

Rapid Review Report

Review Title:	What proportion of healthcare workers are rt-PCR positive and IgM or IgG positive?
Keyword Title:	Proportion of positive healthcare workers during the COVID-19 pandemic
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Key Findings

- Several references provide estimates of the proportion of HCW infected with SARS-CoV2 that range from 0.9% -20%. A recent review from Alberta Health Services that examined the COVID-19 rt-PCR test results among HCW indicates that in that province 2.4% of physicians and 0.9% of non-MD HCW who were tested were positive for SARS-CoV-2 compared to 3.5% of the general population.
- In the studies reviewed, the majority of cases are confirmed by RT-PCR, while only one reference also used serology testing.

Limitations

- The majority of studies report the proportion of infected individuals who are HCW; this does not present the proportion of infected HCW and answer the question posed in this rapid review.
- It is impossible to accurately compare data across the studies as the data were not collected and reported using a standard protocol (e.g., different sampling protocols, different population denominators, different diagnostic procedures, etc.).
- Very few publications focus on obtaining an accurate proportion of HCWs who are infected.
- Most publications test only symptomatic HCW and not those who may be asymptomatic, but still infected.
- Some of the references are available as preprints and are pending peer review.

GRADE of Evidence: D - Very Low

A grade of "D" is assigned when the estimate of effect is very uncertain. The review may consist of expert opinion, no direct research evidence, and/or one or more studies with severe limitations.

For more information about how this rating was determined, visit https://www.essentialevidenceplus.com/product/ebm_loe.cfm?show=grade

Background

The EOC has requested more information regarding whether HCW should be screened for SARS-CoV2 with laboratory tests. One component of this larger question is understanding what proportion of HCW have tested positive (via genetic or serology testing, for example) since the beginning of the outbreak. A better understanding of the prevalence of disease among HCW could aid policy decisions in deployment of HCW and planning for a potential personnel shortage.

Research Question(s)

- What proportion of healthcare workers are rt-PCR positive and IgM or IgG positive?

Method

The search strategy was developed and executed by a team of medical librarians. A rapid review of the literature was performed to answer this question. This method entails a brief scan of the relevant literature to gather publications with potentially relevant information to the question at hand. These publications are reviewed by a team of experts (library, research, and clinical staff) to determine the quality of the data and provide recommendations based on the question and available data. The rapid review is performed over a period of several days to provide a quick response, based in evidence, to a policy question. Note: this is not the same as a systematic review which has much more stringent criteria for analysis and requires a longer turnaround time for results.

PICO Statement

P – Patients/Population	What proportion of health care workers...
I – Intervention/Indication	---
C – Comparator/Control	...throughout the world...
O – Outcome	...have been infected with SARS-CoV-2?

Search Strategy

- Grey literature sources were searched by keyword and included variations and synonyms of the following key concepts: health care workers; prevalence/transmission of COVID19 virus to HCW
- For individual search strategies see Appendix

Inclusion Criteria

- The search was limited to 2020 to the present. No other exclusions were made.

Sources

- The following sources were searched: OVID Medline, PubMed, medRxiv, bioRxiv, CPG Infobase, Cochrane Special Collection on COVID19, CDC Database, Health Canada Website, Google, Google Scholar, Embase, Saskatchewan Health Association

Summary of Evidence

Several studies presented data on the proportion of HCW infected with SARS-CoV-2 [4, 5, 7, 8, 10, 15, 17, 18, and 19]. The number varied between studies, including 1.6%, 3%, 3.9%, 4.1%, 6% (in two studies), 7.9%, and 15% with one study claiming 20% of HCW were infected but with no description of how this number was determined. A rapid review from Alberta Health Services which compared their COVID-19 data among HCW with that of other countries indicates that Alberta has seen 0.9% of their tested HCW infected with SARS-CoV-2 [20].

Table 1. Alberta SARS-CoV-2 testing and COVID-19 testing and case data broken down by Alberta Health Services employees, physicians and the general non-healthcare worker population

Group	Number	# tested	% tested	# (%) of test results positive for SARS-CoV-2	# (%) of test positives from occupational exposure	Occupational risk % (PAR)	Overall risk % (PAR)
Total AHS Employees* (non-physician)	103,467	15,603	15.1%	137 (0.9%)	12 (8.8%)	0.01%	0.13%
AHS Physician	7,408	933	12.6%	22 (2.4%)	N/A **	N/A	0.30%

General Population (non-HCW) ***	4,287,068	122,386	2.9%	4,307 (3.5%)	N/A	N/A	0.10%
Total AB Population	4,397,816	138,922	3.2%	4,469 (3.2%)	N/A	N/A	0.10%

PAR - Population at risk

* Total AHS Employees includes some (but not all) AHS Physicians - AHS Physicians kept separate.

** 2 cases under investigation. 20 cases linked to a single community outbreak.

*** General population (non-HCW) has excluded the AHS Physician numbers because some are captured in AHS Employees and 20 cases are from a single outbreak.

