Public opinion on coronavirus vaccination: Health Implications of Americans' surprisingly widespread acceptance of early Russian and Chinese vaccines

Jonathan Kelley

Principal Investigator, International Social Science Survey

kelly@InternationalSurveyCenter.org

MDR Evans

Professor of Sociology, University of Nevada, Reno

MDREvans@InternationalSurveyCenter.org

C. Corday

Senior Researcher, International Survey Center

ccorday@InternationalSurveyCenter.org

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Abstract

In the US, new vaccines are banned until accepted as safe and effective by the FDA. But the approval process is slow and cautious. The faster, but perhaps riskier, Russian system (like the Chinese) produced an approved coronavirus vaccine months more quickly, leaving Americans at risk of dying for months longer than Russians. Despite widespread fears that many would be hesitant to accept vaccination at all, and understandable doubts about vaccine approval processes outside the US, data from two national surveys in September 2020 show, very surprisingly, that a majority of Americans at that time would have willingly taken the Russian vaccine. Moreover a two-to-one majority of Americans – rich and poor, young and old, Democrat and Republican alike – believed that they ought to be allowed to buy it. Based on those figures, we

estimate that making the Russian vaccine (or the Chinese) immediately available would have saved 70 or more American lives each day in the autumn of 2020 and the beginning of 2021. To put that in context, US government prohibitions on Russian and Chinese vaccines cost more lives each day than the roughly 45 people killed daily by all American murderers combined. For the US government, a less authoritarian domestic policy, and a clearer appreciation of the globalization of medical technology, would seem to be indicated.

Keywords:

COVID-19, China, FDA, Public opinion, Russia, Sinovac SARS-CoV-2 Vaccine, Sputnik V, USA, advanced societies, attitudes, challenge trial, coronavirus, globalization, immunity, international, manufacture location, pharma, pharmaceuticals, survey, survey research, vaccine, vaccine acceptability, vaccine hesitancy, vax.

1. Introduction

There are widespread fears that many – even well educated, well informed people in developed nations like the USA, Britain, and the EU – would be hesitant to accept vaccination against coronavirus.¹ Indeed WHO has "vaccine hesitancy" among its top "ten threats to global health in 2019", The US is no exception (Lin, Tu and Beitsch 2021; Pew 2020a); nor is Europe (Warren and Lofstedt 2021).

There are also doubts, perhaps understandably, about medical technology and vaccine approval processes outside the US. The consequences of any widespread reluctance or delay in vaccinating against the highly contagious coronavirus could be dire, as both practical experience with past epidemics and theoretical modeling of the current coronavirus pandemic show (for example IHME 2021). All this is well known.

But there is another very salient fact, not so well known, that this paper seeks to document and analyze in the hope that insights from the social and behavioral sciences can offer valuable insights to help curb this pandemic (and its successors) by better understanding the sources of people's behavior and developing evidence-based strategies to modify it (Bavel et al. 2020).

Based on data from two large national surveys, this paper shows that, contrary to widespread fears about vaccine reluctance, the American public was surprisingly willing to be vaccinated in September of 2020, months before US, British, or EU approved vaccines were available. Moreover Americans were willing to accept vaccines from Russia (its "Sputnik V" vaccine, in use in July, described in a peer-reviewed article in *The Lancet* and approved by the Ministry of Health of the Russian Federation [Minzdrav] in August). This is also true of vaccines from China (in use in China beginning around the same time). For many Americans there was still some hesitance and intention to delay to see how things worked out, but about 20% were willing to be vaccinated immediately, and more to be vaccinated in subsequent months. Indeed they were almost as willing to take the Russian (or Chinese) vaccine as to take a then hypothetical US approved vaccine.

Medically, this was a great opportunity. In the autumn of 2020 with vaccines as yet unavailable in the US, deaths from coronavirus ran somewhere around 700 to 900 *per day* (CDC figures), and went even higher in the winter. Vaccines to reduce the toll were not approved by the American authorities until the very end of the year and it still seems likely take some months beyond that for sufficient vaccine to be available, and for there to be sufficient experience with it to persuade everyone who is persuadable to get vaccinated.

All this leaves Americans at risk for months longer than necessary. This paper shows that the risk could have been substantially reduced without a miracle, and without a change in public opinion. This paper addresses the possibility that Americans might have taken advantage of the Russian vaccine to reduce the period they would otherwise be at risk of infection and possible death while awaiting slow-moving American developments.

Data from two national surveys in September (combined N=2,280) show that about one American in five was already ready, even eager, to use the existing Russian vaccine immediately. Most of the rest said they would be ready to use it after it had been available for a few months. Each of those "vaxers" would not only reduce their own risk of death, but would reduce the risk of infection throughout their social network and transitory contacts, saving the lives of others, as well.

