

## **Female, not male COVID19 vaccination associates with lower fertility**

Hervé Seligmann

**Analyses comparing fertility in different countries detect that fertility in 2021 is negatively associated with COVID19 vaccination rate in 2021, also after accounting for different potential confounding effects. Further analyses show that fertility decreases with female, not male vaccination rates.**

Data published by Shimabukuro et al (2021) on pregnancy outcomes suggest increased frequencies of adverse pregnancy outcomes for women vaccinated during the first pregnancy trimester, as indirectly confirmed by the reanalysis by Reuters Fact Check [Fact Check-Data from a study does not conclude that over 80% of pregnancies end in miscarriage after COVID-19 vaccinations; figures taken out of context | Reuters](#) who incorrectly stipulates that different pregnancy trimesters should not be analysed separately.

Independently of conjectures about the validity of sampling and analysis of data by Shimabukuro et al (2021) and or by others, the hypothesis that COVID19 vaccination during the first pregnancy trimester increases adverse pregnancy outcome risks predicts that fertility should decrease with vaccination rates when comparing different countries. This prediction is specific to female vaccination rates. Results of such population-level analyses frequently converge with individual-based clinical data, showing coherence between observations made at micro- and macrolevels. Previous COVID19 vaccination analyses at individual- and population-level produced convergent results. Increased mortality was observed in the first weeks after injecting the first COVID19 dose at the level of Israeli individuals ([The uncovering of the vaccination data in Israel reveals a frightening picture-הודעות של נקים \(nakim.org\)](#), [Vaccinated COVID-19 are much more likely to die of illness due to a weakened immune system-הודעות של נקים \(nakim.org\)](#), and as reported for VAERS data).

Comparisons of weekly mortalities in different countries as a function of weekly vaccination rates in these countries ([Children may die from spike protein expelled by the vaccinated-הודעות של נקים \(nakim.org\)](#) ), detected at population level a 4-5 week period during which most vaccine adverse effects occur that coincides with the period during which most adverse vaccine effects are observed as detected using the above referenced individual-based information from Israel and the USA.

Analyses here are in two steps, the first tests for associations between fertility and overall vaccination rates, and in the case of a positive outcome, the second step tests for which sex the association is strongest.

*Fertility decreases with vaccination rate*

Percentages of fully vaccinated people in different countries were from [Coronavirus \(COVID-19\) Vaccinations - Statistics and Research - Our World in Data](#), accessed 04IX2021. Fully vaccinated is as defined at this point in time, a single dose in specific vaccines, and two doses in remaining vaccine trademarks.

Figure 1 plots total fertility rates in 2021 from [Total Fertility Rate 2021 \(worldpopulationreview.com\)](#), accessed 04IX2021 as a function of percentages of fully vaccinated people in these countries.

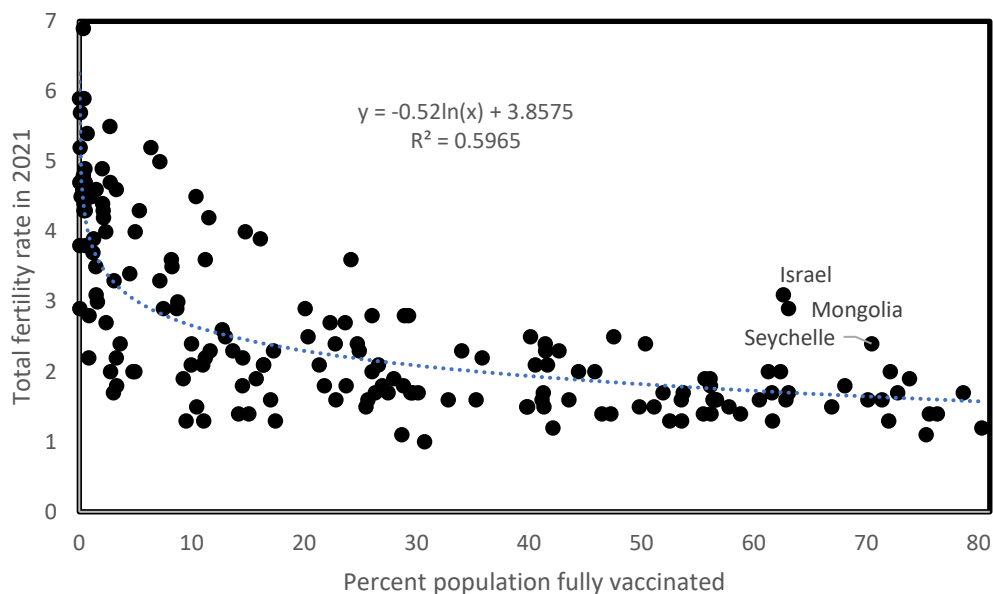


Figure 1. Total fertility rate in different countries from [Total Fertility Rate 2021 \(worldpopulationreview.com\)](#), as a function of percentages of fully vaccinated people in the same countries from [Coronavirus \(COVID-19\) Vaccinations - Statistics and Research - Our World in Data](#), both sites accessed 04IX2021.

