPE) as well as more specific measures such as physical barriers and optimizing ventilation in the setting of various types of vehicles.

2. All published primary studies are retrospective.

## Strength of Evidence

A total of 4,550 abstracts were screened in duplicate by two reviewers (Lee and Bele) and 37 primary, secondary, and grey literature sources were identified. Among these 37, 14 (37.8%) were published guidelines, 3 (8.1%) were grey literature (blog or short statement), and 20 (54.1%) were references from the primary literature. The screening of primary articles was done systematically.

The strength of the evidence around this question was very limited, with fairly good occupational data although occupational versus community risk assessment was limited. There was very little primary evidence on risk factors for transmission and risk mitigation in vehicles. The primary literature contained cohort and descriptive studies, simulations, surveys, and contact tracing. The geographical location of publications varied, although some of the primary literature was published outside of North America. Common themes in recommendations throughout the secondary literature were identified despite these geographical differences.

### *Limitations of this review*

The following limitations are identified:

1. Formal quality assessment (i.e. identifying risk of bias) was not completed, given that this was a rapid review
2. Non-English articles were not included
3. The primary literature pertaining to these questions was overall limited and of lower quality (see above.).

## Summary of Evidence

*Research Question 1: What is the degree of risk of acquiring COVID-19 to taxi and ride-share drivers transporting people at community-based risk; or transporting people with or at higher risk of COVID-19 (e.g. exposed, symptomatic, or documented to have COVID-19)? Are there specific factors associated with a higher transmission risk?*

### *Evidence from Primary Literature*

There is very little primary evidence available on risk factors for transmission in this setting. However, case reports and epidemiological studies have demonstrated risk of transmission of COVID-19 in taxi and ride-sharing vehicles with evidence of transmission to passengers as well as to drivers, and reports from multiple jurisdictions suggest elevated risk of documented COVID-19 in drivers compared to people in other occupations.



In a study reported by Fernandez-Prado et al. (2020), dialysis patients who had shared the same car with patients that later were documented to have SARS-CoV-2 infection had a 3.3 to 4.7-fold increased risk of developing COVID-19 if they were transported with someone who later developed symptomatic or asymptomatic COVID-19 respectively (Fernandez-Prado et al., 2020). There is a two-way risk of infection, i.e., from driver to the passengers and vice versa. In a case study from the United States of America (USA), two instances of transmission within a transport van were described, including transmission in spite of masking and distancing. A presymptomatic COVID-19 positive van driver transported 4 patients on 2-hour trips to and from the hospital, developing symptoms the next day. The driver and all passengers wore cloth facemasks and only interacted during boarding and transportation. Three of 4 passengers tested 6 to 8 days after exposure, and 1 subsequently developed COVID-19 symptoms. A second driver, in the same van and on the same route transported 3 patients on the day he developed symptoms with 1 of 3 passengers testing positive 4 days later. The van driver did not wear a mask, but the passengers wore cloth facemasks (Jones et al., 2021). Ventilation assessment (air flow and small and large microsphere deposition) of the van (3 metres distance) showed dispersal of microspheres to the back of the van when the fan and heater were on only.

A multi-national study of COVID-19 classed as occupationally acquired from Hong Kong, Japan, Singapore, Taiwan, Thailand, and Vietnam epidemiologic reports showed that car, taxi and van drivers made up 15% of all identified occupationally acquired cases (15 out of 103 cases). This study assessed possible work-related exposures if car, taxi and van drivers had close contact with another confirmed case due to work, or had an unknown contact history but were likely to have been infected in the working environment (e.g., an airport taxi driver). In this study, work-related COVID-19 infections assessed as occupational infections were 15% among car, taxi, and van drivers, 10% in non physician health professionals, and 3% in physicians (Lan et al., 2020).

Magnusson et al. (2020) reported that during the first wave in Norway, taxi drivers along with healthcare providers and other public transport workers had 1.5-3.5 times the risk of COVID-19. In the second wave, taxi drivers along with food services workers and travel stewards had 1.5-4 times the risk of COVID-19. In another study, immigrants from Somalia, Pakistan, Iraq, Afghanistan and Turkey working as taxi drivers had slightly higher risk of COVID-19 than other professions (except healthcare). This study also assessed background risk in the broader immigrant groups and found an increase separate from occupational status, with a suggestion, that higher rates of infection are likely related to a complex set of factors including factors related to exposure and to underlying health (Kjollesdal & Magnusson, 2021).

#### *Evidence from secondary and grey literature*

This literature review is restricted to taxis and car sharing, however there is acknowledgement of some evidence from engineering controls in small rooms given the paucity of studies, although this evidence is not used in developing recommendations.

According to the World Health Organization's interim guidance on COVID-19 related occupational health and safety for health workers, transportation of people known or suspected of having COVID-19 without physical separation between the driver and the

passenger, and cleaning between transports of patients with suspected COVID-19 are considered high risk tasks (World Health Organization, 2021). Other risk factors identified in the literature include sharing the same car between multiple drivers in shifts in the same taxi company, riding in a small space with passengers without known COVID-19 status, contact with shared surfaces, whether or not vehicles are cleaned between rides, exposure to asymptomatic carriers, close proximity between driver and passengers, and low air exchange rate (compared to other vehicles such as auto-rickshaws) (Baluja et al., 2021; Lan et al., 2020; Loa et al., 2021).

The European Centre for Disease Prevention and Control's Technical Report included a study from Sweden (in Swedish), which looked at occupational risk of COVID-19 diagnosis and found that relative risk among taxi drivers was 4.8 times higher than in all other professions (95% confidence interval 3.9-6) followed by bus and tram drivers (RR 4.3, 95% CI 3.6–5.1) (European Centre for Disease Prevention Control, 2020; Folkhälsomyndigheten, 2020). The report published by the British Office of National Statistics found that between 9 March and 25 May 2020 in England and Wales, transport workers including taxi drivers and chauffeurs were found to have statistically significant increased mortality rates (65.3 deaths per 100,000; 134 deaths) from COVID-19 (UK Office for National Statistics, 2020). Similarly, UK's EMG Transmission Group's report also highlights higher risk of transmission among taxi drivers (UK EMG Transmission Group, 2021). However, this report also cautions that the occupational risks are interlinked with other factors such as household size, socioeconomic inequalities and financial barriers to isolation and inability to work from home, which might affect individuals' risk of infection.