If use of the Russian coronavirus vaccine were permitted in the US, we conservatively estimate that approximately 40 to 100 US lives would have been saved *each day* after the first month of availability. Many more would have been saved subsequently, both from the on-going immunity among the first wave vaccinated, and from subsequent cohorts accepting vaccination. The benefits would continue at least until US vaccines become fully available and fully accepted – assuming that earlier vaccines continue effective against any widespread new variant of the virus, which may be problematic in the future (IHME 2021) but was not a problem in 2020.

(An earlier version of this paper was published on SocArXiv in October 2020, but the simple policy change described there – individual freedom of choice – was not adopted by the US government.)

2. Data

Data are from the International Social Science Survey (ISSS), Round 21, Cohorts 7 and 8. These are separate internet samples fielded beginning September 13 and September 27 respectively, with almost all completions within a few days of entering the field. The surveys are part of an ongoing ISSS research project on the coronavirus pandemic.

All of the surveys so far are Amazon 'Mechanical Turk' internet-based samples. These can be conducted without risk of contracting coronavirus and, moreover, are swift, convenient, and cost effective. Internet samples of this sort have been widely used during the pandemic (Cornesse and Blom 2020; Graham et al. 2020; McFadden 2020).

Extensive research shows that Mechanical Turk samples have proven remarkably accurate for multivariate analyses (Clifford, Jewell and Waggoner 2015; Springer et al. 2016; Weinberg, Freese and McElhattan 2014), specifically for political affiliations and attitudes (Clifford, Jewell and Waggoner 2015) and for science-related issues (Evans and Kelley 2011). We have found that as well, comparing our 2017-2019 internet samples to face-to-face samples in the US and many other countries (from the International Social Survey Programme's highly regarded "Inequality" series).

A disadvantage is that estimation of population means in internet samples and predicted values in regression analyses may need to be adjusted because they typically over represent younger and highly educated people. For the present analysis, such adjustments make no practical difference because the issues dealt with here are not much related to age or education (as we show below). Moreover, estimates from Pew's carefully curated internet sample and our MTurk samples match closely on many COVID-related questions.

A reanalysis of these data weighting the sample to reflect the joint distribution of age and education (benchmark: US Census) and the univariate distribution of religious background (church attendance in childhood: benchmark International Social Survey Programme 2008) leads to the same conclusions (details available on request).

3. Findings: Widespread acceptance of the Russian coronavirus vaccine

(For clarity, we write in the "ethnographic present" of September 2020 when respondents were surveyed. At that time Russian and Chinese coronavirus vaccines were already approved by their national authorities but US, British, and other vaccines were not yet available or approved by their national authorities.)

Willingness to take the Russian vaccine was assessed by a straightforward direct question (preceded by an image of two vials of the vaccine):

The Russians have created a coronavirus vaccine "Sputnik-V" which has been approved by their Ministry of Health and described in the respected international journal, The Lancet. If it becomes available here in November, would you...

8%	Certainly take it right away	[scored 1.0]
18%	Probably take it right away	[scored .67]
20%	Wait and see for a month or so	[scored .67]
23%	Wait and see for several months	[scored .67]
14%	Probably never take it	[scored .33]
15%	Certainly never take it	[scored .00]
2%	(I'm already immune, no need for vaccination)	[missing]

(100% Total; 2,234 cases; early & late September 2020)
 (Scoring reflects estimated probability of vaccinating.)
 (Estimated probability of vaccinating: mean .55; s.d. .28)

The percentages on the left in green are the percent distribution of the answers (respondents did not see them, nor the other material in green). Just 2% believe they are already immune, although actual immunity is probably closer to 5% or 10% (Anad et al., 2020). So the risk of infection and the issue of vaccination are actually relevant to 90% of the population and subjectively and behaviorally relevant to 98%.

Americans were already in September surprisingly willing to accept the Russian vaccine. Some 8% say they would "certainly" take it right away. Another 18% would "probably" take it right away.

More, 20%, would "wait and see for a month or so". Yet more, 23%, would wait and see for several months. The delay is presumably to see whether all goes well for those who took the vaccine right away.

Finally, fewer than a third of all Americans expected that they would "probably" (14%) or "certainly" (15%) refuse to take the Russian vaccine.

Thus, there is surprisingly widespread acceptance of the Russian 'Sputnik V' vaccine. Assuming that around two-thirds of the "probably take it right away" group would indeed take the vaccine in the first month or so, that suggests that around 20% of

Americans would take the Russian vaccine in the first month or so after it becomes available in the US ($8\% + \frac{2}{3} \cdot 18\% = 20\%$). We will see that that would imply a tremendous savings of American lives.

