

**1. Risk Factors for severe COVID-19:**

***a. Infection Fatality Rate is extremely age dependent***

Ioannidis JPA. Infection fatality rate of COVID-19 inferred from seroprevalence data. *Bull World Health Organ.* (2021a) 99:19-33F.

Levin AT, Hanage WP, Owusu-Boaitey N, Cochran KB, Walsh SP, Meyerowitz-Katz G. Assessing the age specificity of infection fatality rates for COVID-19: systematic review, meta-analysis, and public policy implications. *Eur J Epidemiol.* (2020) 35:1123-1138.

O'Driscoll M, Dos Santos GR, Wang L, Cummings DAT, Azman AS, Paireau J, et al. Age-specific mortality and immunity patterns of SARS-CoV-2. *Nature* (2021) 590:140-145.

Ioannidis JPA. Reconciling estimates of global spread and infection fatality rates of COVID-19: an overview of systematic evaluations. *Eur J Clin Invest.* (2021b) 51:e13554.

Axfors C, Ioannidis JPA. Infection fatality rate of COVID-19 in community dwelling populations with emphasis on the elderly: An overview. medRxiv. (2021) Preprint. Available online at: <https://doi.org/10.1101/2021.07.08.21260210>.

Joffe AR, Redman D. The SARS-CoV-2 pandemic in high income countries such as Canada: A better way forward without lockdowns. 2021 OSF Preprints. <https://doi.org/10.31219/osf.io/r8d6f> . Now in press at: <https://www.frontiersin.org/articles/10.3389/fpubh.2021.715904/abstract>

-see Tables 1 and 2 that summarize the above IFR references, and compare them to Influenza deaths in 2019 in the USA

Sen P, Yamana TK, Kandula S, Galanti M, Shaman J. Burden and characteristics of COVID-19 in the United States during 2020. *Nature* 2021;598:338-341.

-modeled that the national population-weighted ascertainment rate averaged for all of 2020 was 21.8% (15.9, 30.3), and the national IFR during the latter half of 2020 hovers around 0.30%.

Smith C, Odd D, Harwood R, Ward J, Linney , Clark M, et al. Deaths in children and young people in England after SARS-CoV-2 infection during the first pandemic year. *Nature Medicine* 2021. <https://doi.org/10.1038/s41591-021-01578-1>.

-In children age <18y from Mar/20 to Feb/21 in England, of 3105 deaths overall [including 124 from suicide and 268 from trauma], 61 tested positive for SARS-CoV-2, of whom 25 (41%) were determined to have died of SARS-CoV-2 [0.8% of all deaths]. The survival from SARS-CoV-2 infection was estimated at 99.995% [IFR 0.005%]. Risk factors included age 10-17y, Asian or black ethnicity, and comorbidities; but the absolute risk in each risk group was extremely low, accounting for <3% of their deaths overall. Most SARS-CoV-2 deaths had a life-limiting condition (60%), 2+ comorbidities (64%), and/or complex neuro-disability (52%), and none had isolated respiratory (CF, asthma), diabetes, Down's syndrome, epilepsy, or mental health disorder, or were a neonate.

***b. Other important risk factors include physical inactivity, obesity, and poor diet.***

Sallis R, Young DR, Tartof SY, Sallis JF, Sall J, Li Q, Smith GN, Cohen DA. Physical inactivity is associated with a higher risk of severe COVID-19 outcomes: a study in 48 440 adult patients. *Br J Sports Med* 2021. <https://doi.org/10.1136/bjsports-2021-104080>.

## **Joffe AR. References for John Dossetor Health Ethics Center COVID-19 Symposium Nov 26, 2021**

-Being inactive (0-10min/wk) was associated with higher hospitalization OR 2.26 (1.81, 2.83), ICU admission OR 1.73 (1.18, 2.55), and death OR 2.49 (1.33, 4.67) compared to meeting activity guidelines (150+min/week). Being inactive was associated with higher hospitalization OR 1.20 (1.10, 1.32), ICU admission OR 1.10 (0.93, 1.29), and death OR 1.32 (1.09, 1.60) compared to having some physical activity (11-149min/week). The increased risk exceeded the odds of smoking and virtually all the chronic diseases studied [except for age and a history of organ transplant]. The authors concluded that regular physical activity may be the single most important action individuals can take to prevent severe COVID-19 and its complications.

### **Merino J, Joshi AD, Nguyen LH, Leeming ER, Mazidi M, Drew DA, et al. Diet quality and risk and severity of COVID-19: a prospective cohort study. Gut 2021. doi: 10.1136/gutjnl-2021-325353**

-A pre-pandemic healthful Plant-Based Diet reduced risk of COVID-19: low-quality vs high-quality diet reduced the risk of symptomatic COVID-19 aHR 0.91 (0.88, 0.94); for severe COVID-19 aHR 0.59 (0.47, 0.74). The authors suggested we “should consider specific attention to improve nutrition as a social determinant of health.”

### **Kim H, Rebholz CM, Hegde S, LaFiura C, Raghavan M, Lloyd JF, et al. Plant-based diets, pescatarian diets and COVID-19 severity: a population-based case-control study in six countries. BMJ Nutrition Prevention & Health 2021 <https://doi.org/10.1136/bmjnph-2021-000272>.**

-plant-based diets had lower risk, OR 0.27 (95% CI 0.10, 0.81), of moderate-to-severe COVID-19, adjusted for age, sex, race/ethnicity, country, medical specialty, smoking, physical activity, BMI, and medical condition.

### **Kompaniyets L, Goodman AB, Belay B, Freedman DS, Sucusky MS, Lange SJ, et al. Body mass index and risk for COVID-19-related hospitalization, intensive care unit admission, invasive mechanical ventilation, and death – United States, March–December 2020. MMWR 2021;70.**

-risks for hospitalization, ICU, and death were lowest at BMI 24.2, 25.9, 23.7 respectively, and then increased sharply with higher BMIs. Risk for invasive ventilation in ICU increased over the full range of BMIs. The authors concluded that this suggests the need to promote and ensure community access to nutrition and physical activity opportunities that promote and support a healthy BMI.

### **Gao M, Piernas C, Astbury NM, Hippisley-Cox J, O’Rahilly S, Aveyard P, Jebb SA. Associations between body-mass index and COVID-19 severity in 6.9 million people in England: a prospective, community-based, cohort study. Lancet Diabetes Endocrinol 2021.**

-at a BMI of >23 kg/M<sup>2</sup> there was a linear increase in risk of severe-COVID-19 leading to admission to hospital and death, and a linear increase in admission to an ICU across the whole BMI range.

### ***c. Teachers (and students) are not at higher risk:***

#### **Gandini S, Rainisio M, Iannuzzo ML, Bellerba F, Cecconi F, Scorrano L. A cross-sectional and prospective cohort study of the role of schools in the SARS-CoV-2 second wave in Italy. Lancet Regional Health – Europe 2021;5:100092.**

-incidence among students was lower than in the general population; secondary infections at school were <1%, and clusters of ≥2 secondary cases occurred in 5-7% of analyzed schools. Incidence among teachers was comparable to the population of similar age (p=0.23); secondary infections among teachers were rare, occurring more frequently when the index case was a teacher than a student (37%

vs. 10%,  $p=0.007$ ). School closures in 2 regions where they were implemented before other measures did not affect transmission decrease.

**Somekh I, Boker LK, Shohat T, Pettoello-Mantovani M, Simoes EF, Somekh E. Comparison of COVID-19 incidence rates before and after school reopening in Israel. JAMA Netw Open 2021;4(4):e217105.**

-children aged 0-9 had the lowest increases in incidence rates and in positivity relative risks during the 2 school attendance time periods.

**Fenton L, Gribben C, Caldwell D, Colville S, Bishop J, Reid M, White J, et al. Risk of hospital admission with covid-19 among teachers compared with healthcare workers and other adults of working age in Scotland, March 2020 to July 2021: population based case-control study. BMJ 2021;374:n2060**

-in Scotland, teachers showed lower risk of hospital admission with covid-19 RR 0.77 (0.64, 0.92) and of severe covid-19 0.56 (0.33, 0.97) than the general population. The corresponding findings for household members of teachers were 0.91 (0.67, 1.23) and 0.73 (0.37, 1.44), showing lack of increased risk.

**Bark D, Dhillon N, St-Jean M, Kinniburgh B, McKee G, Choi A. SARS-CoV-2 transmission in K-12 schools in the Vancouver Coastal Health Region: a descriptive epidemiologic study. CMAJ Open 2021;9(3):**

<https://doi.org/10.9778/cmajo.20210106>

-in 26 clusters with school-based transmission: 55 secondary cases, which is 55/123,646 (0.04%) of those in school and in 25/378 (7.0%) of schools; ratio of secondary cases to total primary cases was 0.09 in the school setting. The authors concluded that "In-person school attendance may not expose students and staff to higher risks than those experienced in the community."

**Goldfarb DM, Masse LC, Watts AW, Hutchison SM, Muttucomaroe L, Bosman ES, et al. SARS-CoV-2 seroprevalence among Vancouver public school staff in British Columbia, Canada. medRxiv 2021**

<https://doi.org/10.1101/2021.06.16.21258861>

-incidence of COVID-19 cases among students attending in-person was 9.8/1000 during 2020/21 school year, among staff 13/1000 since beginning of pandemic; only 1.4% (24/1688) of staff reported a positive test. The adjusted seroprevalence in staff who gave blood was 2.3% (1.6, 3.2) compared to 2.3% (1.7, 3.0) in blood donors, suggesting no detectable increase in seroprevalence among school staff above the community seroprevalence.

**Ciaranello A, Bell T. Using data and modeling to understand the risks of in-person education. JAMA Netw Open 2021;4(3):e214619**

-Studies have generally demonstrated similar or lower risks among children and adults who have been present in school buildings, compared with general population rates, and student-to-staff transmission has been rare [most adult infections have been acquired from other adults, often when unmasked while eating or drinking]. US and European studies have shown equivocal results about the association of school closure or opening with COVID-19 incidence, hospitalization, and deaths in the community.