Source: Alberta Health Services [20]

Most papers reported the percentage of all confirmed SARS-CoV-2 cases that were also HCW. Unfortunately, this does not answer the question at hand as the data that are provided reflect the number of HCW infected with the virus out of the total number of cases, and not the proportion of infected HCW.

It should also be noted that the number of HCW infected is likely to be higher than the reported values due to lack of broadly applied testing, lack of serology testing, and the higher than average risk of exposure of HCW to the virus. Additionally, for many studies, only symptomatic people are tested and therefore, they may be underestimating the true proportion of infected individuals (given the proportion of asymptomatic infections with SARS-CoV-2).

The majority of publications which described their confirmatory testing used genetic-based testing (i.e., PCR) to confirm the presence of the virus in symptomatic patients. While this provides an idea of how many active infections are present when testing, it does not indicate how many people may have already been exposed to the virus. Thus, serology testing (only presented in one study) may provide better clarity for how many HCW have had the virus and not limit the count to active infections [15]. Additionally, some of those infected can have either mild symptoms or be asymptomatic and may not meet testing criteria in many places around the world. These potential active infections are not accounted for in the data.

Very few publications seek to accurately report the proportion of HCW who are infected. Most studies suffer from sampling bias and a lack of standardized protocols for sampling, testing, and reporting. For these reasons, the majority of the included studies provide only low quality evidence, and only some provide data to answer the research question posed above.

Conclusions

According to the evidence reviewed, between 0.9% and 20% of HCW are infected with SARS-CoV-2. It is uncertain how well these estimates represent the true proportion of HCW who have had COVID-19 in the settings in which they were measured. As most of the estimates were derived from samples of symptomatic HCWs, one might expect such estimates to overestimate the true rate; however, as asymptomatic infection may comprise 40% of all COVID-19 infections (Rapid Review LAB040701v2RR) and most studies did not perform serological testing, one might expect the reported estimates to underestimate the true rate. It is possible that, balancing all factors, current estimates are generally accurate. This question will hopefully be clarified soon with more comprehensive studies of entire populations or representative samples of HCWs in diverse settings using both rt-PCR and serological measures

References Included in Summary

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Appendix: Evidence Search Details

Search Strategies

- PubMed search strategy (search alert created April 7, 2020 at 21:41)
 - (((Health Personnel/ OR students, health occupations/ OR students, dental/ OR students, medical/ OR students, nursing/ OR students, pharmacy/ OR students, public health/ OR Social Workers/ OR (acupuncturist* OR allergists OR anatomist* OR anesthesiologist* OR anesthetist* OR audiologist* OR cardiologist* OR chiropractor* OR clinician* OR dental hygienist* OR dentist* OR dermatologist* OR diabetologist* OR dietician* OR doctor* OR doula OR doulas OR endocrinologist* OR gastroenterologist* OR general practitioner* OR geriatrician* OR gynecologist* OR haematologist* OR (health OR health care OR healthcare) AND adj2 AND (worker* OR practitioner* OR provider OR professional OR navigator* OR student*) OR hospitalist* OR internist* OR medical resident* OR medical student* OR midwife OR midwives OR neonatologist* OR nephrologist* OR neurologist* OR neurosurgeon* OR nurse OR nurses OR nursing student* OR nutritionist* OR obstetrician* OR oncologist* OR ophthalmologist* OR optometrist* OR osteopath OR osteopaths OR otolaryngologist* OR pathologist* OR pediatrician* OR pharmacist* OR pharmacolog* OR phlebotomist* OR physician* OR podiatrist* OR prosthetist* OR psychologist* OR psychiatrist* OR pulmonologist* OR radiographer OR radiologist* OR radiotherapist* OR rheumatologist* OR social worker* OR sonographer* OR surgeon* OR therapist* OR toxicologist* OR urologist* OR veterinarian*)) AND (TITLE-ABSTRACT AND ((coronavirus OR "corona virus" OR coronavirinae OR coronaviridae OR betacoronavirus OR covid19 OR "covid 19" OR nCoV OR "CoV 2" OR CoV2 OR sarscov2 OR 2019nCoV OR "novel CoV" OR "wuhan virus") OR ((wuhan OR hubei OR huanan) AND ("severe acute respiratory" OR pneumonia) AND (outbreak))) OR "COVID-19"[Supplementary Concept] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept]))) AND ((screening OR transmission OR serology OR "throat swabs" OR prevalence OR testing))
- Pubmed May 14th
 - (((Health Personnel/ OR students, health occupations/ OR students, dental/ OR students, medical/ OR students, nursing/ OR students, pharmacy/ OR students, public health/ OR Social Workers/ OR (acupuncturist* OR allergists OR anatomist* OR anesthesiologist* OR anesthetist* OR audiologist* OR cardiologist* OR chiropractor* OR clinician* OR dental hygienist* OR dentist* OR dermatologist* OR diabetologist* OR dietician* OR doctor OR doctors OR doula OR doulas OR endocrinologist* OR gastroenterologist* OR general practitioner* OR geriatrician* OR gynecologist* OR haematologist* OR (health OR health care OR healthcare) AND adj2 AND (worker* OR practitioner* OR provider OR professional OR navigator* OR student*) OR hospitalist* OR internist* OR medical resident* OR medical student* OR midwife OR midwives OR neonatologist* OR nephrologist* OR neurologist* OR neurosurgeon* OR nurse OR nurses OR nursing student* OR nutritionist* OR obstetrician* OR oncologist* OR ophthalmologist* OR optometrist* OR osteopath OR osteopaths OR otolaryngologist* OR pathologist* OR pediatrician* OR pharmacist* OR pharmacolog* OR phlebotomist* OR physician* OR podiatrist* OR prosthetist* OR psychologist* OR psychiatrist* OR pulmonologist* OR radiographer OR radiologist* OR radiotherapist* OR rheumatologist* OR social worker* OR sonographer* OR surgeon* OR therapist* OR