This 20% acceptance of the Russian vaccine is only a little lower than a CBS/YouGov poll (CBS 2020) found in the first week of September for a US vaccine (21% say they would get vaccinated "as soon as possible") with outright rejection (21% "never") perhaps a little lower than our 15% "never" and 14% "probably never" for the Russian vaccine. Pew Research Center results for September are similar (Pew 2020). Similar results have been found in many other nations (for example France: Ward, Alleaume, and Peretti-Watel 2020) and for other viruses (Larson, de Figueiredo A, Xiaohong, et al. 2016).

Those figures are for taking the Russian vaccine "right away". Many more say they would wait and see for a month or two. Taking that into account and making some plausible guesses as shown above (viz that two-thirds of those who "probably" would take it would eventually do so; and that one-third of those who say "probably never" would eventually switch and take it) we get an overall estimate of some 55% of Americans sooner or later taking a Russian vaccine if it were available.

A hypothetical American vaccine

We also asked about a hypothetical American vaccine available at the end of the year, our results suggesting 27% of Americans would take it in the first month, compared to the 20% we have seen for the Russian vaccine:

Americans are developing several coronavirus vaccines but none are available yet. If one becomes available early in November, would you...

12%	Certainly take it right away
22%	Probably take it right away
22%	Wait and see for a month or so
25%	Wait and see for several months
11%	Probably never take it
8%	Certainly never take it
2%	(I'm already immune, no need for vaccination)

(100% Total; 2,347 cases; early & late September 2020)
 (Scoring as for the Russian vaccine question above.)
 (Estimated probability of vaccinating: mean .61; s.d. .24)

This means that first month uptake intentions for the Russian vaccine are around 26% lower than for an American vaccine (viz 20% for the Russian vaccine, 27% for the US vaccine; $1 - (20/27) = 26\%$ lower). Our subsequent data from late 2020 and January 2021 surveys suggest these estimates for the US vaccines turned out to be substantially correct.

The only other analysis of American intentions to take the Russian vaccine of which we are aware comes to a similar conclusion about the US-Russia comparison. A careful analysis of variance based on a late August survey estimated Americans would be 18% less

likely to take a Russian vaccine than to take an otherwise similar American one (Motta 2020, Figure 1).

Taking the "wait and see" answers into account gives a rough estimate of 61% of Americans willing to eventually take an American vaccine. This is compared to a similar rough estimate of 55% eventually taking the Russian vaccine if it were available.

Broad acceptance of existing Chinese vaccines

Surprisingly, opinion on the existing Chinese vaccine is very similar to that on the Russian 'Sputnik-V'. This question was asked in our two national surveys in September, 2020 when the vaccine was already in use in China:

Sao Paulo State Governor Joao Doria displays a box of the COVID-19 vaccine produced by the Chinese

The Chinese have developed a coronavirus vaccine which they are already giving to their military and people in public contact jobs. If it becomes available here in October, would you...

- 10% Certainly take it right away**
 - 20% Probably take it right away**
 - 22% Wait and see for a month or so**
 - 25% Wait and see for several months**
 - 12% Probably never take it**
 - 10% Certainly never take it**
 - 2% (I'm already immune, no need for vaccination)**
- (100% Total; 2,349 cases; early & late September 2020)**
(Scoring as for the Russian vaccine question above.)
(Estimated probability of vaccinating: mean .54; s.d. .28)

Americans are (in our "Ethnographic present" of September 2020) surprisingly willing to accept the Chinese vaccine: Some 10% say they would "certainly" take it right away. Another 20% would "probably" take it right away. This is similar to their views on the Russian vaccine, or even slightly more favorable. Only 12% would "probably never take it and 10% "certainly" not.

In the only other data about American acceptance of foreign vaccines of which we are aware, a large national poll in late July 2020 (N=1997) asked about vaccine uptake for hypothetical US and Chinese vaccines (Morning Consult+Politico, 2020). They also found substantial willingness to take both. Specifically, 27% "would be among the first to get vaccinated" for the US vaccine and 19% for the Chinese. Only 17% "would

not get vaccinated" with the US vaccine and 23% for the Chinese. The rest would "be in the middle to get vaccinated" or "be among the last to get vaccinated", in all some 45% for the American vaccine and 41% for the Chinese.

In sum, most Americans would accept Russian or Chinese vaccines.

Broad acceptance of an English vaccine as well

Given that Americans mostly would accept existing Russian and Chinese vaccines (in our "Ethnographic present" of September 2020) it is hardly surprising that they also accept the prospect of vaccine from England, a more familiar and more scientifically advanced nation:

The English are developing and testing a coronavirus vaccine. It might be approved by the government health authority in England and become available here in January next year. If you weren't already vaccinated would you...