### *Synthesis of the Information Relating to Question 1*

Overall, the evidence suggests that driving taxis or ride-sharing vehicles is associated with higher risk of infection and mortality compared to other occupational groups studied so far. In some studies, driver risk of infection was even higher than that of healthcare providers. Since asymptomatic carriers can transmit infection, passengers (or drivers) [without noticeable symptoms may be a source of infection](#) for others, so consistent precautions are required. One study even suggests devising safety strategies based on the assumption that any person using the taxi service may be infected.

Since most of the included studies and guides were published prior to mass vaccinations, none of the studies examined the impact of vaccinations on the risk of infection.

### *Research Question 2: What is the current evidence on best practices to reduce risk of transmission in vehicles/during ride sharing, and what are the optimal mitigation strategies to reduce risk?*

#### *Evidence from secondary and grey literature*

Jurisdictions across Canada and international bodies have published guidelines on taxis, limos, and on other ride-sharing activities (Centers for Disease Control and Prevention, 2021; Eastern Ontario Health Unit, 2021; European Centre for Disease Prevention Control, 2020; Government of Alberta, 2020; Health Information and Quality

Authority, 2021; Infrastructure Health and Safety Association, 2021; INSPQ Public Health Expertise and Reference Centre, 2021; Norwegian Institute of Public Health, 2020; Occupational Safety and Health Administration, 2020; Queensland Health, 2020; The Workers' Compensation Board of British Columbia, 2021; UK EMG Transmission Group, 2021; Windsor-Essex County Health Unit, 2021; World Health Organization, 2021). These guidelines largely discuss infection prevention and control practices customized to vehicular settings. Common recommendations can be grouped to categories of screening practices, masking wearing, maintaining limited contact, air circulation, and cleaning and disinfection practices. These jurisdictional recommendations are summarized in Table 1.

## 1. Screening Practices

Screening practices identify symptomatic or high-risk passengers by asking questions on possible COVID-19 exposure or asking about travel history (i.e. international travelers). Guidelines recommended having screening practices for both drivers and passengers. The passenger screening could occur at booking or during the interaction between passenger and driver at the initial contact.

Some guides explicitly mentioned that employers should be responsible for setting up a process to identify sick drivers. Drivers who have had a high-risk exposure or are developing symptoms should not be driving, and provisions for appropriate coverage and sick leave are required. Drivers are also asked to contact local health authorities and their healthcare providers for follow-up if they suspect exposure to COVID-19 or if starting to develop symptoms.

## 2. Mask Wearing

Most public health agencies including the Centre for Disease Control (2021), for example, have mandated masks on taxi and other ride-shares if traveling into, within, or out of the USA and in USA transportation hubs such as airports and stations. The specific masking practice recommendations varied for passenger and driver, based on a risk assessment.

## 3. Limiting outside of household contacts

Multiple guidelines stated that only those from the same household should be sharing a taxi or ride-share, and no multiple households or groups should be sharing a cab. A guide published by Eastern Ontario stated that passengers who are required to be in isolation or self-isolation should only travel for essential healthcare appointments.

## 4. Droplet and contact-based precautions

Installation of physical barriers was discussed in some guidance documents, with recommendation for a barrier (e.g. plexiglass) between passenger(s) and driver. However, slight wording differences of “recommended or should consider” and “required” were observed between guidelines. When a barrier was required it was suggested that if a barrier could not be installed, then the driver must wear a mask.

Guides recommended that contactless payment should be used for taxi or ride-share services. The passenger should sit at the furthest position from the driver (Driver at Front-Left, passenger at Back-Right).

Hand-washing practice was included in all guidance, some quite detailed. The Windsor-Essex Health unit guide, for example, contained an explicit statement on cleaning hands with an alcohol-based hand rub or washing with soap and water for at least 20 seconds. However, variations on responsibilities of providing hand sanitizer were observed. One guide asked that employers be responsible for providing hand sanitizer to drivers, while another asked that the driver provide the passenger with a hand sanitizer.

## 5. Air Circulation

All guides advised against setting ventilation systems to recirculation mode. Some guides had a statement that ventilation with open windows is possible.

## 6. Cleaning and Disinfection

Disinfection between rides or between shifts was included in guides, with recommendations and explicit instructions. Additionally, there were statements such as using only the disinfectants that have a Drug Identification Number. Eastern Ontario Health Unit also contained link to Government of Canada-approved disinfectants with DINs. The CDC also provides a list of EPA-approved disinfectants for hard non-porous surfaces.