**Fukumoto K, McClean CT, Nakagawa K. No causal effect of school closure in Japan on the spread of COVID-19 in spring 2020. Nature Medicine 2021. <https://doi.org/10.1038/s41591-021-1571-8>.**

-Matching each municipality with open schools to a municipality with closed schools that is the most similar in terms of potential confounders "we did not find any evidence that school closures in Japan reduced the spread of COVID-19."

**Ladhani SN, the sKIDs Investigation Team. Children and COVID-19 in schools. The benefits of in-person schooling with mitigations in place outweigh risks of COVID-19 for children. Science 2021;374(6568):680-682.**

-Makes several points. First, school closure harms children [with effects on education, social and emotional well-being, welfare services, school meals, school-based immunization]. Second, children almost invariably developed mild, transient, and self-limiting illnesses – case fatality rates are strongly associated with age. Third evidence suggests that school opening is not harmful. In the UK there were very few infections and outbreaks during the 6wk [of reopening] until mid-July/20, with most cases affecting staff and limited transmission among students [4/603 (0.7%) of 4-12yo students and 1/1015 (0.1%) of staff seroconverted; when outbreaks occurred, more than half involved only 2 cases]; antibody positivity rates were similar in students and staff and comparable to local community seroprevalence. IN the US, several active contact tracing studies found that very low rates of secondary infections occurred inside educational premises in K-12 [e.g., in North Carolina surveillance of 11 districts with >90K students and staff over 9 weeks found 773 community-acquired and 32 school-acquired infections; in Wisconsin incidence among students and staff in Sept-Nov was lower than in the county overall, and only 7/191 (3.7%) cases in students and staff were linked to in-school spread; in New York City prevalence in public schools was similar or less than community prevalence Oct-Dec/20, and only 191/36423 (0.5%) close school-contacts tested positive.

**Etrem Z, Schechter-Perkins EM, Oster E, van den Berg P, Epshtein I, Chaiyakunapruk N, et al. The impact of school opening model on SARS-CoV-2 community incidence and mortality. Nature Medicine 2021. <https://doi.org/10.1038/s41591-012-01563-8>.**

-During the 12 weeks after school opening (July-Sept/20), SARS-CoV-2 incidence rates were not statistically different in counties with in-person learning versus remote school modes in most regions of the United States, and there was no impact of school opening mode on subsequent COVID-19-related deaths in any region. In the “South, there was a significant and sustained increase in cases per week among counties that opened in a hybrid or traditional mode versus remote, with weekly effects ranging from 9.8 (2.7, 16.1) to 21.3 (9.9, 32.7) additional cases per 100K persons.” The authors “suggest that schools can open for in-person learning during the pandemic with minimal contribution to sustained community incidence of infections.”

**Walsh S, Chowdhury A, Braithwaite V, Russell S, Birch JM, Ward JL, et al. Do school closures and school reopenings affect community transmission of COVID-19? A systematic review of observational studies. BMJ Open 2021;11:e053371.**

-A review of 40 studies up to 7Jan/21 from 150 countries. In school closure studies, there was substantial heterogeneity, with half of studies at lower risk of bias reporting reduced community transmission and half reporting null findings. Studies were confounded by other NPIs implement around same time. Authors concluded that the effectiveness of school closures remains uncertain. In school reopening studies, 3 out of 4 studies at lower risk of bias reported no associated increases in transmission.

**Wood R, Thomson E, Galbraith R, Bribben C, Caldwell D, Bishop J, et al. Sharing a household with children and risk of COVID-19: a study of over 300 000 adults living in healthcare worker households in Scotland. Arch Dis Child 2021;106:1212-1217.**

-After schools reopened to all children 12 Aug/20, with active transmission of SARS-CoV-2 in the community, up until 12 Oct/20, there was no association seen between exposure to young children and risk of any COVID-19 (aHR per child in household 1.03; 95% CI 0.92, 1.14).

## 2. The risk of long-COVID:

### a. Long-COVID is rare in children

**Buonsenso D, Munblit D, De Rose C, Sinatti D, Ricchiuto A, Carfi A, Lantini P. Preliminary evidence on long COVID in children. Acta Paediatrica 2021 <https://doi.org/10.1111/apa.15870>.**

-at 162.5 (113.7) days after COVID diagnosis, 41.8% completely recovered, 35.7% had 1-2 symptoms, and 22.5% had 3 or more symptoms [which, correcting for the MIS-C incidence of 2.3% in their cases but <1/3000 in SARS-CoV-2 infections, means <1/300 had 3 or more symptoms]. Fatigue was the symptom in 10.8% [but fatigue “more – compared to before COVID-19 diagnosis” occurred in only 1 (0.8%)].

**Molteni E, Sudre CH, Canas LS, Bhopal SS, Hughes RC, Antonelli M, et al. Illness duration and symptom profile in a large cohort of symptomatic UK school-aged children tested for SARS-CoV-2. Lancet 2021. [https://doi.org/10.1016/S2352-4642\(21\)00198-X](https://doi.org/10.1016/S2352-4642(21)00198-X)**

-77/1734 (4.4%; 95% CI 3.5, 5.5) illness duration ≥28d vs. 0.9% (0.5, 1.4) in matched cohort, but did not involve attentional problems, memory complaints, or anxiety. 25/1379 (1.8%; 95% CI 1.2, 2.7) illness duration ≥56d, and symptom burden did not increase with time. However, normative data outside of the pandemic suggest prevalence and persistence of symptoms in general pediatric population are common: ~60% are ‘prone to headache’; 66% had headaches over the previous year; 4.4% had ‘more than a few days of disabling fatigue’; ‘fatigue lasting over 6mo associated with absence from full-time school or that had prevented participation in activities’ 1.5% at age 13y and 2.2% at age 16y.

**Say D, Crawford N, McNab S], Wurzel D, Steer A, Tosif S. Post-acute COVID-19 outcomes in children with mild and asymptomatic disease. Lancet Child Adolescent Health 2021;5:e22-e23.**

-follow-up at 3–6mo in 151 children found 10 (6.62%) had post-acute COVID symptoms [all were symptomatic at diagnosis]; correcting for MIS-C (reported in 1.17% of their patients) this becomes 0.19% with symptoms up to 8 weeks

**Radtke T, Ulyte A, Puhan MA, Kriemler S. Long-term symptoms after SARS-CoV-2 infection in children and adolescents. JAMA 2021**

-found that 9.2% seropositive vs. 9.7% seronegative had at least 1 symptom beyond 4wk, and 3.7% seropositive vs 2.2% seronegative had at least 1 symptom beyond 12wk [no difference]. A similar proportions of seropositive and seronegative children reported excellent or good health (94% vs 96%)

**Blankenburg J, Wekenborg MK, Reichert J, Kirsten C, Kahre E, Haag L, et al. Mental health of adolescents in the pandemic: Long-COVID-19 or Long-Pandemic Syndrome? medRxiv 2021.**

<https://doi.org/10.1101/2021.05.11.21257037>.

-in Grade 8-12 students each symptom was present in at least 35% of the students within the last 7d, with no difference comparing seropositive to seronegative students; self-reported mental distress also did not differ. The authors suggest that this confirms the negative effects of lockdown measures

**Zimmermann P, Pittet LF, Curtis N. How common is long COVID in children and adolescents? PIDJ 2021**

-14 studies with major limitations and marked heterogeneity; 5 studies included controls and 2 did not find persistent symptoms to be more prevalent in children and adolescents with evidence of SARS-CoV-2 infection [symptoms are difficult to distinguish from pandemic-associated symptoms due to lockdown]. The authors “suggest that infection-associated symptoms are not necessarily more common or severe than pandemic-associated symptoms.” Many of the over 200 symptoms attributed to long-COVID are nonspecific and highly prevalent in the general population.

***The toll on mental health in children (the contemporary controls without long-COVID during the pandemic) has been very high***

**Racine N, McArthur BA, Cooke JE, Elrich R, Zhu J, Madigan S. Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19. A Meta-analysis. JAMA Pediatr 2021;175(11):1142-1150.**

-In 29 studies to Feb 16/21 including 80879 participants, the pooled prevalence of clinically elevated depressive and anxiety symptoms were 25.2% (21.2, 29.7) and 20.5% (17.2, 24.4). Prevalence was higher in studies done later in the pandemic, in girls, and for depression, in older children. This is double pre-pandemic estimates, and reflects the control group for studies of persistent symptoms in children during the pandemic.

**AAP, AACAP, CHA declare national emergency in children's mental health. American Academy of Pediatrics News. 2021 Oct 19.**

<https://publications.aap.org/aapnews/news/17718?autologincheck=redirected>

-discusses the escalating mental health crisis due to physical isolation, ongoing uncertainty, fear, and grief. Emergency department visits Mar-Oct/20 for mental health emergencies rose by 24% for children ages 5-11, 31% ages 12-17 in the US. Emergency Department visits for suspected suicide attempts increased nearly 51% among girls ages 12-17 in early 2021.

**b. Long COVID is not common in adults**

**Nasserie T, Hittle M, Goodman SN. Assessment of the frequency and variety of persistent symptoms among patients with COVID-19: A systematic review. JAMA Netw Open 2021;4(5):e2111417.**

-45 studies of 9751 participants reported 84 signs or symptoms and 19 laboratory or imaging measurements. Most frequent symptoms included dyspnea 36%, fatigue 40%, sleep disorders 29.4%, depression 14.9%, anxiety 22.1%, memory loss 28.3%. Frequent study quality concerns included sampling strategy being unclear or non-consecutive 14; baseline severity not reported 22; attrition not reported or at least 30% in 24 and attrition of 20-29% in 6; predominantly previously hospitalized in 16 studies; severity of symptoms not well quantified. Studies found physical and mental health scores were mostly within 1/2 SD of population norms.