toxicologist* OR urologist* OR veterinarian*) AND (TITLE-ABSTRACT AND ((coronavirus OR "corona virus" OR coronavirinae OR coronaviridae OR betacoronavirus OR covid19 OR "covid 19" OR nCoV OR "CoV 2" OR CoV2 OR sarscov2 OR 2019nCoV OR "novel CoV" OR "wuhan virus") OR ((wuhan OR hubei OR huanan) AND ("severe acute respiratory" OR pneumonia) AND (outbreak))) OR "COVID-19"[Supplementary Concept] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept])) AND ((screening OR transmission OR serology OR "throat swabs" OR prevalence OR testing OR IgM OR IgG OR PCR positive OR RT-PCR+))

- Medline – May 29th

- 1 coronavirus/ or exp betacoronavirus/ or coronavirus infections/

(coronavirus* or corona virus* or coronavirus* or coronaviral or (wuhan adj1 virus) or (wuhan adj1 viral) or cov or covid or WN-CoV or ncov or 2019ncov or ncov2019 or nccovid or nccovid2019 or 2019nccovid or covid-19 or covid19 or covid 19 or corvid 19 or HCov-19 or HCov-2019 or hcov19 or hcov2019 or severe acute respiratory syndrome coronavirus 2 or severe acute respiratory syndrome corona virus 2 or

- 2 SARS Coronavirus 2 or SARS Corona virus 2 or SARS-COV-2 or SARSCOV2 or SARSCOV 2 or SARS2 or SARS-2 or coronavirus disease 2019 or corona virus disease 2019 or 2019 novel coronavirus infection* or 2019 novel coronavirus disease or 2019-nCoV infection* or coronavirus disease-19 or new coronavirus or novel corona virus).mp,kf,hw,rn,in.

- 3 1 or 2

- 4 exp "health care facilities, manpower, and services"/

(health workforce or health care worker? or healthcare worker? or health-care worker? or health care provider? or healthcare provider? or health-care provider? or medical care provider? or healthcare employee? or health personnel or medical personnel or medical staff or hospitalist? or physician? or doctor? or pathologist? or primary care phsycian? or GP or PCP or pulmonologist? or general practitioner? or general practice physician? or nursing staff or nurse? or hospital personnel or hospital staff or hospitalist? or internist? or medical resident? ! or medical student?

- 5 or midwife or midwives or neonatologist? or nephrologist? or neurologist? or neurosurgeon? or nursing student? or nutritionist? or obstetrician? or oncologist? or ophthalmologist? or optometrist? or osteopath or osteopaths or otolaryngologist? or pathologist? or p#ediatrician? or pharmacist? or pharmacolog? or phlebotomist? or podiatrist? or prosthetist? or psychologist? or psychiatrist? or pulmonologist? or radiographer? or radiologist? or radiotherapist? or rheumatologist? or social worker? or sonographer? or surgeon? or therapist? or toxicologist? or urologist?).tw,kf,mp.

- 6 4 or 5

exp immunoglobulin g/ or exp immunoglobulin m/ or polymerase chain reaction/ or real-time polymerase chain reaction/ or reverse transcriptase polymerase chain reaction/

- 8 (IgM or IgG or "immunoglobulin m" or "immunoglobulin g" or "immunoglobulin g positive" or "immunoglobulin m positive" or PCR positive or PCR or polymerase chain reaction?).tw,kf.

- 9 7 or 8

10 3 and 6 and 9

11 limit 10 to yr="2020 -Current"

Sources

- Medline
- PubMed
- medRxiv
- bioRxiv
- CPG Infobase
- Cochrane Special Collection on COVID-19
- CDC Database
- Health Canada Website
- Google
- Google Scholar
- Embase
- Saskatchewan Health Association



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