**Table 1.** Summary of Jurisdictional Recommendations on Commonly Considered Factors Among Taxi or Ride-share Services

Jurisdiction	Factors and Recommendations					Comments
	Mask	Barrier	Circulation	Cleaning	Others	
Alberta, Canada (2020)	1.non-medical face masks for standard risk situations;  2. surgical mask (carrying persons required to isolate or quarantine)	Physical barrier between driver and passenger	Do not set ventilation system to recirculation mode	Protocolized hand hygiene (before and after loading)  Cleaning between passengers  Keep vehicle cleaning logs	Consider PPE if barrier cannot be installed  Disposable gloves (if cash payment is required)  Distancing 2 m (outside vehicle)  No contact between driver and passenger during loading and unloading luggage	Evidence: expert opinion (inferred)
Centre for Disease Control and Prevention, USA (2021)	Non-surgical masks: Required (for both drivers and passengers)	N/A	Do not set ventilation system to recirculation mode  Open vehicle windows to increase airflow and/or use the car's vents to bring in fresh outside air	Cleaning between shifts (frequently touched surfaces)  Cleaning between passengers (especially if carried passengers who are sick at minimum)  Protocolized hand hygiene		Evidence: expert opinion (inferred)
Eastern Ontario Health	Mask (Non-specific) or face-covering: Required for	Physical barrier between driver and passenger	Open vehicle windows to increase	Protocolized cleaning (Frequently	Disposable gloves when cleaning	Evidence: expert opinion (inferred)

Unit, Canada (2021)	passengers and drivers		airflow, (especially if transporting a passenger to or from a COVID-19 assessment center, or a healthcare facility and/or symptomatic passenger )	<p>touched surfaces: At least twice per day, or after every ride if possible.)</p> <p>Cleaning after transporting medical patients (e.g. to and from the hospital, assessment centre, or other healthcare settings), or symptomatic patients)</p>		
EMG Group	NA	NA	NA	NA	Revise workplace risk assessments (in accordance with occupational safety and health legislation and occupational health and safety measures adapted)	<p>Note: Technical report of current evidence on transmission</p> <p>Evidence: expert opinion (inferred)</p>
European Centre for Disease Prevention and Control, Europe (2020)	NA	NA	NA (general about any indoor spaces)	NA	Drivers should be provided with simple types of intervention (not specified) and PPE	
Government of British Columbia, Canada (2021)	Mask: Required	Physical barrier between driver and passenger	NA	<p>Protocolized hand hygiene (after handling cash or cards)</p> <p>Tissues and wipes for passengers and garbage bag within reach</p>	<p>Eliminate the use of the front passenger seat (where passenger numbers allow for it)</p> <p>Increase signage at taxi-ranks advising</p>	Evidence: expert opinion (inferred)

				<p>Provide hand sanitizer for passengers</p> <p>Employers provide drivers with hand sanitizers and alcohol-based disinfectant wipes.</p> <p>Cleaning between passengers (frequently touched surfaces)</p>	<p>passengers of basic hygiene etiquette.</p> <p>Touchless payment or signature methods</p> <p>Minimize shared rides</p> <p>Passengers to handle their own personal luggage (if possible)</p>	
Health Information and Quality Authority, Ireland, (2021)	<p>(For Passengers) Austria: FFP2 Mask (or equivalent) required</p> <p>England: Face-covering required</p> <p>Wales: Face covering required for age over 11</p> <p>Northern Ireland: Face mask required for age over 13</p> <p>Denmark: Face mask required</p>	NA	NA	NA		<p>This document summarizes the guidelines from other countries.</p> <p>Evidence: Expert opinion</p>
Infrastructure Health and Safety Association, Canada, (2021)	Surgical Mask/Procedural mask or N95: required as a source control per risk assessment for workers	NA	NA	<p>Cleaning between shifts</p> <p>Cleaning between passengers</p>	<p>Distancing 2 m (outside vehicle)</p> <p>No contact between driver and passenger during loading</p>	Evidence: Expert opinion

	<p>Use masks as source control in their workplace Apply risk assessment to determine appropriate mask types</p> <p>Protocolized training on PPE</p>				<p>Touchless payment or signature methods</p> <p>Protocolized hand hygiene</p>	
<p>INSPQ Public Health Expertise and Reference Centre, Canada, (2020)</p>	<p>Procedural mask: standard</p> <p>Surgical mask: required if client is symptomatic. If there is no mask, to wear a face cover. Applies to drivers</p>	<p>Physical barrier between driver and passenger</p>	<p>Do not set the ventilation system to recirculation mode.</p>		<p>Driver exclusion for symptoms</p> <p>Protocolized hand hygiene</p> <p>Protocolized clothing</p> <p>Distancing 2 m (outside, symptomatic)</p> <p>Enhanced measures for symptomatic passenger</p>	<p>Evidence: Expert opinion</p>
<p>Norwegian Institute of Public Health, Norway, (2020)</p>	<p>Medical face mask: required for passenger, and companion if suspected of COVID-19.</p> <p>Eye protection and gloves: required for driver if passenger symptomatic</p>	<p>NA</p>	<p>NA</p>	<p>Cleaning between shifts</p> <p>Cleaning between passengers</p> <p>Employer training program for cleaning vehicles.</p> <p>Segregated driving teams (routine vs. symptomatic for handling passengers</p>	<p>Distancing 2 m (outside, symptomatic)</p> <p>Distancing 2 m (outside, routine)</p> <p>Protocolized training program</p> <p>Driver exclusion for symptoms</p> <p>Protocolized hand hygiene</p>	<p>Evidence: Expert opinion only</p>



				Recordkeeping of drivers in contact with COVID-19 passenger (employer)	Protocolized respiratory etiquette	
Occupational Safety and Health Administration, USA, (2020)	Face coverings or surgical masks: required for driver.  Mask have at least two layers of tightly woven breathable fabric. Face coverings should be provided at no cost to workers	NA	Lower vehicle windows to increase airflow.	Cleaning between shifts  Cleaning between passengers  Employer provided cleaning and hand hygiene products	Driver exclusion for symptoms  Protocolized hand hygiene	Evidence: Expert opinion only
Queensland Health, Australia, (2020)	Facial mask (surgical or procedural): standard for driver  Medical masks and respirators: required for driver if passenger is symptomatic	NA	NA	NA	No passenger sharing  Protocolized hand hygiene  Driver exclusion for symptoms  Enhanced measures for symptomatic passenger	Evidence: Expert opinion only
Windsor-Essex County Health Unit (Canada, 2021)	Face mask: required for driver	NA	NA	Cleaning between shifts  Cleaning between passengers  Employer provided cleaning and hand hygiene products	Driver exclusion for symptoms  Protocolized hand hygiene  Contactless payments  Maximum physical distancing  No passenger sharing	Evidence: Expert opinion only

World Health Organization (WHO, 2021)	<p>Medical, fabric masks: required for driver/workers</p> <p>Medical mask: required for driver if transferring symptomatic patient</p>	NA	Enhanced ventilation without recirculation	<p>Cleaning between shifts</p> <p>Cleaning between passengers</p>	<p>Driver exclusion for symptoms</p> <p>Protocolized hand hygiene</p> <p>Protocolized respiratory etiquette</p> <p>Protocolized training program</p>	Evidence: Expert opinion only
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### *Evidence from the primary literature*

Compared to secondary literature, the recommended best practices from primary literature were limited but the findings from the primary literature are aligned with recommendations from the secondary literature.