12% Certainly take it right away
20% Probably take it right away
24% Wait and see for a month or so
24% Wait and see for several months
11% Probably never take it
8% Certainly never take it
2% (I'm already immune, no need for vaccination)
(100% Total; 2,365 cases; early & late September 2020)
(Scoring as for the Russian vaccine question above.)
(Estimated probability of vaccinating: mean .62; s.d. .24)

Americans find a hypothetical English vaccine just as acceptable as a hypothetical American one, roughly 62% willing to take the English and 61% the American. Both of these are only fractionally more acceptable than the existing Russian and Chinese vaccines.

In short, vaccine globalization.

While globalized preferences are the main story, some people have specific preferences, shown by a greater willingness to take one nation's vaccine than another nation's. Some prefer the Russian vaccine to the Chinese (12% of the population) or vice-versa (also 12%). Interestingly, some prefer the Russian vaccine to the American (also 12%), Some of this may be random measurement error, an inevitable but familiar complication (

Strikingly, a few who say they would **not** take the US vaccine at all would probably (7%) or definitely (1%) take the Russian vaccine right away. So too for probably (6%) or definitely (2%) taking the Chinese vaccine right away. So making the Russian and Chinese vaccines available in the US would get a few Americans vaccinated who would not accept vaccination if only an American vaccines were available.

4. Who would willingly take the Russian vaccine?

Consistent with research on other vaccines in general and COVID vaccines in particular (Nexøe, Kragstrup and Søgaard 1999; Salmon et al. 2005; Siddiqui, Salmon and Omer 2013; Vermandere et al. 2016; Freeman et al. 2020; Wong et al. 2020), demographic and socioeconomic differences in willingness to take the Russian vaccine are mostly modest (Table 1, column 1). (We are speaking still in the "ethnographic present" of September 2020).

Older people are a little less willing to vaccinate, other things equal (standardized effect of $-.10$, $p < .001$). The largest difference, one rarely noted in the literature, is that devout churchgoers are substantially more willing to vaccinate (standardized total effect of $.20$, $p < .001$); about half of that comes about because their personal life style and health beliefs (column 1 - column 2 = $.20 - .11 = .09$, or about half of $.20$).

Married people, Democrats, and those at the top of the occupational hierarchy (higher professionals like professors, lawyers, and engineers) rather than those at the bottom of the hierarchy (like unskilled laborers and farm workers) are all slightly more inclined to vaccinate (standardized effects around $.06$ or $.07$, $p < .01$). This is in good part because of their personal life style and health beliefs (compare column 1 and column 2). Similar age and political differences are found in France (Ward, Alleaume and Peretti-Watel 2020: Table 1).

All in all demographic, socioeconomic status and political differences are small, altogether accounting for a paltry 8% of the variance.

Table 1.

Americans' willingness to take the Russian 'Sputnik-V' coronavirus vaccine as of September 2020 (months before any US vaccine was available). Standardized regression coefficients. Total effects in red; direct effects in Col. 2; indirect effects are the difference between them. Metric effects are given in the Appendix. International Social Science Survey Round 21, USA 2020. Early and late September surveys pooled.

	Would take the Russian vaccine	
	(1)	(2)
Demographic		
Male (1 or 0)	0.03	0.01
Black (1 or 0)	0.05*	-0.00
Hispanic (1 or 0)	0.01	0.00
Age (years)	-0.10***	-0.06**
Church going (ln # yearly)	0.20***	0.11***
Married (1 or 0)	0.07**	0.04
SES & politics		
Education (years)	0.03	0.00
Occupation (0-1)	0.07**	0.05*
Vote Democratic (1-0)	0.06**	0.00
Health beliefs		
Perceived severity: COVID		0.09***
Feel at risk of COVID		0.01
Trust MDs, medical PhDs		0.11***
Personal life style		
Often visit overnight		0.15***
Personally risk tolerant		0.10***
Wants COVID safe areas		0.17***
Observations	1841	1822
R-squared	0.077	0.171
*Standardized regression coefficients		
* p<0.05, ** p<0.01, *** p<0.001		

Some health beliefs (Rosenstock 1974) matter rather more (Table 1, column 2). In particular perceived severity of COVID (measured by a 3 item scale, Alpha reliability &&&) has a standardized effect of .09 ($p<.001$). Trust in medical providers and medical science (&&& item scale, Alpha reliability &&&) matters a little more, .11. But surprisingly subjective perceptions of one's own risk of getting COVID do not. Personal life styles are the most consistently important. Those who often visit overnight, or often have overnight visitors themselves, or both, are noticeably more inclined to seek vaccination – as well they might be since their risk of

5. Who would get vaccinated "right away"?

Willingness to be vaccinated with the Russian 'Sputnik V' vaccine is widespread throughout American society (speaking still in the "ethnographic present" of September 2020) with no statistically significant difference between young and old, rich and poor, or (more surprisingly in a generally politicized pandemic) between Democrats and Republicans (Table 1).

(Scoring reflecting estimated probability of taking the vaccine in the first month of availability)

The Russians have created a coronavirus vaccine ...would you...