**Groff D, Sun A, Ssentongo AE, Ba DM, Parsons N, Poudel GR, et al. Short-term and long-term rates of postacute sequelae of SARS-CoV-2 infection. A systematic review. JAMA Netw Open 2021;4(10):e2128568.**

-57 studies reported on 38 manifestations in cases 79% of whom were hospitalized, suggested a median 54% having at least 1 laboratory, radiologic, pathologic, or clinical sign/symptom of post-acute sequelae at 6+ months. Most common were difficulty concentrating (23.8%), generalized anxiety (29.6%), pulmonary radiologic abnormality (62.2%), general functioning impairment (44%), and fatigue or muscle weakness (37.5%). These effects were due to direct viral effects or "indirect effect on mental health due to post-traumatic stress, social isolation, and economic factors, such as loss of employment." Limitations included heterogeneity in definitions; they could not stratify incidence by severity of initial illness, comorbidities, age, or hospitalization; and, not mentioned by the authors, lack of control groups, poorly described severity of persistent symptoms, and unknown significance of laboratory and radiologic abnormalities.

***Contrast these reviews with the following:***

**Office for National Statistics. Technical article: Updated estimates of the prevalence of post-acute symptoms among people with coronavirus (COVID-19) in the UK: 26 April 2020 to 1 August 2021.**

-prevalence of any of 12 common symptoms (in last 7d) 12-16 weeks after infection 5.0% vs. 3.4% in controls [in age 2-11, 12-16, and 17-24y: 3.2% vs 4.1%, 3.0% vs 1.3%, and 3.6% vs 3.6%]. Prevalence of any of 12 continuous symptoms [need not be the same symptom at every visit] after infection for at least 12 weeks 3.0% vs 0.5% in controls [in age 2-11, 12-16, and 17-24y: 0.7%, 1.2%, and 1.5%]. Limitation is that participants may be more likely to report symptoms following a positive test because of increased awareness.

**Sudre CH, Murray B, Varsavsky T, Graham MS, Penfold RS, Bowyer RC, et al. Attributes and predictors of long COVID. *Nature Med.* (2021) 27:626-631. DOI: 10.1038/s41591-021-01292-y.**

-App users who had detected COVID-19 cases reported symptoms (of unknown severity) at  $\geq 8$  weeks in 4.5% and  $\geq 12$  weeks in 2.3%, of whom 43.9% had been hospitalized.

**Nalbandian A, Sehgal K, Gupta A, Madhavan MV, McGroder C, Stevens JS, et al. Post-acute COVID-19 syndrome. *Nature Medicine.* (2021) 27:601-615.**

-A recent review that suggested approximately 30% of hospitalized COVID-19 cases have post-acute COVID-19 syndrome (of unclear severity); this would mean that [if  $< 5\%$  of cases are hospitalized, then  $< 1\%$  of infections are hospitalized] up to 0.3% of infections end up with this syndrome.

***And the increasing prevalence of mental health disorders in the general population even without COVID-19 infection (i.e., the control group).***

**Czeisler ME, Lane RI, Wiley JF, Czeisler CA, Howard ME, Rajaratnam SMW. Follow-up survey of US adult reports of mental health, substance use, and suicidal ideation during the COVID-19 pandemic, September 2020. *JAMA Netw Open.* (2021) 4(2):e2037665.**

**Salari N, Hosseini-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M, et al. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. *Global Health.* (2021) 16:57.**

-Suggest that contemporary uninfected controls during the pandemic are often experiencing social isolation, unemployment, loneliness, and  $\sim 30\%$  prevalence of anxiety and depression.

***And the potential for nocebo effects.***

**Bagus P, Pena-Ramos JA, Sanchez-Bayon A. COVID-19 and the political economy of mass hysteria. *Int J Environ Res Public Health.* (2021) 18(4):1376.**

-Nocebo effects due to being bombarded by reports in the press and on social media, anxiety, fear, and negative expectations can lead to at least some of the cases of prolonged symptoms.

**Matta J, Wiernik E, Robineau O, Carrat F, Touvier M, Severi G, et al. Association of self-reported COVID-19 infection and SARS-CoV-2 serology test results with persistent physical symptoms among French adults during the COVID-19 pandemic. *JAMA Intern Med* 2021. In Press.**

-In 26,823 participants, having physical symptoms during the previous 4 weeks that had persisted for at least 8 weeks was associated with self-reported infection (*belief in having been infected*) with ORs ranging from 1.39 to 16.37 (e.g., fatigue OR 4.90; poor attention or concentration OR 3.42; headache OR 2.40; breathing difficulties OR 7.75; palpitations OR 5.14; chest pain OR 6.58; cough OR 4.85), and *not with having actually been infected* (i.e., serology positive, which was associated only with persistent anosmia). Thus, "symptoms may not emanate from SARS-CoV-2 infection per se," but instead may be ascribed to SARS-CoV-2 despite having other causes.

### 3. Lockdowns are based on three flawed assumptions.

Joffe AR. COVID-19: Rethinking the Lockdown Groupthink. *Front Public Health*. (2021) 9:625778.

-a cost-benefit analysis with references for many of the methods and data used

Joffe AR, Redman D. The SARS-CoV-2 pandemic in high income countries such as Canada: A better way forward without lockdowns. 2021 OSF Preprints. <https://doi.org/10.31219/osf.io/r8d6f> . Now in press at: <https://www.frontiersin.org/articles/10.3389/fpubh.2021.715904/abstract>

-reviews 27 studies findings lockdowns are not associated with transmission of SARS-CoV-2

-reviews 11 studies finding lockdowns have higher cost than benefit in terms of population wellbeing

Joffe A, Redman D. Applying Philosophy, Logic, and Rational Argumentation to the Severe Acute Respiratory Syndrome Coronavirus-2 Pandemic Response. Preprints 2021.

<https://doi.org/10.20944/preprints202105.0264.v1>

-giving many references for the flawed lockdown assumptions

Halperin DT, Hearst N, Hodgins S, Bailey RC, Klausner JD, Jackson H, et al. Revisiting COVID-19 policies: 10 evidence-based recommendations for where to go from here. *BMC Public Health* 2021;21:2084.

-Discusses that some widely held assumptions underlying current policy approaches call for an evidence-based reassessment - maintaining a constant state of emergency is not viable. Suggest that lockdowns should be avoided “in favor of more effective, carefully targeted ‘scalpel’ public health strategies,” and that lockdowns have “far-reaching unintended consequences” [mental health, drug overdose, domestic violence, child abuse, weight gain, abuse by law enforcement, discontinuing non-COVID healthcare]. Also discusses: vaccination should be equitable, prioritize the vulnerable, and be deferred in previously infected; emphasize education and harm reduction approaches as opposed to coercive and punitive measures; keep schools open as not major drivers of transmission, and harm “dwarfs any benefits”; and de-emphasize identifying new cases [i.e., focus on mortality and hospitalization].

*And, specifically in Canada:*

Vickers DM, Baral S, Mishra S, Kwong JC, Sundaram M, Katz A, et al. Stringency of containment and closures on the growth of SARS-CoV-2 in Canada prior to accelerated vaccine roll-out. (October 21, 2021). Available at SSRN: <http://dx.doi.org/10.2139/ssrn.3947387>.

-Across 5 provinces and 2 pandemic waves from 28Feb/20 to 15Feb/21, pandemic responses correlated with decreased growth of SARS-CoV-2 cases. However, this correlation attenuated as response stringency increased [steepest in first wave at average SI 25.2 out of 100 and became less negative [diminishing returns] in all subsequent SI periods], case growth declined identically regardless of a province’s initial stringency [declined rapidly by 37-50% and began plateauing within the first 2 weeks of the first wave], and case growth stabilized despite incrementally stringent responses in late-2020 [no correlation with SI during second wave]. This demonstrates “a limited dose-response relationship between SI of NPIs and reduced case growth” and overall “the results of this study did not yield significant case reduction with increasing stringency of NPIs in the first and second waves across five provinces.” It is likely that any early benefit rapidly saturated among those who could work from home and remain well-housed, but without effect on essential workers and those with public-facing jobs, those voluntarily avoiding busier public places, and those reallocating mobility to ‘allowed’ businesses. This suggests a mismatch between where the largest risk was and how restrictive NPIs were: requires targeted approaches, such as paid-leave, voluntary isolation support, and improved occupational health.

*In addition, lockdowns cause risk factors for severe COVID-19 to increase*



**Chaffee BW, Cheng J, Couch ET, Hoeft KS, Helpert-Felsher B. Adolescents' substance use and physical activity before and during the COVID-19 pandemic. JAMA Pediatr 2021;175(7):715-722.**

-Grade 9 and 10 students at 8 public high schools Northern California: being physically active declined sharply from baseline after the stay-at-home order.

**Pagoto SL, Conroy DE. Revitalizing adolescent health behavior after the COVID-19 pandemic. JAMA Pediatr 2021;175(7):677-679.**

-stay-at-home restrictions have had unintended implications for health-related behaviors in youth. Yet, premature decline in physical activity could track into adulthood and increase risk for chronic disease later in life [healthy and unhealthy behaviors that are established in adolescence often extend into adulthood].

**Woolford SJ, Sidell M, Li X, Else V, Young DR, Resnicow K, Koebnick C. Changes in body mass index among children and adolescents during the COVID-19 pandemic. JAMA 2021**

-among 5–11-year-old children, overweight or obesity increased from 36.2% to 45.7% during the pandemic (absolute increase 8.7% compared to reference period); among 12-15 year old children there was an absolute increase of 5.2%, and among 16-17 year old an absolute increase of 3.1%.

**Jarnig G, Jaunig J, van Poppel MNM. Association of COVID-19 mitigation measures with changes in cardiorespiratory fitness and body mass index among children aged 7 to 10 years in Austria. JAMA Netw Open 2021;4(8):e2121675**

-among 12 randomly selected primary schools in urban and rural districts of Klagenfurt, Austria, children with overweight or obesity increased 3.8% during the year.