An article published by Baluja et al. (2021) suggested that any preventive and safety strategies must be devised based on the presumption that any person using the taxi service may be infected, leading to a conclusion that universal adoption of measures is warranted. These authors listed risk assessment, hand-hygiene practices, masking, air ventilation, and physical distancing as crucial measures.

The previously mentioned study by Fernandez-Prado et al. (2020) documented transportation-related risk in dialysis patients exposed to even asymptomatic infective persons in shared vehicles, with an implicit need for non-symptom based universal precautions.

### *Studies on specific potential mitigating factors including airflow in vehicles and broader studies on eye protection and the use of barriers:*

Ventilation: To inform ventilation optimization, a simulation study by Mathai et al. (2021) using varying droplet sizes assessed computational fluid dynamics simulations for a range of ventilation options in a model four-door passenger car, and concluded the following:

- A well-ventilated space requires the availability of entrance and exit for airflow and establishing a favorable pressure gradient between the two, so having all windows fully open, or the front right across from the driver seated front left, and the back left, across from the passenger (seated back right) fully open was seen as optimal in a 4 door vehicle.
- Once a cross-ventilation path is established, opening a third window has little effect on the air change per hour rate.

Eye Protection: Basic science literature points to the possible transmissibility of COVID-19 through exposure of surfaces of the eye (Chen et al., 2020; Coroneo & Collignon, 2021; Marra et al., 2021). A systematic review of observational studies in healthcare workers by Chu et al. (2020) demonstrated that eye protection was associated with less infection (n=3713; aOR 0.22, 95% CI 0.12 to 0.39, RD -10.6%, 95% CI -12.5 to -7.7, low certainty) (Chu et al., 2020). The same study also showed physical distancing of 1 metre or more is associated with lower transmission of COVID-19 (n=10 736, aOR 0.18, 95% CI 0.09 to 0.38; risk difference -10.2%, 95% CI -11.5 to -7.5, moderate certainty) (Chu et al., 2020).

Barriers: The use of plexiglass barriers in vehicles has not been studied specifically, and they may vary in application and consequent effect on airflow (whether the barrier fully contains airflow between the driver and passenger compartment for example). Although the literature is limited, studies in Georgia and across the US have suggested that barriers in schools are not associated with reduced transmission based on public health data, when assessed as aspects of prevention bundles (Gettings et al., 2021; Lessler et al., 2021). In addition, COVID-19 outbreak transmission has been documented in offices with barriers installed with concerns for adverse change to airflow (Ishigaki et al., 2021).

### *Synthesis of the Information Relating to Question 2*

Application of infection prevention and control practices tailored to taxi and other ride-share services was recommended in published guidelines. Primary articles on recommended practices are few. However, the science and assumptions from primary literature are in alignment with these published recommendations from secondary literature. The recommendations have varying levels of detail, representing jurisdictional differences. There is a lack of information on recommendations for immunization in taxi drivers or passengers from primary and secondary literature, although emerging evidence on both vaccination protection against COVID-19 disease and against transmission (as summarized in a SAG [report](#)) would strongly support a recommendation that taxi and ride-share drivers be immunized to reduce their own occupational risk of COVID-19 and also reduce potential risk of transmission to their passengers.

### **Evolving Evidence**

Research on SARS-CoV-2 is continually evolving and as such the evidence will continue to be assessed as new information is provided. Evidence on above recommendations may change as immunization progresses.

## Appendix

### List of Abbreviations

AHS	Alberta Health Services
CDC	Center for Disease Control and Prevention
COVID-19	Coronavirus Disease 2019
INSPQ	Institut national de santé publique du Québec
PPE	Personal Protective Equipment
RR	Risk Ratio
SAG	Scientific Advisory Group
USA	United States of America
WHO	World Health Organization

## Methods

### Literature Search

A literature search was conducted by Becky Skidmore, medical information specialist; search strategies were tested through an iterative process in consultation with the review team.

B. Skidmore searched databases for articles published from January 1<sup>st</sup>, 2019 up until May 25, 2021. Databases included Ovid MEDLINE®, including Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Embase, EBM Reviews - Cochrane Central Register of Controlled Trials, and EBM Reviews – Cochrane Database of Systematic Reviews. We also searched the Web of Science (core collection).