8%	Certainly take it right away	[scored 1.0]
18%	Probably take it right away	[scored .67]
20%	Wait and see for a month or so	[scored .00]
23%	Wait and see for several months	[scored .00]
14%	Probably never take it	[scored .00]
15%	Certainly never take it	[scored .00]
2%	(I'm already immune, no need for vaccination)	[missing]

(100% Total; 2,234 cases; early & late September 2020)
(Probability of taking in first month: mean .21; s.d. .35)

Appendix Table 2.

Willingness to be vaccinated with the Russian 'Sputnik V' vaccine IN THE FIRST MONTH IT IS AVAILABLE. Metric regression coefficients. International Social Science Survey Round 21, USA 2020. Early and late September surveys pooled.

Accept Russian vaccine in first month available	
<u>Demographic</u>	
Male (1 or 0)	0.00
Black (1 or 0)	0.07***
Hispanic (1 or 0)	-0.08
Under age 40 (1 or 0)	-0.01
Age 65+ (1 or 0)	0.01
Church going (ln # yearly)	0.03***
<u>SES, marriage, politics</u>	
Education (years)	0.00
Occupation (0-1)	0.15***
Married (1 or 0)	0.04*
Vote Democratic (1-0)	0.05*
Constant	-0.02
Observations	1841
R-squared	0.049
* p<0.05, ** p<0.01, *** p<0.001	

Consistent with past research on vaccination for other diseases (Siddiqui, Salmon and Omer 2013), background and demographic differences are small. Men are fractionally more accepting (4% more likely to be vaccinated; $t=2.29$, $p<.05$). Blacks are 8% more likely ($t=3.98$, $p<.001$) and Hispanics about 10% less likely ($t=-2.13$, $p<.05$). The young are not significantly different than the middle aged; nor (more surprisingly) are the old. Well educated university graduates are not significantly different from high school dropouts. Perhaps surprisingly in an otherwise politicized epidemic, political differences are negligible (in line with other research on vaccination: Motta et al. 2020).

The one socioeconomic difference that clearly matters is occupation: those at the top of the hierarchy (higher professionals like professors, lawyers, and engineers) are around 12% more likely to accept vaccination than those at the bottom of the hierarchy (like unskilled laborers and farm workers).

In all, demographic and socioeconomic differences explain only a paltry 2.6% of the variance. We find the same pattern for potential uptake of Chinese, English, and future American vaccines (results not shown but available on request and confirmed by results from our subsequent surveys).

This near randomness in the potential uptake of the Russian (and other) vaccines has an important implication for understanding vaccination's impact on the epidemic. It means that those who get vaccinated promptly will be a more or less random sample of the population and so would be just as likely (or unlikely) to get infected as anyone else. And so just as likely or unlikely to die as anyone else.

So, for example, if vaccination reaches 20% of the population and protects (say) 50% of those vaccinated from subsequent infection, then it reduces the rate of infection – and presumably also the death rate – by 10% (viz $.20 * .50 = .10$).

This is the basic assumption in our model.

6. The Russian vaccine's potential reduction in American coronavirus deaths

6.1. Estimation

We model the Russian vaccine's possible effect on America's coronavirus death rates simply and straightforwardly (further details in Appendix 1). There is at present no other vaccine available in the US, nor any likely to be available for some months, so we begin with a vaccine *tabula rasa* (recall that we are still speaking in the "ethnographic present" of September 2020 and that events are indeed bearing out these expectations).

Deaths from COVID-19 in September were running around 700 to 900 a day. Death rates were higher earlier in the epidemic, lower for a while in the summer, and higher in the winter. We take 700 a day as a plausible ballpark figure to work with. Increasing it by (say) half (as in fact happened late in 2020), or reducing it by half, would change our estimates in proportion.

For simplicity and clarity, we consider only the first month's uptake of the Russian vaccine, drawing on the estimates from our survey with specifically 20% following through with their expressed intention of taking the vaccine "right away" when it becomes available. We assume this is a random 20% of the population with respect to the risk of infection and the subsequent risk of death. We assume that a quarter get vaccinated in the first week, another quarter the second week, another in the third week, and the rest in the fourth week of availability. The result is shown in Figure 1, which illustrates only the first couple of months. The pattern shown there would, we predict, continue as long as immunity from the vaccine lasts and until alternative vaccines become readily available, perhaps three or four months from the beginning.

Uptake of the Russian vaccine in the second and subsequent months would follow the same pattern, with everything starting a month or two later (but likely ending a month or two sooner as alternative vaccines become available in late 2020 or early 2021). How many would take up the Russian vaccine in the second month of availability is not easy to know, perhaps two-thirds of the 20% who now say they would "Wait and see for a month or so". So too for the third month for the 23% who now say they would "Wait and see for several months". A few, perhaps a third, of the 14% who now say they would "Probably never take it" might relent at some point. All this would protect an additional 33% (viz $[\frac{2}{3}] * 20\% + [\frac{2}{3}] * 23\% + [\frac{1}{3}] * 14\% = 33\%$), bringing the total protected to 53%. This second wave would save more lives, perhaps as many again as saved by the first month's cohort. For simplicity we do not graph these possibilities in Figure 1.