#### 4: Vaccine Mandates/Passports should not be used

##### a. The Efficacy of Vaccine Mandates is Unclear:

**Golden A, Nimni G, Rao S, Rau N. Opinion: Why vaccine passports won't slow COVID spread, will hurt the poor and threaten medical ethics. Six good reasons to rethink vaccine certificates. National Post 2021; Sept 9.**

-discusses that mandates have unclear benefits, overestimate vaccine effect on transmission, underestimate vaccine effect on protection from severe disease, ignore marginalized communities, and may contribute to inequality, loss of trust, and unintended consequences.

**Subramanian SV, Kumar A. Increases in COVID-19 are unrelated to levels of vaccination across 68 countries and 2947 counties in the United States. Eur J Epidemiol 2021**  
<https://doi.org/10.1007/s10654-021-00808-7>.

-discusses the unclear efficacy of vaccine in controlling spread. For countries, there was “no discernable relationship between percentage of population fully vaccinated and new COVID-19 cases in the last 7 days. In fact, the trend line suggests a marginally positive association...” For US counties, “the median new COVID-19 cases per 100,000 people in the last 7 days is largely similar across the categories of percent population fully vaccinated... also appears to be no significant signaling of COVID-19 cases decreasing with higher percentages of population fully vaccinated.”

**Porat T, Burnell R, Calvo RA, Ford E, Paudyal P, Baxter WL, Parush A. “Vaccine Passports” may backfire: Findings from a cross-sectional study in the UK and Israel on willingness to get vaccinated against COVID-19. Vaccines 2021;9:902.**

-Found that need frustration – particularly autonomy frustration – was associated with lower willingness to get vaccinated. Suggested that control measures, such as domestic vaccine passports, may have detrimental effects on people’s autonomy, motivation, and willingness to get vaccinated.

##### b. Why Efficacy is Unclear

###### i) Vaccine Efficacy (VE) waning over time, especially for infection and transmission

**Puranik A, Lenehan PJ, Silvert E, Niesen MJM, Corchado-Garcia J, O’Horo JC, Virk A, et al. Comparison of two highly-effective mRNA vaccines for COVID-19 during periods of Alpha and Delta variants prevalence. medRxiv 2021. <https://doi.org/10.1101/2021.08.06.21261707>**

-VE against infection: mRNA1273 86% (81, 90.6), BNT 76% (69, 81); in July 76% (58, 87), and 42% (13, 62). VE against hospitalization: mRNA1273 91.6% (81, 97), BNT 85% (73, 93); in July 81% (33, 96.3), and 75% (24, 93.9).

**Tang P, Hasan MR, Chemaitelly H, Yassine HM, Benslimane FM, Al Khatib HA, AlMukdad S, et al. BNT162b and mRNA-1273 COVID-19 vaccine effectiveness against the Delta (B.1.617.2) variant in Qatar. medRxiv 2021. <https://doi.org/10.1101.2021.08.11.21261885>**

-VE against any Delta infection: BNT 64.2% (38.1, 80.1) ≥14d after first dose; 53.5% (43.9, 61.4) ≥14d after second dose; for mRNA1273 79.0% (58.9, 90.1) and 84.8% (75.9, 90.8). VE against severe/critical/fatal Delta: ≥14d after second dose BNT 89.7% (61.0, 98.1) and mRNA1273 100.0% (41.2, 100.0).

**Chau NVV, Ngoc NM, Nguyet LA, Quang VM, Ny NTH, Khoa DB, et al. Transmission of SARS-CoV-2 Delta variant among vaccinated healthcare workers, Vietnam. medRxiv 2021**

-investigation suggested ongoing transmission between the HCW, and that vaccine might not lower the infectivity of breakthrough cases

**Wadman M. Israel's grim warning: Delta can overwhelm shots. With early vaccination and outstanding data, country is the world's real-life COVID-19 lab. Science 2021;373(6557):838-839.**

-with 78% of those ≥12y fully vaccinated, Israel is now logging one of the world's highest infection rates [nearly 700/M daily new cases; more than half in fully vaccinated people], suggesting that protection from infection wanes.

**Subbaraman N. How do vaccinated people spread Delta? What the science says. Delta spreads more readily than other coronavirus variants among vaccinated people, data suggest. Nature 2021;596:327-328.**

-emerging evidence suggests that Delta more likely than other variants to spread through vaccinated people; that vaccinated people who become infected with Delta can carry as much virus in their nose as do unvaccinated people; and that vaccines remain protective against serious illness and death

**Mizrahi B, Lotan R, Kalkstein N, Peretz A, Perez G, Ben-Tov A, et al. Correlation of SARS-CoV-2 breakthrough infections to time-from-vaccine; Preliminary study. medRxiv 2021.**

<https://doi.org/10.1101/2021.07.29.21261317>

-the risk for infection was significantly higher for early vaccinees compared to those vaccinated later

**Krause PR, Fleming TR, Peto R, Longini IM, Figueroa JP, Sterne JAC, et al. Considerations in boosting COVID-19 vaccine immune responses. Lancet 2021 [https://doi.org/10.1016/50140-6736\(21\)02046-8](https://doi.org/10.1016/50140-6736(21)02046-8).**

-vaccines continue to be effective against severe disease, including by delta variant; but, less effective against asymptomatic disease, or against transmission. Vaccine supplies could save more lives if used in previously unvaccinated populations (especially people who are at appreciable risk of serious disease). Some are already protected because of previous infection.

**Scobie HM, Johnson AG, Suthar AB, Severson R, Alden NB, Balter S, et al. Monitoring incidence of COVID-19 cases, hospitalizations, and deaths, by vaccination status – 13 U.S. jurisdictions, April 4-July 17, 2021. MMWR. 2021;70.**

-findings suggest a potential decline in vaccine protection against confirmed SARS-CoV-2 infection and continued strong protection against COVID-19-associated hospitalization and death

**Bajema KL, Dahl RM, Prill MM, Meites E, Rodriguez-Barradas MC, Marconi VC, et al. Effectiveness of COVID-19 mRNA vaccines against COVID-19-associated hospitalization – Five veterans affairs medical centers, United States, February 1-August 6, 2021. MMWR 2021;70.**

-VE against hospitalization: similar before (Feb1-June30) and during (July1-Aug6) delta predominance: 84.1% vs 89.3%.

**Grannis SJ, Rowley EA, Ong TC, Stenehjem E, Klein NP, DeSilva MB, et al. Interim estimates of COVID-19 vaccine effectiveness against COVID-19-associated emergency department or urgent care clinic encounters and hospitalizations among adults during SARS-CoV-2 B.1.617.2 (Delta) variant predominance – nine states, June-August 2021. MMWR 2021;70.**

-VE estimates similar to before Delta became predominant: reaffirm high protection against moderate and severe COVID-19 resulting in emergency department, urgent care clinic, and hospital visits

**Keehner J, Horton LE, Binkin NJ, Laurent LC, Pride D, Loghurst CA, et al. Resurgence of SARS-CoV-2 infection in a highly vaccinated health system workforce. NJEM 2021**

-VE against symptomatic COVID-19 was >90% March to June/21, and 65.5% (48.9, 76.9) in July/21

**News in Focus. COVID vaccine immunity is waning – how much does that matter? Nature 2021;597:606-607.**

-steady decline in neutralizing antibody levels, growing risk of breakthrough infection over time, and in Israel elderly people who got vaccine at beginning of year seemed to have almost double risk of severe illness during July outbreak compared to more recent vaccinees

**Acharya CB, Schrom J, Mitchell AM, Coil DA, Marquez C, Rojas S, et al. No significant difference in viral load between vaccinated and unvaccinated, asymptomatic and symptomatic groups infected with SARS-CoV-2 Delta variant. medRxiv 2021. <https://doi.org/10.1101/2021.09.28.21264262>.**

-mean Ct-values (a surrogate for viral load) of vaccinated and unvaccinated no difference

**Eyre DW, Taylor D, Purver M, Chapman D, Fowler T, Pouwels KB, Walker AS, Peto TEA. The impact of SARS-CoV-2 vaccination on Alpha and Delta variant transmission. medRxiv 2021.**

<https://doi.org/10.1101/2021.09.28.21264260>.

-for each doubling of weeks since 14d after 2<sup>nd</sup> vaccination, aOR of a contact testing positive increased 1.13 (1.09, 1.17) for ChAdOx1 and 1.20 (1.10, 1.31) for BNT; by 12wk, ChAdOx1 for Delta no evidence transmission rates different vaccinated vs unvaccinated, and BNT also attenuated substantially.

**Singanayagam A, Hakki S, Dunning J, Madon KJ, Crone MA, Koycheva A, et al. Community transmission and viral load kinetics of the SARS-CoV-2 delta (B.1.617.2) variant in vaccinated and unvaccinated individuals in the UK: a prospective, longitudinal, cohort study. Lancet Infect Dis 2021.**

-Included 231 contacts exposed to 162 epidemiologically linked delta infected index cases in households and found the attack rate in household contacts was 25% (18, 33) in fully vaccinated contacts and 38% (24, 53) in unvaccinated contacts, with risk of infection increased with time in the 2-3 months since the second dose. This gave a VE 34% (-15, 60) [not statistically significant]. The attack rate in household contacts of fully vaccinated index cases was 25% (15, 35) similar to that from unvaccinated index cases 23% (15, 31).