*Accounting for GDP per capita as confounding factor*

The negative association between vaccination and fertility rates in Figure 1 is highly significant statistically ( $r = -0.772$ ,  $N = 175$ ,  $P = 0$ ), and is in line with the report by Shimabukuro et al (2021). Note that Israel, Mongolia and Seychelle have high fertility considering their high vaccination rates. This could hint that this association could be indirect, due to other factors affecting each fertility and vaccination. Indeed, national GDP per capita from [List of countries by GDP \(nominal\) per capita - Wikipedia](#), accessed 04IX2021, correlates negatively with fertility ( $r = -0.80$ ,  $P = 0$ ). Rich countries are also more vaccinated ( $r = -0.793$ ,  $P = 0$ ). Therefore, the regression between fertility and GDP per capita ( $y = 20.489 * X^{-0.245}$ ) was used to calculate the residual fertility after accounting for variation in GDP per capita between countries.

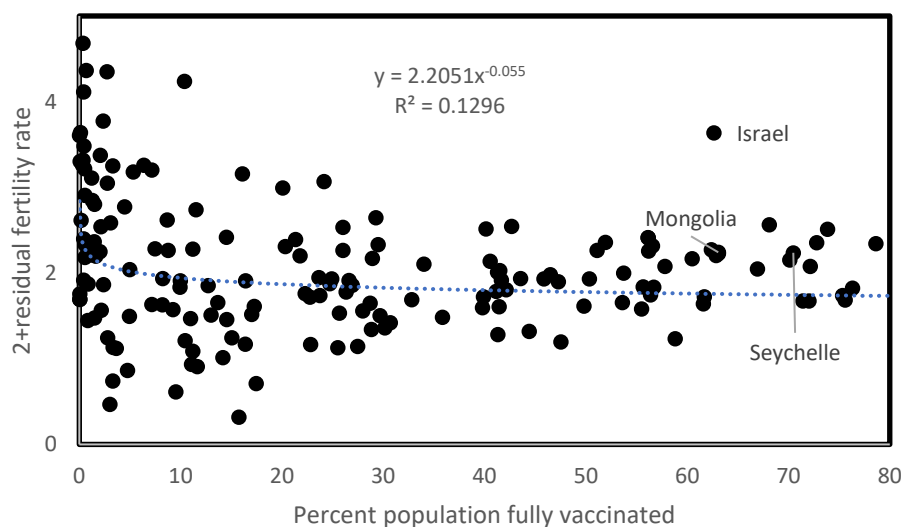


Figure 2. Residual of total fertility rate in different countries from [Total Fertility Rate 2021 \(worldpopulationreview.com\)](#) after accounting to association with national GDP per capita, as a function of percentages of fully vaccinated people in the same countries from [Coronavirus \(COVID-19\) Vaccinations - Statistics and Research - Our World in Data](#), both sites accessed 04IX2021.

Figure 2 shows that the association of fertility and vaccination remains significant after accounting for effects of GDP per capita on fertility rates ( $r = -0.36$ ,  $N = 173$ ,  $P = 0.00000057$ , one tailed test). Results from two among three countries with notable outlier status in Figure 1 (Mongolia and Seychelles) fit the general patterns observed for most countries after accounting for GDP per capita. Using the same residual method to account for effects of GDP per capita on vaccination rates, the association between residual fertility and residual vaccination rates remains statistically significant ( $r = -0.138$ ,  $N = 170$ ,  $P = 0.0369$ , one tailed test).

One can never be sure that all potential confounding effects, such as those observed for GDP per capita, are accounted for. Nevertheless, note that accounting for about 60 percent of the initial variation in fertility and vaccination rates, the inverse association between vaccination and fertility rates remains detectable.

*Contrasts between 2019 and 2021 fertility also decrease with vaccination*

A further analysis confirms that population analyses converge with the individual-based observation from Shimabukuro et al (2021). Here, analyses use contrasts between fertility in 2021 and fertility in 2019 ([List of sovereign states and dependencies by total fertility rate - Wikipedia](#), accessed 04IX2021 (no data for fertility in 2020 was found)). Figure 3 plots the subtraction of fertility in 2019 from the fertility in 2021 as a function of vaccination rates.