We assume that some people would have a bad reaction to the vaccine, pessimistically taking the *worst* recent experience as our model, namely the 1976 swine flu vaccine. Approximately 45 million people were vaccinated then, resulting in 53 deaths due to the vaccine (Millera et al. 2015). Scaling that up to the current US population of 300 million, that corresponds to some 350 vaccine-related deaths. This in a coronavirus epidemic which had already killed some 200,000 as of September 2020 (and more subsequently). So even under these pessimistic assumptions, vaccine-caused deaths are small in the big picture, almost negligible – indeed orders of magnitude less than coronavirus-caused deaths (Figure 1, in red).

With the wisdom of hind-sight (as of early 2021), deaths from the various vaccines eventually approved in Russia, China, Canada, Britain, and the EU have been vastly safer than the US 1976 swine flu vaccine, killing few if any of those vaccinated. So fears of the dangers of coronavirus vaccines have turned out to be grossly exaggerated (although not uncommon in the lay public and not unknown even in medical circles).

6.2. Implications

The results of our rough and ready calculations are shown in Figure 1. If use of the Russian coronavirus vaccine had been permitted in the US, our analysis implies that at least 40 to 100 US lives would have been saved *each day* after the first month of availability. The benefits ramp up in the first month, as vaccination proceeds throughout the month. (This is again the "ethnographic present" of September 2020; in the event, the Russian vaccine seems to be even more effective than our most

optimistic estimate, and so the number of US lives that could have been saved would be even more than our 100 per day.)

Many more lives would be saved subsequently, both from the on-going immunity among the first wave vaccinated, and from subsequent cohorts accepting vaccination. The benefits would continue at least until US vaccines become fully available and fully accepted, perhaps sometime in 2021.

Figure 1.

Estimated American lives saved each day (shown in green) or lost each day (shown in red) if use of the Russian coronavirus vaccine was permitted in the US in the autumn of 2020 before US vaccines are available. Vaccine uptake estimated from two national surveys in September (International Social Science Survey, Round 21, US Cohorts 7 & 8; combined N= 2,280). Vaccine risks are worst-case estimates based on what was known in September 2020. Vaccine effectiveness (% of infections prevented) is estimated alternatively as very low (25%), low (50%), or good (75%). Deaths in the absence of vaccination are estimated as 700 per day based on rates observed in the autumn of 2020. Estimates shown are for the approximately 20% of Americans who say they would take up the Russian vaccine "right away". The 30% or 40% who would "wait and see" for a month or more are not included; their outcomes would be in similar in pattern but starting a month or more later.

How many lives would be saved depends heavily on how effective the vaccine turns out to be in preventing COVID-19 infection. But even if it is a very poor vaccine, preventing only 25% of infections (far below what the FDA considered adequate), it would still save a lot of lives. The reason is that "getting vaxed" hardly ever kills anyone (the red line in Figure 1) so that almost any prevention a vaccine gives is a gain. Saving some lives while waiting for a better alternative to emerge is better than our current policy of doing nothing, which saves none and costs many lives.

A vaccine that is 50% effective in preventing infection (the minimum the FDA considers adequate) would do much better, saving around 70 lives per day after the

first few weeks (solid green line in Figure 1). And that protection would continue months into the future, assuming that immunity once established continues for at least some months (as is usually the case for vaccines against other coronaviruses). And all this comes from vaccinating just 20% of the population; vaccinating more would save more.

Finally, a vaccine that is 75% effective (good but not unusually good – and probably even less that 20-20 hindsight reveals) would, we estimate, save something like 100 lives per day after it has been deployed for a while (Figure 1, dashed line in green, for weeks 5 onward).

What, then, do the American people think about this?

7. A two-to-one majority believe Americans should be allowed to buy the Russian vaccine

The question, asked in our two September surveys:

In the US, well-meaning government regulations ban new medicines - including coronavirus vaccines - until the FDA approves them as "safe and effective". But the FDA is slow and cautious. The faster, but slightly riskier Russian system has a vaccine available months before the USA, leaving Americans at risk of getting coronavirus, and dying of it, for months longer than Russians...

Should Americans be allowed to buy Russian vaccines now, if they want?

15%	Yes!!	(scored 1.00)
36%	Yes	(scored 0.75)
24%	??	(scored 0.50)
15%	No	(scored 0.25)
10%	No!!	(scored 0.00)
(100% Total; mean=.58; 2,355 cases; September 2020)		

The percentages on the left in green are the percent distribution of the answers. Scoring for the regression is shown on the right, also in green (it approximates probabilities). Respondents did not see any of the material in green.