**Andrews N, Tessier E, Stowe J, Gower C, Kirsebom F, Simmons R, et al. Vaccine effectiveness and duration of protection of Comirnaty, Vaxzevria and Spikevax against mild and severe COVID-19 in the UK. Preprint. 2021.**

-VE for symptomatic disease: by 20+ wk for Delta was Vaxzevria 47.3% (45, 49.6), Comirnaty 69.7% (68.7, 70.5). Waning was greater for 65y+ (to 36.6% and 55.3%) than for 40-64y (to 57.8% and 75.7%). VE for hospitalizations: by 20+ wk for Delta was Vaxzevria 77.0% (70.3, 82.3), Comirnaty 92.7% (90.3, 94.6). VE for death: by 20+ wk for Delta was Vaxzevria 78.7% (52.7, 90.4), Comirnaty 90.4% (85.1, 93.8). Waning occurred mostly for clinically extremely vulnerable group age 65y+

**Ministry of Health Israel. Two-dose vaccination data. Government of Israel. 20.6.21 to 17.7.21. Side presentation updated to 18/7/21. [https://www.gov.il/BlobFolder/reports/vaccine-efficacy-safety-follow-up-committee/he/files\\_publications\\_corona\\_two-dose-vaccination-data.pdf](https://www.gov.il/BlobFolder/reports/vaccine-efficacy-safety-follow-up-committee/he/files_publications_corona_two-dose-vaccination-data.pdf).**

-VE for SARS-CoV-2 cases 39%, symptomatic COVID-19 40.5%, COVID-19 hospitalization 88.0%, severe COVID-19 91.4%. VE depended on time of vaccine completion Jan, Feb, Mar, April/21: for SARS-CoV-2

infection 16%, 44%, 67%, 75%; for symptomatic COVID-19 16%, 44%, 69%, 79%; for hospitalization and severe COVID-19 by April 83% and 84%

**Chemaitelly H, Tang P, Hasan MR, AlMukdad S, Yassine HM, Benslimane FM, et al. Waning of BNT162b2 vaccine protection against SARS-CoV-2 infection in Qatar. NEJM 2021.**

<https://doi.org/10.1056/NEJMoa2114114>.

-VE for any infection peaked by first month 77.5% (76.4, 78.6), declined gradually thereafter, accelerating after the 4<sup>th</sup> month: month 4 at 51.7% (45.0, 57.6), month 5 at 22.5% (10.6, 32.7), month 6 at 17.3% (2.2, 30.1), and month 7 at 22.3% (-1.7, 40.7). VE for symptomatic infection peaked month 1 at 81.5% (79.9, 83.0), and negligible by month 5 at 12.0% (-6.1, 27.1), and for asymptomatic peaked month 1 at 73.1% (70.3, 75.5), and negligible by month 4 at 11.5% (-17.1, 33.2). VE for any severe disease peaked in first 2 months at 96%+, and persisted at approximately this level for six months, with decline “possibly in the 7<sup>th</sup> month [55.6% (-44.3, 86.3)]... but the case numbers were small [only 6 and 11 cases]”. VE was similar for all ages and variants.

**Goldberg Y, Mandel M, Bar-On YM, Bodenheimer O, Freedman L, Haas EJ, et al. Waning immunity after the BNT162b2 vaccine in Israel. NEJM 2021.**

-In those age 60+ the rate ratio for infection among those fully vaccinated in Jan/21 as compared with 2 months later in Mar/21 was 1.6 (1.3, 2.0), and in April/21 was 2.2 (1.6, 3.1). This meant the VE for those vaccinated May/21 was 82% and those vaccinated in Jan/21 was 57%. The rate ratio for severe disease between vaccination in Jan/21 and later in Mar/21 was 1.8 (1.1, 2.9). For those age 40-59 the rate ratio for infection among those fully vaccinated in Feb/21 as compared with 2 months later in April/21 was 1.7 (1.4, 2.1), and in May/21 was 2.1 (1.4, 3.0). This meant the VE for those vaccinated in May/21 was 83% and those vaccinated in Jan/21 was 57%. The rate ratio for severe disease between vaccination in Feb/21 and later in April/21 was 2.2 (0.6, 7.7). For those age 16-39y the rate ratio among those fully vaccinated in Mar/21 as compared with 2 months later in May/21 was 1.6 (1.3, 2.0), giving a VE for those vaccinated May of 80%, and for those vaccinated in Jan of 55%

**Nordstrom P, Ballin M, Nordstrom A. Effectiveness of Covid-19 vaccination against symptomatic infection, hospitalization, and death up to 9 months: a Swedish total-population cohort study. Lancet Preprints 2021.**

Vaccine	Peak	Waning	Ineffective	Risk groups
BNT162b2	D15-30 at 92% (92, 93)	D121-180 at 47% (39, 55)	D211+ 23% (-2, 41)	Age 80+; homemaker service, men
mRNA-1273	D15-30 at 96% (94, 97)	D181+ at 59% (18, 79)	-	As above
ChAdOx1	D15-30 at 68% (52, 79)	D61-120 at 41% (29, 51)	D121+ -19% (-97, 28)	As above
ChAdOx1/mRNA	D15-30 at 89% (79, 94)	D121+ 66% (41, 80)	-	As above
Severe	D15-30 at 95% (83, 93)	D121-180 at 74% (47, 87)	D181+ at 42% (-35, 75)	As above; any comorbidity

**Shitrit P, Zuckerman NS, Mor O, Gottesman BS, Chowers M. Nosocomial outbreak caused by the SARS-CoV-2 Delta variant in a highly vaccinated population, Israel, July 2021. Euro Surveill 2021;26(39):pii=2100822.**

-attack rates: staff 16/151 (10.6%), patients 23/97 (23.7%), despite exposed vaccination rate 96.2% at a median 177 (range 111 to 194) days earlier.

**Tortof SY, Slezak JM, Fischer H, Hong V, Ackerson BK, Ranasinghe ON, et al. Effectiveness of mRNA BNT162b2 COVID-19 vaccine up to 6 months in a large integrated health system in the USA: a retrospective cohort study. Lancet 2021. [https://doi.org/10.1016/50140-6736\(21\)02183-8](https://doi.org/10.1016/50140-6736(21)02183-8).**

VE against	First month	5 months after full vaccination
Infection	88% (86, 89)	47% (43, 51)
65y+	80% (73, 85)	43% (30, 54)
Other ages	Almost 90%	Similar degree of waning
Hospital admission	87% (82, 91)	88% (82, 92)

-most recent report Aug/21 from Israel suggests VE against hospital admissions has waned in 65y+ roughly at 6 months [vaccinated in Jan 54.8%; in March 81%; in April 69.4%]

**Cohn BA, Cirillo PM, Murphy CC, Krigbaum NY, Wallace AW. Breakthrough SARS-CoV-2 infections in 620,000 U.S. Veterans, February 1, 2021 to August 13, 2021. medRxiv 2021 <https://doi.org/10.1101/2021.10.13.21264966>**

-In US Veterans age 18y+ receiving care in VHA in the period 1Feb/21 to 13Aug/21, vaccine protection declined over time at all ages. By August/21 the VE for infection was 3% (-7, 12) for Janssen, 64% (62, 66) for Moderna, and 50% (47, 52) for Pfizer-BioNTech.

**Salvatore PP, Lee CC, Sleweon S, McCormick DW, Nicolae L, Knipe K, et al. Transmission potential of vaccinated and unvaccinated persons infected with the SARS-CoV-2 Delta variant in a federal prison, July-August 2021. medRxiv 2021 <https://doi.org/10.1101/2021.11.12.21265796>.**

-In an outbreak of Delta in a federal prison Texas, there were no significant differences detected in duration RT-PCR positivity, Ct value on any day, or duration of viral-culture positivity between vaccinated and unvaccinated cases. The authors concluded that we “should consider vaccinated persons who become infected with SARS-CoV-2 to be no less infectious than unvaccinated persons.”

**Hagan LM, McCormick DW, Lee C, Sleweon S, Nicolae L, Dixon T, et al. Outbreak of SARS-CoV-2 B.1.617.2 (Delta) variant infections among incarcerated persons in a federal prison – Texas, July-August 2021. MMWR 2021;70(38):1349-1354.**

-In the Texas prison outbreak, infection occurred in 172/233 (74%) of incarcerated persons. The attack rate was higher in unvaccinated [39/42 (93%) vs. fully vaccinated 129/185 (70%) or partially vaccinated 4/6 (67%)] and in those vaccinated 4+ months prior [83/93 (89%) vs vaccinated 2wk-2mos prior 19/31 (61%) and vaccinated 2-4mos prior 27/61 (44%)]. By my calculation, this translates to a crude VE of 25%, and by 4+ months of 4%.

**UK Health Security Agency. COVID-19 vaccine surveillance report. Week 42.**

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1027511/Vaccine-surveillance-report-week-42.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1027511/Vaccine-surveillance-report-week-42.pdf)

-Between week 38 and week 41 2021, as shown in Table 2 (page 13), case rates/100,000 were higher in unvaccinated than vaccinated at ages <18 and 18-29, but higher in vaccinated than unvaccinated at all other age groups [30-39, 40-49, 50-59, 60-69, 70-79, 80+]. This is shown graphically in Figure 2a (page 17).

**Ioannidis JPA. Benefit of COVID-19 vaccination accounting for potential risk compensation. *npj Vaccines*. 2021;6:99.**

-Discusses the effect of risk compensation [i.e., vaccine protection may increase people's risky behavior, such as meeting with more people, for lengthier periods, and/or in situations of higher infection risk, and with less adherence to distancing, masks, and/or testing]. If VE is 60% for infection, then even modest risk compensation will eliminate (if 'risky behavior' increases about 2.5-3X) or halve (if 'risky behavior' increases even <1.8-2X) the vaccine benefit.

**ii) Natural Immunity is likely as good as or better than vaccine induced immunity**

**Vitale J, Mumoli N, Clerici P, De Paschale M, Evangelista I, Cei M, Mazzone A. Assessment of SARS-CoV-2 reinfection 1 year after primary infection in a population in Lombardy, Italy. *JAMA Internal Medicine* 2021 <https://doi.org/10.1001/jamainternmed.2021.2959>**

-5 reinfections (0.31%, 95% CI 0.03, 0.58) in 1579 positive patients [1 was hospitalized] vs. 528 new infections (3.9%; 3.5, 4.2) in 13496 controls; adjusted IRR 0.07 (0.06, 0.08), HR 0.06 (0.05, 0.08). Suggests that natural immunity appears to confer a protective effect for at least a year

**Rosenberg D. Natural infection vs vaccination: which gives more protection? *Arutz Sheva Israel National News*. July 13, 2021.**

-from the Israeli Health Ministry: 835,792 known to have recovered from the virus, 72 cases, amounts to 0.0086% reinfections; 5,193,499 known to have been vaccinated, >3000 cases, amounts to 0.0578% breakthrough infections = >6.72X risk of infection in vaccinated vs. previously infected

**Wadman M. Having SARS-CoV-2 once confers much greater immunity than a vaccine – but no infection parties, please. *Science* 2021 Aug 26.**

-natural immune response after SARS-CoV-2 infection offers considerably more of a shield against the Delta variant than two doses of Pfizer-BioNTech vaccine. People who recover continue to develop increasing numbers and types of CoV-targeting antibodies for up to 1 year [in contrast, twice-vaccinated people stop seeing increases in the potency or breadth of the overall memory antibody compartment a few months after second dose].