Additionally, grey literature was searched from the following sources:

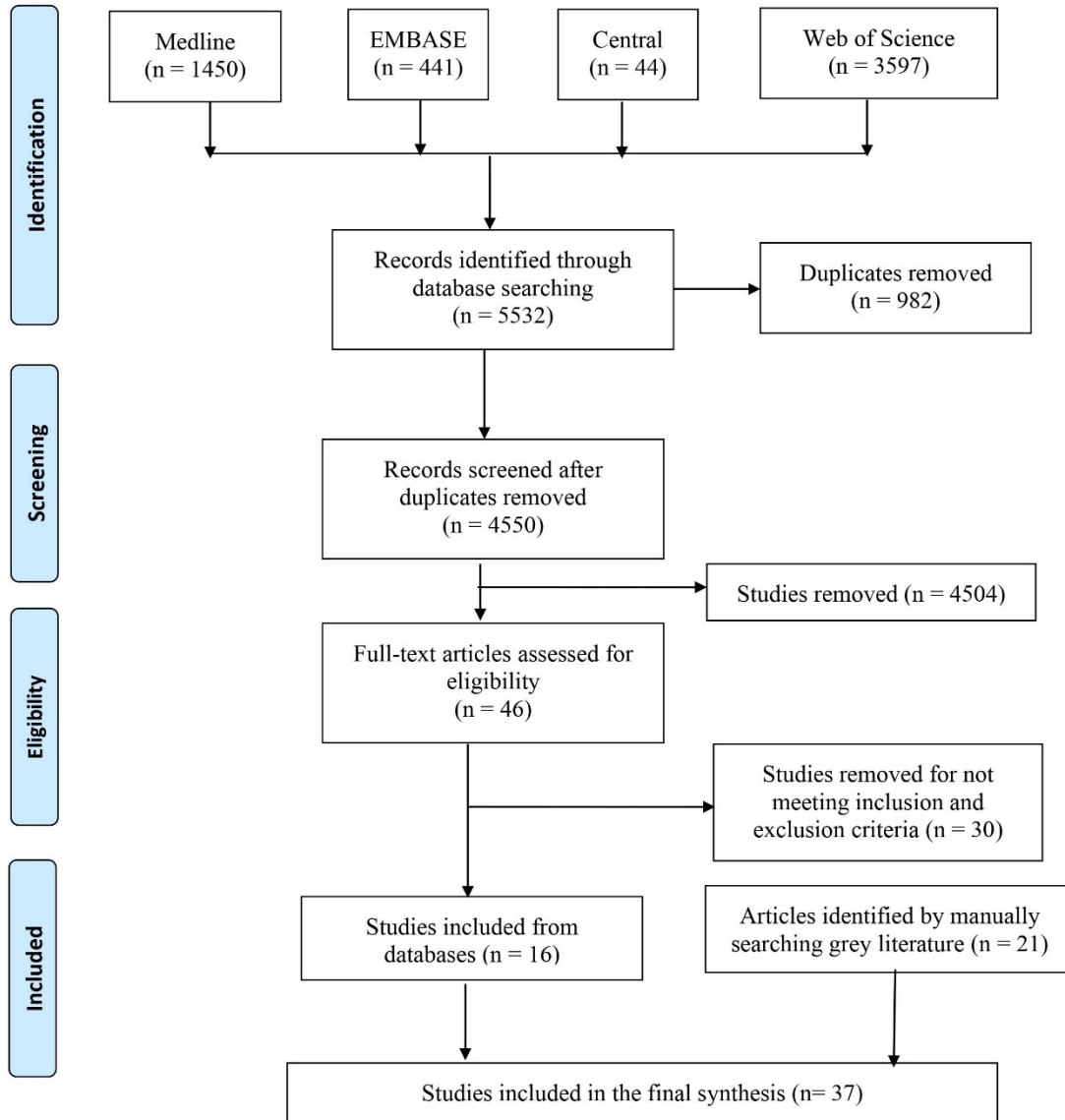
1. WHO COVID database <https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/>
2. Living Overviews of Evidence (L.OVE) Platform <https://iloveevidence.com>
3. COVID-END inventory of best evidence syntheses for clinical management <https://www.mcmasterforum.org/networks/covid-end/resources-to-support-decision-makers/inventory-of-best-evidence-syntheses/clinical-management>
4. Cochrane COVID19 register <https://covid-19.cochrane.org/>

Briefly, the search strategy involved combinations of keywords and subject headings including a combination of controlled vocabulary (e.g., “Coronavirus Infections”, “Motor Vehicles”, “Automobile Driving”) and keywords (e.g., “COVID19”, “taxi”, “rideshare”). Vocabulary and syntax were adjusted across the databases. No language restrictions were applied but searches were limited to the publication dates 2019 to the present. Results were downloaded and deduplicated using EndNote version 9.3.3 (Clarivate Analytics) and uploaded to Covidence.

Identified articles were initially screened by title and abstracts against the inclusion/exclusion criteria listed in Table 1 below. 4,550 articles were identified by KRS with references and abstracts provided for further review after removing duplications. 4,534 studies were excluded from the review in accordance with the inclusion/exclusion criteria stated below.

PRISMA diagram is shown below.

## PRISMA Flow Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).

**Table 1.** Inclusion and exclusion criteria for results of the literature search

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>- Studies focusing on taxi and/or other ride sharing services</li> <li>- Human only</li> <li>- Timeline: Jan 1, 2019 to May 21, 2021</li> <li>- All methods</li> <li>- English only (or with English translation)</li> <li>- Full text, peer-reviewed, non-peer reviewed (pre-print), grey literature</li> <li>- No limits on geographic location</li> </ul>	<ul style="list-style-type: none"> <li>- Not available in English</li> <li>- Studies with no available full text</li> <li>- Presented data/evidence is not sufficient to address the research questions</li> <li>- Studies focusing on public transportation (e.g. buses and trains)</li> <li>- Studies focusing on medical transportation (e.g. ambulances)</li> </ul>

### *Critical Evaluation of the Evidence*

Exclusion criteria for study quality were adapted from the Mixed Methods Appraisal Tool (MMAT)(Hong et al., 2018). Potential articles were evaluated on three criteria: 1) Peer reviewed or from a reputable source; 2) Clear research question or issue; 3) Whether the presented data/evidence is appropriate to address the research question. Preprints and non peer-reviewed literature (such as commentaries and letters from credible journals) are not excluded out of hand due to the novelty of COVID-19 and the speed with which new evidence is available.

Table 2 below is a narrative summary of the body of evidence included in this review. The categories, format, and suggested information for inclusion were adapted from the Oxford Centre for Evidence-Based Medicine, the Cochrane Library, and the AGREE Trust (Brouwers et al., 2010; Urwin et al., 2020; Viswanathan et al., 2017; Wynants et al., 2020).