A majority of Americans believe they should be allowed to buy Russian vaccines if they want, 51% (viz 15% + 36%). Only 25% are opposed (15% + 10%), so that is a two-to-one majority in favor (recall this is still the "ethnographic present" of September, 2020).

Quite a few are, however, undecided, 24%. If the question were put to a referendum where the undecided had to make up their mind one way or another, or abstain altogether, the likely result would be 58% in favor and 42% opposed.

All this is equally true of the Chinese vaccines (the question was asked immediately following the Russian question):

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. . .
Should Americans be allowed to buy Chinese vaccines now, if they
want?
13% Yes!! (scored 1.00)
35% Yes (scored 0.75)
23% ?? (scored 0.50)
17% No (scored 0.25)
12% No!! (scored 0.00)
(100% Total; mean=.55; 2,348 cases; September 2020)

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So Chinese and Russian vaccines are viewed in much the same way. Perhaps surprisingly since Russia is more developed economically although not more advanced scientifically. And Americans are quite accustomed to buying things from China.

Demographic and socioeconomic differences in opinion

Demographic and socioeconomic differences of opinion about buying foreign vaccines are small (Table 3). Men are a trifle more in favor of being allowed to buy the Russian vaccine (3% more $t=2.36$, $p<.05$). Blacks are 9% more favorable ($t=5.22$, $p<.001$) and Hispanics are not ($t=-0.26$, n.s.). Neither young nor old are significantly different than the middle aged. Nor are well educated university graduates significantly different from those with less education. Income is irrelevant.

Table 3.
Belief that Americans should be allowed to buy the Russian 'Sputnik V' vaccine and to buy Chinese vaccines (estimated probability of saying "yes"). Metric regression coefficients. International Social Science Survey Round 21, USA 2020. Early and late September surveys pooled.

	Allowed to buy foreign vaccines:	
	Russian (1)	Chinese (2)
Male (1 or 0)	0.03*	0.02
Black (1 or 0)	0.07***	0.09***
Hispanic (1 or 0)	-0.04	-0.01
Under age 40 (1 or 0)	0.01	0.01
Age 65+ (1 or 0)	-0.03	-0.09*
Church going (ln # yearly)	0.03***	0.02***
Education (years)	0.00	0.00
Occupation (0-1)	0.05	0.07*
Married (1 or 0)	0.01	-0.00
Vote Democratic (1-0)	-0.02	0.01
Constant	0.50***	0.39***
Observations	1925	1912
R-squared	0.066	0.039

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

The only real socioeconomic difference that is that those at the top of the occupational hierarchy (professors, lawyers, engineers and other higher professionals) are around 8% more supportive than those near the bottom of the hierarchy (like unskilled laborers; $t=2.76$, $p<.01$). Concretely, 62% of typical higher professionals believe they

should be allowed to buy the 'Sputnik V' vaccine while only 55% of otherwise similar unskilled workers think that – hardly a big difference. Notice that these are differences only in the **size** of the majority.

There are no significant partisan differences either ($t = -1.68$, $p = .09$). This is unlike many other aspects of the coronavirus epidemic where partisan differences are strong and often heated.

So far as we are aware, these questions have not previously been asked.

8. Conclusion

We have argued that making the Russian coronavirus vaccine 'Sputnik V' immediately available in the US would have saved approximately 40 to 100 American lives each day after the first month of availability. Many more would be saved subsequently, both from the on-going immunity among the first wave vaccinated, and from subsequent cohorts accepting vaccination. The benefits would continue at least until US vaccines become fully available and fully accepted. The benefits of allowing Chinese vaccines to be bought in the US would be similar. Allowing both would be a little better (a few Americans would use one but not the other and supply of the two would probably be less of a constraint).

Making the Russian vaccine immediately available for Americans to buy if they want to is a policy supported by a two-to-one majority of the nation. That is a policy supported by rich and poor, young and old, Democrat and Republican alike. Public opinion is no hindrance to adopting it. Only the US government is a hindrance.

Recall that we are still speaking in the "ethnographic present" of September 2020. Evaluating a public policy on the basis of 20-20 hindsight is neither a fair nor an informative way of judging the actions of the time. Suffice it to say that applying 20-20 hindsight (as of April 2021) amply confirms conclusions from September 2020.

Leaving the "ethnographic present" of September 2020 for the benefits of hindsight note that current US government policy still prevents Americans from getting the existing Russian vaccine, or indeed from getting vaccines already approved and widely distributed in China, Canada, Britain and the EU.