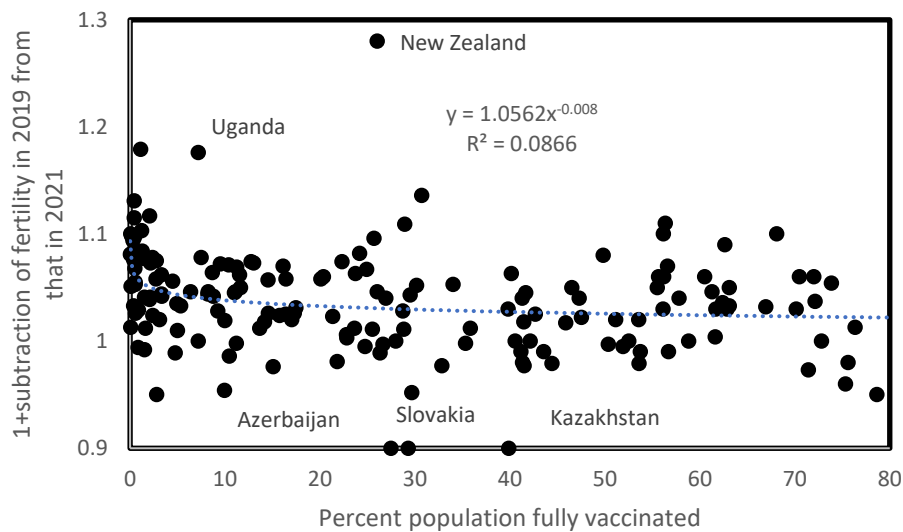


Figure 3. Subtraction of total fertility rate in 2019 from [List of sovereign states and dependencies by total fertility rate - Wikipedia](#) from total fertility rate in 2021 [Total Fertility Rate 2021 \(worldpopulationreview.com\)](#) as a function of percentages of fully vaccinated people from [Coronavirus \(COVID-19\) Vaccinations - Statistics and Research - Our World in Data](#), all sites accessed 04IX2021.

After subtracting the 2019 fertility rate from that from 2021, the negative association between fertility and vaccination rates remains statistically significant ( $r = -0.294$ ,  $N = 171$ ,  $P = 0.00000057$ ). It is notable that in most countries, fertility increased in 2021 as compared to 2019. This overall effect adds on average 0.038 to fertility rates in 2021 as compared to those in 2019, and might originate

from the use of different procedures when estimating fertility, as rates from 2019 and 2021 have different sources. Other effects are also possible (i.e. confining populations might increase fertility). This average effect is not to be confused from the effect of vaccination on the variation in the difference between fertility rates of 2019 and 2021. Excluding outlier countries indicated on Figure 3 that violate the requirement for a normal distribution of the dependent variable increases the strength of the negative association ( $r = -0.3397$ ,  $N = 166$ ,  $P = 0.00000378$ ).

#### *Fertility decreases with female, not male vaccination*

Above results at population level indicate that COVID19 vaccination decreases fertility. Data from [The COVID-19 Sex-Disaggregated Data Tracker | Global Health 50/50 \(globalhealth5050.org\)](https://www.globalhealth5050.org/) accessed 4IX2021 provide percentages of males and females among the vaccinated populations of 23 countries analysed above. Assuming equal proportions of males and females in all countries, sex-specific vaccination rates were calculated using the overall country vaccination rate and the proportion of males/females among the vaccinated. Female vaccination rates are greater than those of males in 20 among 23 countries (paired t-test,  $P = 0.0022$ ). The association between fertility and male vaccination is weaker than for female vaccination rate (males,  $r = -0.599$ ,  $P = 0.00126$ ; females,  $r = -0.716$ ,  $P = 0.00006$ ). A strong association exists between male and female vaccination rates ( $r = 0.848$ ). Hence, it is difficult to determine whether male or female vaccination affects most fertility. Therefore, two separate partial correlation analyses were done. The first tests for correlation between male vaccination and fertility, after accounting for effects of female vaccination on each of the two former variables. The produces the partial correlation coefficient  $r = -0.032$ ,  $P = 0.44$ . The second partial correlation analysis accounts for associations for correlation between female vaccination and fertility, after accounting for effects of male vaccination on each of the two former variables, which produces the partial correlation coefficient  $r = -0.49$ ,  $P = 0.01$ . The negative result for males also functions as a negative control in relation to the positive result in females.

#### **Conclusion**

Comparisons between countries show lower fertility associated with female, not male vaccination rates. This is in line with suspicions of greater adverse pregnancy risks in women vaccinated during the first pregnancy trimester.

#### References

Shimabukuro TT, Kim SY, Mers TR, Moro PL, Oduyebo T, Panagiotakopoulos L, Marquez PL, Olson CK, Liu R, Chang KT, Ellington SR, Burkel VK, 2021 Preliminary findings of mRNA Covid-19 vaccine safety in pregnant persons. *New Eng J Med* 384, 2273-2282.