**Table 2.** Narrative overview of the literature included in this review.

	Description
<b>Volume</b>	Four cohort studies were included, 3 contact tracking studies were included, 3 descriptive studies were included, 14 government guides were included, 2 literature reviews were included, 4 simulation studies were included, 4 survey studies were included.
<b>Quality</b>	The quality of primary literature in answering these two research questions varied. The quality of literature related to the first question on risk associated with taxi and ride-share drivers was high. However, the quality of literature on interventions was lacking. □The grey literature is from reputable and established organizations and current intervention strategies are in alignment with each other.
<b>Applicability</b>	Guidelines were published from across Canadian and international jurisdictions. These jurisdictions have similar health system structure as Alberta.
<b>Consistency</b>	Findings were consistent in the primary literature, and guidelines consistent in their recommendations around infection prevention and control practices.

## Search Strategy

Final Search Strategy

May 21, 2021

Ovid Multifile

Database: EBM Reviews - Cochrane Central Register of Controlled Trials <April 2021>, EBM Reviews - Cochrane Database of Systematic Reviews <2005 to May 19, 2021>, Embase <1974 to 2021 May 24>, Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations and Daily <1946 to May 24, 2021>

Search Strategy:

- 
- 1 COVID-19/ (82301)
  - 2 SARS-CoV-2/ (74525)
  - 3 Coronavirus/ (13284)
  - 4 Betacoronavirus/ (40980)
  - 5 Coronavirus Infections/ (57218)
  - 6 (COVID-19 or COVID19).tw,kf. (239821)
  - 7 ((coronavirus\* or corona virus\*) and (hubei or wuhan or beijing or shanghai)).tw,kf. (9575)
  - 8 (wuhan adj5 virus\*).tw,kf. (517)
  - 9 (2019-nCoV or 19nCoV or 2019nCoV).tw,kf. (3098)
  - 10 (nCoV or n-CoV or "CoV 2" or CoV2).tw,kf. (86799)
  - 11 (SARS-CoV-2 or SARS-CoV2 or SARSCoV-2 or SARSCoV2 or SARS2 or SARS-2 or severe acute respiratory syndrome coronavirus 2).tw,kf. (88225)
  - 12 (2019-novel CoV or Sars-coronavirus2 or Sars-coronavirus-2 or SARS-like coronavirus\* or ((novel or new or nouveau) adj2 (CoV or nCoV or covid or coronavirus\* or corona virus or Pandemi\*2)) or (coronavirus\* and pneumonia)).tw,kf. (34919)
  - 13 (novel coronavirus\* or novel corona virus\* or novel CoV).tw,kf. (17801)
  - 14 ((coronavirus\* or corona virus\*) adj2 "2019").tw,kf. (55207)
  - 15 ((coronavirus\* or corona virus\*) adj2 "19").tw,kf. (8996)
  - 16 ("coronavirus 2" or "corona virus 2").tw,kf. (28403)
  - 17 (OC43 or NL63 or 229E or HKU1 or HCoV\* or Sars-coronavirus\*).tw,kf. (7460)
  - 18 (COVID-19 or severe acute respiratory syndrome coronavirus 2).os. (17)
  - 19 (coronavirus\* or corona virus\*).ti. (42863)
  - 20 or/1-19 [COVID-19] (298466)
  - 21 Motor Vehicles/ (15152)
  - 22 Automobiles/ (16463)
  - 23 Automobile Driving/ (34364)
  - 24 (autos or automobile\* or car or cars or sedan or sedans or vehic\*).tw,kf. (438476)
  - 25 (taxi or taxis or taxicab? or cab or cabs or limo or limos or limousine\* or Lyft or rideshar\* or ride-shar\* or (ride? adj2 shar\*) or ridehail\* or ride-hail\* or (ride? adj2 hail\*) or carpool\*).tw,kf. (13752)
  - 26 Uber.tw,kf. not German.lg. (2131)
  - 27 (chauffeur\* or driver\* or driving).tw,kf. (378256)
  - 28 (shar\* adj3 transport\*).tw,kf. (1618)
  - 29 exp Occupational Exposure/ and Transportation/ (339)
  - 30 (((occupation\* adj3 risk\*) or (occupation\* adj3 expos\*) or (work\* adj3 risk\*) or (work\* adj3 expos\*)) adj5 (drive\* or transport\* or travel\*)).tw,kf. (699)
  - 31 or/21-30 [DRIVERS/DRIVING, ETC] (811581)
  - 32 20 and 31 [COVID-19 - DRIVERS/DRIVING, ETC] (2963)
  - 33 exp Animals/ not Humans/ (16090418)
  - 34 32 not 33 [ANIMAL-ONLY REMOVED] (2840)
  - 35 limit 34 to yr="2019-current" (2745)
  - 36 35 use ppez [MEDLINE RECORDS] (1482)
  - 37 coronavirus disease 2019/ (192833)
  - 38 severe acute respiratory syndrome coronavirus 2/ (91572)