**Gazit S, Shlezinger R, Perez G, Lotan R, Peretz A, Ben-Tov A, Cohen D, Muhsen K, Chodick G, Patalon T. Comparing SARS-CoV-2 natural immunity to vaccine-induced immunity: reinfections versus breakthrough infections. *medRxiv* 2021 <https://doi.org/10.1101/2021.08.24.21262415>**

-SARS-CoV-2 naïve vaccinees: 5.96 (4.85, 7.33) increased risk for breakthrough infection and 7.13 (5.51, 9.21) increased risk for symptomatic disease [and also a higher risk for hospitalization] compared to previously infected. Suggests that "natural immunity confers longer lasting and stronger protection against infection, symptomatic disease and hospitalization caused by the Delta variant"

**Bertollini R, Chemaitelly H, Yassine HM, Al-Thani MH, Al-Khal A, Abu-Raddad LJ. Associations of vaccination and of prior infection with positive PCR test results for SARS-CoV-2 in airline passengers arriving in Qatar. *JAMA* 2021;326(2):185-188.**

-Completely vaccinated: 10092 matched PCR + 0.82% (0.66, 1.01) vs 3.74% (3.37, 4.12); RR 0.22 (0.17, 0.28). Prior infection: 7694 matched PCR + 1.01% (0.80, 1.26) vs. 3.81% (3.39, 4.26); RR 0.26 (0.21, 0.34)

**Radbruch A, Chang HD. A long-term perspective on immunity to COVID. *Nature* 2021;595:359-360.**

## **Joffe AR. References for John Dossetor Health Ethics Center COVID-19 Symposium Nov 26, 2021**

-B and T cells specific for a virus maintained in dormancy, but poised to spring into action if encounter virus again. Findings predict that infection with SARS-CoV-2 induces long-term immunity in most individuals

**Zuo J, Dowell AC, Pearce H, Verma K, Long HM, Begum J, et al. Robust SARS-CoV-2-specific T cell immunity is maintained at 6 months following primary infection. Nat Immunology 2021;22:620-626.**

-reassuring that functional SARS-CoV-2-specific T cell responses are retained at 6 months following infection

**Want Z, Muecksch F, Schaefer-Babajew, Flinkin S, Viant C, Gaebler C, et al. Naturally enhanced neutralizing breadth against SARS-CoV-2 one year after infection. Nature 2021;595:426**

-findings suggest that immunity in convalescent individuals will be very long lasting

**Kojima N, Shrestha NK, Klausner JD. A systematic review of the protective effect of prior SARS-CoV-2 infection on repeat infection. medRxiv 2021 <https://doi.org/10.1101/2021.08.27.21262741>**

-10 studies eligible including 9.93M people with median observation ranging 1-10.3mos; weighted average risk reduction against reinfection 90.4% (SD 7.7%; range 80.5 to 100%), observed for up to 10 months

**Block J. Vaccinating people who have had covid-19: why doesn't natural immunity count in the US? BMJ 2021;374:n2101**

-memory B cells and memory T cells will respond by producing antibodies to the variants; over 20 references that natural immunity is durable up to 8 months after infection; studies in Qatar, England, Israel, and US suggest infection rates at equally low levels among fully vaccinated and previously infected; comparing symptomatic and asymptomatic the [highly functional] T-cell response was identical

**Shrestha NK, Burke PC, Nowacki AS, Terpeluk P, Gordon SM. Necessity of COVID-19 vaccination in previously infected individuals. medRxiv 2021 <https://doi.org/10.1101/2021.06.01.21258176>.**

-cumulative incidence remained almost zero among healthcare workers previously infected unvaccinated (0/1359), previously infected vaccinated (0/1220), and previously uninfected vaccinated (15, 0.7% of infections), compared with steady increase among previously uninfected unvaccinated (2139, 99.3% of infections). Median duration since prior infection 143 [76, 179] days: suggesting protection for 10 months or longer

**Cavanaugh AM, Spicer KB, Thoroughman D, Glick C, Winter K. Reduced risk of reinfection with SARS-CoV-2 after COVID-19 vaccination – Kentucky, May-June 2021. MMWR 2021;70(32):1081-1083.**

-previous infection but not vaccinated OR 2.34 (1.58, 3.47) for reinfection compared to previous infection and fully vaccinated. Limitations include: the vaccinated may be less likely to seek testing because of believing in protection, the study was limited to 2 months (of 19 months of data) and 1 state (of all states with data), and was regardless of symptoms.

**Bozio CH, Grannis SJ, Naleway AL, Ong TC, Butterfield KA, DeSilva MB, et al. Laboratory-confirmed COVID-19 among adults hospitalized with COVID-19-like illness with infection-induced or mRNA vaccine-induced SARS-CoV-2 immunity – Nine states, January-September 2021. MMWR 2021;70: Early Release**

-In the VISION Network including 187 hospitals across 9 states, among COVID-like-illness hospitalizations in those whose previous infection or vaccination occurred 90-179d earlier, the aOR for confirmed



## **Joffe AR. References for John Dossetor Health Ethics Center COVID-19 Symposium Nov 26, 2021**

COVID-19 among unvaccinated previously infected was 5.49 (2.75, 10.99) compared to those fully vaccinated with no previous infection. A crucial limitation is that only 7348/139,650 (5%) of eligible patients were included because only 67.5% were tested with hospitalization, and of these only 7.8% had a previous test done [required to determine if there was previous infection].

### **Qureshi A, Baskett WI, Huang W, Lobanova I, Naqvi H, Shyu CR. Re-infection with SARS-CoV-2 in patients undergoing serial laboratory testing. CID. 2021.**

-Of 9119 prior infected patients with serial tests at 62 healthcare facilities in US from 1Dec/19 to 13Nov/20, reinfection occurred in 0.7%.

### **Canadian Covid Care Alliance. Which is better for future COVID-19 protection: Immunity following natural infection or vaccine-induced immunity? Reviewed by the CCCA Scientific and Medical Advisory Committee. October 8, 2021.**

-Reviews more than 15 studies that suggest: natural immune responses, even to mild infections, were broader [including antibody, plasmablasts, memory B-cells, and T-cells, to many viral epitopes], durable, included mucosal immunity, and minimally impacted by variants. Re-infections were rare (<1%) with no study reporting an increase in reinfection over time. Although vaccination following natural infection may increase antibody titers to the Spike protein, this may not be required for further protection [vaccine responses are distinct from that of natural infection, and much less durable]. In fact, a second vaccine dose not only failed to boost antibodies, but determined a contraction of the S-specific T cell response.

### **Alexander PE. 122 Research studies affirm naturally acquired immunity to Covid-19: Documented, linked, and quoted. Brownstone Institute 2021 (October 17).**

-Discusses studies that show naturally acquired immunity (to even mild infection) is equal to or more robust and superior to existing vaccines. Studies show infection effect on natural immunity, including antibodies, memory CD4+ and CD8+ T cells, memory B-cells, and long-lasting bone-marrow plasma cells, all of broader diversity than with vaccine. Studies also show clinical effect to prevent re-infection of 80-100% for at least 8 months.

### **Kojima N, Klausner JD. Protective immunity after recovery from SARS-CoV-2 infection. Lancet Infect Dis 2021. [https://doi.org/10.1016/S1473-3099\(21\)00676-9](https://doi.org/10.1016/S1473-3099(21)00676-9).**

-A review that finds the risk of (repeat) SARS-CoV-2 infection is decreased by 80.5-100%, even after mild infections, persisting for more than 10 months of follow-up.

### **Murchu EO, Byrne P, Carty PG, De Gascun C, Keogan M, O'Neill M, et al. Quantifying the risk of SARS-CoV-2 reinfection over time. Rev Med Virol 2021;e2260.**

-A review of 11 large cohort studies, finding that reinfection was an uncommon event (absolute rate median 0.27%; range 0-1.1%), with no study reporting an increase in the risk of reinfection over time.

### **c. Concerns about vaccination in children: very low individual risk from COVID-19, and vaccine risk including myocarditis in younger males.**

### **Gur-Arie R, Kraaijeveld SR, Jamrozik E. An ethical analysis of vaccinating children against COVID-19: benefits, risks, and issues of global health equity. Wellcome Open Research 2021;6:252.**

-Discusses several reasons not to mandate vaccinating children. First, the minimal benefit to healthy children, who are at similar or lower risk than that of typical seasonal influenza [and post-infection immunity likely more effective at protecting against re-infection later in life when disease would be

more severe]. Second, potential for rare vaccine harms in children, which would undermine vaccine confidence in general [we now know of the myocarditis risk, for example]. Third, protecting risk groups does not require vaccinating children, because children account for a relatively small fraction of transmission, vaccines in these risk groups are highly effective against severe diseases, and vaccines cannot generate herd immunity.” Fourth, perpetuation of global vaccine inequities, including that the social benefit [for adults and children] of vaccinating adults, particularly in LMICs, far outweighs the benefit of vaccinating healthy children in HICs.

**Zimmermann P, Pittet LF, Finn A, Pollard AJ, Curtis N. Should children be vaccinated against COVID-19? Arch Dis Child 2021. <https://doi.org/10.1136/archdischild-2021-323040>.**

-Discusses several considerations in vaccinating children. Arguments in favor are weak: a) protection against COVID [in children is generally mild, and no evidence of increasing severity; death risk is <0.005%; and many may already be immune and protected by vaccinated adults]; b) protection against MIS-C [which is rare (<0.1% of infected), resolves in vast majority, with mortality <1-2%; no evidence vaccine protects from it, or may not induce it]; c) protection against long-COVID [there may be no difference in prevalence of persistent symptom between infected and noninfected children]; and d) prevention of community transmission [but, transmission in educational settings is low and index cases are often adults; vaccine efficacy is waning, and infected vaccinated are as likely to transmit; once adults vaccinated (protected) this is less important; and once endemic, early childhood infection (which is mild) with subsequent boosting from ongoing exposure at older ages, may bring about population immunity more effectively]. Arguments against are stronger: a) risk of adverse events [myocarditis/pericarditis after mRNA vaccines (occurs in 1/6623 males 16-19y); of thrombosis after viral vector vaccines; and theoretical risk of inducing MIS-C]; b) long-term safety concerns [for which there is a lack of data, and which could undermine overall vaccine confidence]; and c) vaccine supply concerns [vaccines may be better prioritized for high-risk adults, including in LMIC].

**Wong BLH, Ramsay ME, Ladhani SN. Should children be vaccinated against COVID-19 now? Arch Dis Child 2021;106(12):1147-1148.**

-Discusses deaths in children being “extremely rare”, that children “do not contribute much to the spread”, that surveillance will be needed to “assess the risk of rare events [after vaccine], including immune-mediated conditions”, and that whether all children will eventually be vaccinated will depend on “the safety, effectiveness, and duration of protection afforded by available vaccines. Most importantly, it will depend on whether such vaccines interrupt transmission...”

**Summary of the national advisory committee on immunization (NACI) statement of November 19, 2021. Recommendation on the use of the Pfizer-BioNTech COVID-19 vaccine (10 mcg) in children 5-11 years of age. Public Health Agency of Canada. 2021.**

-A pediatric formulation (10 mcg compared to the adult 30 mcg) at a dosing interval of at least 8 weeks “may be offered”. The size of the trial “would not detect rare adverse events that may occur at a frequency less often than 1 in 1000 people.” Supports parents’ ability to “make an informed decision,” and that they “not stigmatized based on whichever choice they make.”

**Kostoff RN, Calina D, Kanduc D, Briggs MB, Vlachoyiannopoulos P, Svistunov AA, Tsatsakis A. Why are we vaccinating children against COVID-19? Toxicology Reports 2021;8:1665-1684.**

-Discusses several points. First, COVID-19 attributed deaths per capita are negligible in children. Second, the normalized post-inoculation deaths reported to VAERS are small, but not negligible [from 14Dec/20 to 24May/21, after >285 million doses given in the US, there were 4863 reports of death in VAERS with strong clustering around the time of injection; and, historically, VAERS reported only 1% of actual

vaccine/inoculation adverse events]. Unknown long-term effects could occur, and the vaccine trials did not address biomarkers that could serve as early warning indicators of predisposition to serious disease.

**Gundry SR. mRNA COVID vaccines dramatically increase endothelial inflammatory markers and ACS risk as measured by the PULS cardiac test: A warning. Circulation 2021;144:A10712.**

-566 patients seen in a preventive cardiology practice had new PULS test [“a clinically validated measurement of multiple protein biomarkers which generates a score predicting the 5-year risk of a new Acute Coronary Syndrome”] drawn 2-10 weeks after 2<sup>nd</sup> vaccine dose and compared to their previous score 3-5 months pre-vaccine. The PULS score increased from 11% to 25%. The conclusion was that “the mRNA vacs dramatically increase inflammation on the endothelium and T cell infiltration of cardiac muscle...”

**Hoeg TB, Krug A, Stevenson J, Mandrola J. SARS-CoV-2 mRNA vaccination-associated myocarditis in children ages 12-17: A stratified national database analysis. medRxiv 2021**

<https://doi.org/10.1101/2021.08.30.21262866>

-identified 257 cases of post-vaccine myocarditis in VAERS in USA: 15% after dose 1, 85% after dose 2; median 2d after (91.9% within 5d); hospitalization rate was 86.4% (86.2% age 12-15, 86.6% age 16-17)

Group	Myocarditis Rate/million		Compared to 120d COVID-19 hospitalization risk	
	One dose	Two doses	Without comorbidities	With comorbidity
Males 12-15y	12.0	162.2 (1/6.2K)	22.8X at low; 6.1X at moderate; 4.3X at high community rates	4.8X at low; 1.3X at moderate. COVID 1.09X at high community rates
Males 16-17y	8.2	94.0 (1/10.6K)	13.2X at low; 3.5X at moderate; 2.5X at high community rates	2.8X at low. COVID 1.34X at moderate, 1.88X at high community rates
Females 12-15y	0	13.0	-	-
Females 17-17y	2.0	13.4	-	-

**Public Health Ontario. Myocarditis and Pericarditis following vaccination with COVID-19 mRNA vaccines in Ontario: December 13, 2020 to August 7, 2021. Toronto, ON: Queen’s Printer for Ontario; 2021.**

-204 reports met the case definition of myocarditis: mainly in adolescents/young adults - males aged 18-24y following second dose after Pfizer 37.4/M (1/26.7K) and after Moderna 263.2/M (1/3.8K) [7X higher]. Required an ED visit in 99%, hospitalization in 71.6%, and ICU in 1.5%.

**Public Health Ontario. Adverse events following immunization (AEFIs) for COVID-19 in Ontario: December 13, 2020 to October 17, 2021. Toronto, ON: Queen’s Printer for Ontario; 2021.**

-age 12-17 and age 18-24 in males: dose 1 at 1/15K and 1/22.8K; dose 2 at 1/7962 and 1/5750; so overall in all males having vaccine the risk is the sum of dose 1 and 2 [because the doses do not overlap patients, as if one has myocarditis from dose 1 it is very unlikely you will get dose 2] = 1/5200 and 1/4591.

-In a similar update to data to Nov 7, 2021: dose 1 at 1/15K and 1/20K; dose 2 at 1/7490 and 1/5504; so, overall in males having vaccine the risk is the sum of dose 1 and 2 = 1/4996 and 1/4316

**Witberg G, Barda N, Hoss S, Richter I, Wiessman M, Aviv Y, et al. Myocarditis after Covid-19 vaccination in a large health care organization. NEJM 2021. <https://doi.org/10.1056/NEJMoa2110737>.**

-In Clalit Health Services, the largest HCO in Israel, myocarditis within 42d of first dose of vaccine [i.e., within only 21d of second dose] occurred in 54 people [41 mild, 12 intermediate, 1 fulminant]; 94% male; 69% after second dose (about 3-5d later). Hospitalization occurred for 49/54, for 3 [2, 4] days. There was 1 death the day after discharge from unspecified cause. In male patients 16-29y myocarditis after vaccine occurred in 10.69/100K (6.93, 14.46) = 1/12.2K.

**Mevorach D, Anis E, Cedar N, Bromberg M, Haas EJ, Nadir E, et al. Myocarditis after BNT162b mRNA vaccine against Covid-19 in Israel. NEJM 2021. <https://doi.org/10.1056/NEJMoa2109730>.**

-From 20Dec/20 to 31May/21 in Israel there were 136 definite or probable myocarditis cases after vaccine, 81% hospitalized, 91% male, 76% under 30y old, and clustered during the first few days after second dose. In males age 16-19y the risk difference between first (first 21d) and second (first 21d) doses was 13.73/100K (8.11, 19.46) = 1/7283; the standardized incidence ratio compared to historical rates, after the second dose was 13.60 (9.30, 19.20) [and 8.53 (5.57, 12.50) for males 20-24y; 6.96 (4.25, 10.75) for males 25-29y, and 2.90 (1.98, 4.09) for males 30y+]. Importantly, the rate ratio 30d after second dose compared to unvaccinated was 8.96 (4.50, 17.83), resulting in an excess 1/6637 (and only 1/99,953 for females) [for males 20-24y 6.13 (3.16, 11.88); for males 25-29y 3.58 (1.82, 7.01)]. Within 7 days of the second dose this was even higher for males 16-19y 31.90 (15.88, 64.08).

***Myocarditis from COVID-19 is rare and of uncertain significance***

**Udelson JE, Rowin EJ, Maron BJ. Return to play for athletes after COVID-19 infection. The fog begins to clear. JAMA Cardiology 2021;6(9):997-999.**

-review of several observational studies in athletes suggests those with detected COVID-19 have up to 0.9% incidence of cardiac magnetic resonance imaging (CMR) detected myocarditis. However, limitations include: the clinical implications of CMR detected abnormalities are unclear; interpretation of CMR was variable and non-standardized; there was no control group, and the denominators are unclear (i.e., how many infected that were not detected is unknown).

**Martinez MW, Tucker AM, Bloom J, Green G, DiFiori JP, Solomon G, et al. Prevalence of inflammatory heart disease among professional athletes with prior COVID-19 infection who received systematic return-to-play cardiac screening. JAMA Cardiol 2021;6(7):745-752.**

-Of 789 infected athletes, 5 (0.6%) ultimately had CMR suggesting inflammatory heart disease (3 myocarditis, 2 pericarditis), and no adverse cardiac events occurred.

**Moulson N, Petek BJ, Drezner JA, Harmon KG, Kliethermes SA, Patel MR, et al. SARS-CoV-2 cardiac involvement in young competitive athletes. Circulation 2021;144:256-266.**

-Of 3018 infected athletes, abnormal EKG occurred in 0.7%, troponin in 0.9%, ECHO in 0.9%, and CMR in 0.5%. Only 1 (0.03%) had an adverse cardiac event, likely unrelated to SARS-CoV-2 infection. Only 5 (0.2%) hospitalized, for non-cardiac reasons.

**Starekova J, Bluemke DA, Bradham WS, Eckhardt LL, Grist TM, Kasmirek JE, et al. Evaluation for myocarditis in competitive student athletes recovering from Coronavirus Disease 2019 with cardiac magnetic resonance imaging. JAMA Cardiol 2021;6(8):945-950.**

-A review of health records of all competitive athletes recovering from COVID-19 who underwent CMR. Of 145 infected athletes, none were hospitalized, and 2 (1.4%) had CMR consistent with myocarditis, 1 of whom had 1 cm mild gadolinium enhancement and mild T2 signal abnormalities with normal laboratory values, and 1 had marked over multiple segments with elevated troponin.