39 Coronavirinae/ (4824)  
 40 Betacoronavirus/ (40980)  
 41 coronavirus infection/ (58094)  
 42 (COVID-19 or COVID19).tw,kw. (243700)  
 43 ((coronavirus\* or corona virus\*) and (hubei or wuhan or beijing or shanghai)).tw,kw. (9725)  
 44 (wuhan adj5 virus\*).tw,kw. (540)  
 45 (2019-nCoV or 19nCoV or 2019nCoV).tw,kw. (3423)  
 46 (nCoV or n-CoV or "CoV 2" or CoV2).tw,kw. (86288)  
 47 (SARS-CoV-2 or SARS-CoV2 or SARSCoV-2 or SARSCoV2 or SARS2 or SARS-2 or severe acute respiratory syndrome coronavirus 2).tw,kw. (93875)  
 48 (2019-novel CoV or Sars-coronavirus2 or Sars-coronavirus-2 or SARS-like coronavirus\* or ((novel or new or nouveau) adj2 (CoV or nCoV or covid or coronavirus\* or corona virus or Pandemi\*2)) or (coronavirus\* and pneumonia)).tw,kw. (35432)  
 49 (novel coronavirus\* or novel corona virus\* or novel CoV).tw,kw. (18130)  
 50 ((coronavirus\* or corona virus\*) adj2 "2019").tw,kw. (55606)  
 51 ((coronavirus\* or corona virus\*) adj2 "19").tw,kw. (8742)  
 52 ("coronavirus 2" or "corona virus 2").tw,kw. (28291)  
 53 (OC43 or NL63 or 229E or HKU1 or HCoV\* or Sars-coronavirus\*).tw,kw. (7641)  
 54 (coronavirus\* or corona virus\*).ti. (42863)  
 55 or/37-54 [COVID-19] (307112)  
 56 motor vehicle/ (15819)  
 57 car/ (17068)  
 58 car driver/ (994)  
 59 car driving/ (15286)  
 60 (autos or automobile\* or car or cars or sedan or sedans or vehic\*).tw,kw. (440046)  
 61 (taxi or taxis or taxicab? or cab or cabs or limo or limos or limousine\* or Lyft or rideshar\* or ride-shar\* or (ride? adj2 shar\*) or ridehail\* or ride-hail\* or (ride? adj2 hail\*) or carpool\*).tw,kw. (13817)  
 62 Uber.tw,kw. not German.lg. (2135)  
 63 (chauffeur\* or driver\* or driving).tw,kw. (378792)  
 64 (shar\* adj3 transport\*).tw,kw. (1620)  
 65 "traffic and transport" and occupational exposure/ (148)  
 66 (((occupation\* adj3 risk\*) or (occupation\* adj3 expos\*) or (work\* adj3 risk\*) or (work\* adj3 expos\*)) adj5 (drive\* or transport\* or travel\*)).tw,kw. (713)  
 67 or/56-66 [DRIVERS/DRIVING, ETC] (810214)  
 68 55 and 67 [COVID-19 - DRIVERS/DRIVING, ETC] (3106)  
 69 exp animal/ or exp animal experimentation/ or exp animal model/ or exp animal experiment/ or nonhuman/ or exp vertebrate/ (53724177)  
 70 exp human/ or exp human experimentation/ or exp human experiment/ (42205590)  
 71 69 not 70 (11520295)  
 72 68 not 71 [ANIMAL-ONLY REMOVED] (2973)  
 73 limit 72 to yr="2019-current" (2881)  
 74 73 use oemzsd [EMBASE RECORDS] (1369)  
 75 COVID-19/ (82301)  
 76 SARS-CoV-2/ (74525)  
 77 Coronavirus/ (13284)  
 78 Betacoronavirus/ (40980)  
 79 Coronavirus Infections/ (57218)  
 80 (COVID-19 or COVID19).ti,ab,kw. (243647)  
 81 ((coronavirus\* or corona virus\*) and (hubei or wuhan or beijing or shanghai)).ti,ab,kw. (9700)  
 82 (wuhan adj5 virus\*).ti,ab,kw. (531)  
 83 (2019-nCoV or 19nCoV or 2019nCoV).ti,ab,kw. (3399)  
 84 (nCoV or n-CoV or "CoV 2" or CoV2).ti,ab,kw. (86266)  
 85 (SARS-CoV-2 or SARS-CoV2 or SARSCoV-2 or SARSCoV2 or SARS2 or SARS-2 or severe acute respiratory syndrome coronavirus 2).ti,ab,kw. (93860)

- 86 (2019-novel CoV or Sars-coronavirus2 or Sars-coronavirus-2 or SARS-like coronavirus\* or ((novel or new or nouveau) adj2 (CoV or nCoV or covid or coronavirus\* or corona virus or Pandemi\*2)) or (coronavirus\* and pneumonia)).ti,ab,kw. (35403)
- 87 (novel coronavirus\* or novel corona virus\* or novel CoV).ti,ab,kw. (18103)
- 88 ((coronavirus\* or corona virus\*) adj2 "2019").ti,ab,kw. (55593)
- 89 ((coronavirus\* or corona virus\*) adj2 "19").ti,ab,kw. (8725)
- 90 ("coronavirus 2" or "corona virus 2").ti,ab,kw. (28274)
- 91 (OC43 or NL63 or 229E or HKU1 or HCoV\* or Sars-coronavirus\*).ti,ab,kw. (7617)
- 92 (coronavirus\* or corona virus\*).ti. (42863)
- 93 or/75-92 [COVID-19] (299690)
- 94 Motor Vehicles/ (15152)
- 95 Automobiles/ (16463)
- 96 Automobile Driving/ (34364)
- 97 (autos or automobile\* or car or cars or sedan or sedans or vehic\*).ti,ab,kw. (439583)
- 98 (taxi or taxis or taxicab? or cab or cabs or limo or limos or limousine\* or Lyft or rideshar\* or ride-shar\* or (ride? adj2 shar\*) or ridehail\* or ride-hail\* or (ride? adj2 hail\*) or carpool\*).ti,ab,kw. (13561)
- 99 Uber.ti,ab,kw. not German.lg. (2131)
- 100 (chauffeur\* or driver\* or driving).ti,ab,kw. (378371)
- 101 (shar\* adj3 transport\*).ti,ab,kw. (1618)
- 102 exp Occupational Exposure/ and Transportation/ (339)
- 103 (((occupation\* adj3 risk\*) or (occupation\* adj3 expos\*) or (work\* adj3 risk\*) or (work\* adj3 expos\*)) adj5 (drive\* or transport\* or travel\*).ti,ab,kw. (711)
- 104 or/94-103 [DRIVERS/DRIVING, ETC] (812122)
- 105 93 and 104 [COVID-19 - DRIVERS/DRIVING, ETC] (2961)
- 106 limit 105 to yr="2019-current" (2809)
- 107 106 use coch,cctr [COCHRANE RECORDS] (49)
- 108 36 or 74 or 107 [ALL DATABASES] (2900)
- 109 remove duplicates from 108 (1935) [TOTAL UNIQUE RECORDS]
- 110 109 use ppez [MEDLINE UNIQUE RECORDS] (1450)
- 111 109 use oomezd [EMBASE UNIQUE RECORDS] (441)
- 112 109 use coch [CDSR UNIQUE RECORDS] (0)
- 113 109 use cctr [CENTRAL UNIQUE RECORDS] (44)