**Kotecha T, Knight DS, Razvi Y, Kumar K, Vimalasvaran K, Thornton G, et al. Patterns of myocardial injury in recovered troponin-positive COVID-19 patients assess by cardiovascular magnetic resonance. Eur Heart J 2021;42:1866-1878.**

-148 patients 64 (12) years old with severe COVID-19 [all hospitalized; 32% ventilated in an ICU] and elevated troponin. Myocarditis-like scar detected in 32%, limited to 3 or less myocardial segments in 88% of cases, with no associated LV dysfunction, and no evidence of diffuse fibrosis or edema in the remote myocardium. "Myocarditis-like injury can be encountered, with limited extent and minimal functional consequence."

**Mandrola J, Foy A, Prasad V. Setting the record straight: There is no 'Covid heart'. STAT May 14, 2021.**

-discusses papers that find very low rate of symptomatic myocarditis requiring hospitalization in young athletes having COVID-19.

**Joy G, Artico J, Kurdi H, Seraphim A, Lau C, Thornton GD, et al. Prospective case-control study of cardiovascular abnormalities 6 months following mild COVID-19 in healthcare workers. JACC 2021.**

<https://doi.org/10.1016/j.jcmg.2021.04.011>

-found cardiovascular abnormalities, including by CMR, were no more common in infection positive vs infection negative healthcare workers 6 months later.

#### **d. Vaccine Mandates Worsen Inequality and Discriminate Marginalized Groups**

**Sacarny A, Daw JR. Inequities in COVID-19 vaccination rates in the 9 largest US cities. JAMA Health Forum 2021;2(9):e212415.**

-found lower vaccination rates associated with being Black, Hispanic, or Latino; lower mean incomes and higher poverty rates, and lower college completion rates. Suggested this may be due to systematic underinvestment in public health in segregated communities; unequal access to health care information and services; and medical racism that drives legitimate mistrust among members of marginalized groups.

**Lord Jonathan Sumption about freedom and democracy [retired justice UK supreme court]**

[Liberal democracy will be the biggest casualty of this pandemic \(telegraph.co.uk\)](https://www.telegraph.co.uk)

-"The biggest casualty of the lockdown will not be the closed pubs, restaurants and shops and the crippled airlines. It will not be our once-thriving musical, theatrical and sporting culture. It will not even be the wreckage of our economy. These are terrible things to behold. But the biggest casualty of all will be liberal democracy. Liberal democracy breaks down when frightened majorities demand mass coercion of their fellow citizens and call for our personal spaces to be invaded. These demands are invariably based on what people conceive to be the public good. They all assert that despotism is in the public interest.

...

A society in which oppressive control of every detail of our lives is unthinkable except when it is thought to be a good idea, is not free. It is not free while the controls are in place. And it is not free after they are lifted, because the new attitude will allow the same thing to happen again whenever there is enough public support. Liberty is not an absolute value, but it is a critically important, foundational one. Of all freedoms, the freedom to interact with other human beings is perhaps the most valuable. It is a basic human need, the essential condition of human happiness and creativity"

**Dryden-Peterson S, Velasquez GE, Stopka TJ, Davey S, Gandhi R, Lockman S, Ojikutu BO. Disparities in SARS-CoV-2 vaccination-to-infection risk during the COVID-19 pandemic in Massachusetts. JAMA Health Forum 2021;2(9):e212666.**

-found structural disparity in vaccine distribution: lower ratio of vaccine coverage to infection risk in communities with increased socioeconomic vulnerability and larger proportions of Black and Latinx individuals. Suggested that we had “prioritized large hospital systems and mass vaccination sites, rather than strategies to mitigate structural racism recommended by others”

**Bibbins-Domingo K, Petersen M, Havlir D. Taking vaccine to where the virus is – Equity and effectiveness in Coronavirus vaccinations. JAMA Health Forum 2021;2(2):e210213.**

-suggested incorporating place-based vaccine prioritization: bring vaccine to areas of high viral transmission according to zip-codes; use trusted messengers; take vaccination campaigns to the communities that have been hard-hit for too long

**Corbie-Smith G. Vaccine hesitancy is a scapegoat for structural racism. JAMA Health Forum 2021;2(3):e210434.**

-suggest that ‘vaccine hesitancy’ puts the focus on the individual. A better term is vaccine deliberation: “when I know that you care, I’ll care about what you know”; when health care systems make shifts that demonstrate trustworthiness and a commitment to equity, more people will likely agree to take the vaccine. Should aim to provide support to both access appointments and travel to them; use mobile units and pop-up clinics preferably cosponsored by trusted local community; and have community leaders and organization fully engaged in planning and implementation.

**Agarwal R, Dugas M, Ramaprasad J, Luo J, Li G, Gao G. Socioeconomic privilege and political ideology are associated with racial disparity in COVID-19 vaccination. PNAS 2021;118(33):e2107873118**

-racism’s “serious threat to public health”: the weighted average COVID vaccine disparity across counties was 16% [white 35.9%, black 19.9%]. Not related to vaccine hesitancy; rather, related to social determinants of health [median income, high school education]. Needs a special effort to overcome barriers: access to resources and dissemination of accurate information.

**Carson SL, Casillas A, Castellon-Lopez Y, Mansfield LN, Morris D, Barron J, et al. COVID-19 vaccine decision-making factors in racial and ethnic minority communities in Los Angeles, California. JAMA Netw Open 2021;4(9):e2127582.**

-focus group results suggest a need to invest in community-based engagement, improve accessibility and transparency of information, and reduce structural barriers to vaccination.

**Mello MM, Silverman RD, Omer SB. Ensuring uptake of vaccines against SARS-CoV-2. NEJM 2020;383(14):1296-1299.**

-Support mechanisms for persons required to receive vaccine are necessary, especially for high-priority groups, with near-zero financial and logistic barriers [bringing to points of care, pharmacies, and work sites]. Also, need to build public trust with transparent, inclusive [representatives of high-risk population groups, and groups concerned about vaccine safety] planning.

**Chagla Z, Ma H, Sander B, Baral SD, Moloney G, Mishra S. Assessment of the burden of SARS-CoV-2 variants of concern among essential workers in the greater Toronto area, Canada. JAMA Netw Open 2021;4(10):e2130284.**

-cases and VOC were disproportionately associated with neighborhoods with lower income and with a higher proportion of essential workers. This “necessitates tailored and equitable intervention strategies including vaccine prioritization and outreach services.”

**e. Better messaging is important to reduce vaccine hesitancy and improve trust**

**Ashworth M, Thunstrom L, Cherry TL, Newbold SC, Finnoff DC. Emphasize personal health benefits to boost COVID-19 vaccination rates. PNAS 2021;118(32):e2108225118.**

-messaging that emphasizes personal health benefits has the largest impact; vaccine safety message did little to overcome a lack of confidence in vaccine

**Patel MS. Text-message nudges encourage vaccination. Nature 2021;597:336-337.**

-nudges using a single text message from a person’s healthcare provider [to make the behavior easier, motivating people to take prompt action] increase vaccination rates.

**Merkley E, Loewen PJ. Assessment of communication strategies for mitigating COVID-19 vaccine-specific hesitancy in Canada. JAMA Netw Open 2021;4(9):e2126635.**

-an online survey suggested that communication strategies that focus on the death prevention potential (and not the comparatively less impressive overall effectiveness at preventing symptomatic transmission) are most effective.

**Siegler AJ, Luisi N, Hall EW, Bradley H, Sanchez T, Lopman BA, Sullivan PS. Trajectory of COVID-19 vaccine hesitancy over time and association of initial vaccine hesitancy with subsequent vaccination. JAMA Netw Open 2021;4(9):e2126882.**

-Vaccine hesitancy is not a stable trait precluding vaccination, but, instead, is labile: nearly one-third initially hesitant received vaccine, and more than one-third transitioned into vaccine willing. Vaccine willingness has not alleviated health inequities in vaccines received [baseline vaccine willingness similar for White and Hispanic, yet at follow-up fewer Hispanic were vaccinated].

**Assistant Secretary for Planning Evaluation ASPE. Issue Brief August 2021. Unvaccinated for COVID-19 but willing: Demographic factors, geographic patterns, and changes over time.**

-approximately 30% of US adults are unvaccinated, and among these, approximately 44% may be willing [the proportion of willing is higher among young adults, Blacks, Hispanics, and uninsured].

**f. Vaccine equity internationally is being ignored**

**Cohen J. Vaccine equity hopes dashed. Latest forecast slashes this year’s global supply by 25%. Science 2021;373(6561):1297.**

-only 1.9% of people in low-income countries have received a single dose; in India only 12% were fully vaccinated. Quotes the WHO director general Tedros Ghebreyesus saying: “the companies and countries that control the global supply of vaccines think the world’s poor should be satisfied with leftovers.”

## 5. Emergency Management as a better *process* for a public emergency

Joffe AR, Redman D. The SARS-CoV-2 pandemic in high income countries such as Canada: A better way forward without lockdowns. 2021 OSF Preprints. <https://doi.org/10.31219/osf.io/r8d6f>. Now in press at: <https://www.frontiersin.org/articles/10.3389/fpubh.2021.715904/abstract>

-discusses the Emergency Management process, and resulting priorities to address in managing the society-wide emergency of the pandemic

Redman D. Position Paper. Canada's deadly response to COVID-19. Frontier Center for Public Policy. Policy Series No. 237. July 2021. [https://fcpp.org/wp-content/uploads/FC-PS237\\_CDADeadlyResponse\\_JL1621\\_F2.pdf](https://fcpp.org/wp-content/uploads/FC-PS237_CDADeadlyResponse_JL1621_F2.pdf)

-discusses how government and medical officers of health did not follow the Emergency Management process, and what a response informed by EM principles and process should look like