\*\*\*\*\*

Web of Science

# 22 3,597

#19 NOT #20

Refined by: PUBLICATION YEARS: ( 2021 OR 2020 OR 2019 )

Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 21 3,716

#19 NOT #20

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# 20 3,149,421

TI=(animal or animals or mice or mouse or rat or rats or lamb or lambs or sheep or murine or cow or cows or cattle or bovine or piglet\* or pig or pigs or hog or hogs horse or horses or equine or dog or dogs or canine or cat or cats or feline or rabbit or rabbits or monkey or monkeys or chimpanzee\*)

Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 19 3,758

#18 AND #12

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#17 OR #16 OR #15 OR #14 OR #13

Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 17 533

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 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
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TS=(shar\* NEAR/3 transport\*)  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
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TS=(chauffeur\* or driver\* or driving)  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 14 45,226

TS=(taxi or taxis or taxicab\* or cab or cabs or limo or limos or limousine\* or Lyft or rideshar\* or (ride NEAR/0 shar\*) or (ride NEAR/2 shar\*) or (rides NEAR/2 shar\*) or ridehail\* or (ride NEAR/0 hail\*) or (ride NEAR/2 hail\*) or (rides NEAR/2 hail\*) or carpool\*)  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 13 713,721

TS=(autos or automobile\* or car or cars or sedan or sedans or vehic\*)  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 12 136,646

#11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 11 20,048

TI=(coronavirus\* or "corona virus" or "corona viruses")  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 10 5,457

TS=(OC43 or NL63 or 229E or HKU1 or HCoV\* or "Sars-coronavirus")  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 9 13,542

TS=("coronavirus 2" or "corona virus 2" or "coronavirus 2019" or "coronavirus 19")  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 8 8,002

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 # 7 8,099

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 # 6 323

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 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 5 38,291

TS=("SARS-CoV-2" or "SARS-CoV2" or "SARSCoV-2" or SARSCoV2 or SARS2 or "SARS-2" or "severe acute respiratory syndrome coronavirus 2")  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
 # 4 37,803

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 # 3 23

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 # 2 5,511

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 # 1 117,422

TS=("COVID-19" or COVID19)  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 22 3,594  
#19 NOT #20  
Refined by: PUBLICATION YEARS: ( 2021 OR 2020 OR 2019 )  
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Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 20 3,149,421  
TI=(animal or animals or mice or mouse or rat or rats or lamb or lambs or sheep or murine or cow or cows or cattle or bovine or piglet\* or pig or pigs or hog or hogs horse or horses or equine or dog or dogs or canine or cat or cats or feline or rabbit or rabbits or monkey or monkeys or chimpanzee\*)  
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#18 AND #12  
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# 18 2,090,624  
#17 OR #16 OR #15 OR #14 OR #13  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 17 359  
TS=((occupation\* NEAR/3 risk\*) or (occupation\* NEAR/3 expos\*) or (work\* NEAR/3 risk\*) or (work\* NEAR/3 expos\*) ) NEAR/5 (drive\* or transport\* or travel\*) )  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 16 2,585  
TS=(shar\* NEAR/3 transport\*)  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 15 1,440,947  
TS=(chauffeur\* or driver\* or driving)  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 14 45,226  
TS=(taxi or taxis or taxicab\* or cab or cabs or limo or limos or limousine\* or Lyft or rideshar\* or (ride NEAR/0 shar\*) or (ride NEAR/2 shar\*) or (rides NEAR/2 shar\*) or ridehail\* or (ride NEAR/0 hail\*) or (ride NEAR/2 hail\*) or (rides NEAR/2 hail\*) or carpool\*)  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 13 713,721  
TS=(autos or automobile\* or car or cars or sedan or sedans or vehic\*)  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 12 136,646  
#11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 11 20,048  
TI=(coronavirus\* or "corona virus" or "corona viruses")  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 10 5,457  
TS=(OC43 or NL63 or 229E or HKU1 or HCoV\* or "Sars-coronavirus")  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 9 13,542  
TS=("coronavirus 2" or "corona virus 2" or "coronavirus 2019" or "coronavirus 19")  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 8 8,002  
TI=((coronavirus\* or "corona virus") AND ("2019" or "19") )  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years  
# 7 8,099  
TS=("novel coronavirus" or "novel corona virus" or "novel CoV")  
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 6 323  
 TS=("2019-novel CoV" or "Sars-coronavirus2" or "Sars-coronavirus-2" or "SARS-like coronavirus")  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 5 38,291  
 TS=("SARS-CoV-2" or "SARS-CoV2" or "SARSCoV-2" or SARSCoV2 or SARS2 or "SARS-2" or "severe acute respiratory syndrome coronavirus 2")  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 4 37,803  
 TS=("2019-nCoV" or 19nCoV or 2019nCoV or nCoV or n-CoV or "CoV 2" or CoV2)  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 3 23  
 TS="Wuhan virus"  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 2 5,511  
 TS=((coronavirus\* or corona virus\*) and (hubei or wuhan or beijing or shanghai) )  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

# 1 117,422  
 TS=("COVID-19" or COVID19)  
 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

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