By forcibly preventing Americans from buying the vaccines early on, the US government puts itself in an untenable *moral* position by most tenants of moral philosophy (Bentham, Kant, Locke) and political philosophy ("We hold these truths to be self-evident ... unalienable Rights ...").

To put the matter bluntly, American policy has killed many dozens of people *each day* for months toward the end of 2020 and early in 2021.

To put that in context, all American murderers *combined* kill about 45 people each day.

One key issue is a moral one: Is it better to be almost absolutely safe for those who eventually take the FDA-approved vaccine at the cost of deaths every day to people who today would have taken Sputnik-V and other vaccines that have not completed

the FDA approval process? Does the tiny risk of a bad vaccine reaction causing death justify preventing people from making up their own minds how they weight that tiny risk against the risk they face without taking the vaccine? Or should the scientists stick to the science and provide the best information currently available – and best estimates based on past experience about the relative risks – leaving to the citizenry the right to make up their own minds about how they weigh those risks and to have access to the Russian vaccine if they want it? Our current system has killed dozens of people each day – people who would have survived had they been allowed to take the vaccine, as they wished. Is our system justified in inflicting these deaths on unwilling victims on the say-so of unelected (albeit well-meaning) medical bureaucrats with views of risk and morality which differ greatly from those of the majority of Americans?

To put the moral issue bluntly, true believers are the most dangerous zealots, as Savonarola most painfully illustrated centuries ago. The FDA has blood on its hands.

9.1 APPENDIX 1: THE MODEL

Our underlying model is described in Sections 4 and 5.1 above.

It is implemented in a straightforward Excel spreadsheet described here. The spreadsheet is freely available for downloading on our website (URL temporarily suppressed for blind review).

Basic assumption: If vaccination reaches 20% of the population and protects (say) 50% of those vaccinated from subsequent infection, then it reduces the rate of infection – and the death rate – by 10% (viz $.20 * .50 = .10$).

The model covers those who intend to get vaccinated "right away", which we take to be in the first month (see Section #3). These are the results shown in Section #5, Figure 1.

Those who expect to be vaccinated in the 2nd or subsequent months would follow the same logic and essentially the identical model but starting in the 2nd or subsequent months. These results are briefly discussed in text but not shown numerically.

The following calculations for those who intend to get vaccinated "right away" are repeated for each week; 9 weeks are shown in Figure 1. The first 4 weeks are the establishment period as the Russian vaccine is taken up. Subsequent periods are the stable state for the cohort of people who took up the vaccine "right away".

These calculations are repeated for each week:

pctVax = cumulative proportion of population vaccinated by that week
(assumption: # accepting vaccination spread evenly over 4 weeks)

nNewVax = Week1: *pctVax* in week 1 * *US_population* in millions
Week2 onward: (*pctVax* this week – *pctVax* previous week) * *US_population*

$vaxKill = nNewVax * (number\ dying\ from\ the\ vaccine\ per\ day)$
 (assume: worst case estimate from 1976 swine flu vaccine. For simplicity assume deaths happen immediately upon vaccination.)

$covidKill = number\ dying\ from\ COVID-19\ each\ day$
 (from observed data; assume is the same each week)

$vaxProtect = 0.50$
 (alternate assumptions shown [.25, .50, .75]; same each week)

$vaxEffectv = pctVax * covidKill * vaxProtect$

$vaxSave = vaxEffectv - vaxKill$

10. REFERENCES

- Anand, Shuchi, Maria Montez-Rath, Jialin Han, Julie Bozeman, Russell Kerschmann, Paul Beyer, Julie Parsonnet, Glenn M Chertow, et al., 2020. "Prevalence of SARS-CoV-2 antibodies in a large nationwide sample of patients on dialysis in the USA: A cross-sectional study." *The Lancet*. Published Online September 25, 2020; [https://doi.org/10.1016/S0140-6736\(20\)32009-2](https://doi.org/10.1016/S0140-6736(20)32009-2)
- Bavel, Jay J. van, Katherine Baicker, Paulo S. Boggio et al. 2020. "Using Social and Behavioural Science to Support Covid-19 Pandemic Response. ." *Nature Human Behaviour*.
- Bollen, Kenneth A. 1989. "The Consequences of Measurement Error." Pp. 151-69 in *Structural Equations with Latent Variables*. New York: John Wiley.
- CBS 2020. www.cbsnews.com/news/voters-covid-19-vaccine-opinion-poll
- Clifford, Scott, Ryan M Jewell, and Philip D Waggoner. 2015. "Are Samples Drawn from Mechanical Turk Valid for Research on Political Ideology?" *Research & Politics* 2(4):doi:10.1177/2053168015622072.
- Cornesse, Carina and Annelies G. Blom. 2020. "Response Quality in Nonprobability and Probability-Based Online Panels." *Sociological Methods & Research* online first:https://doi.org/10.1177/0049124120914940. doi: <https://doi.org/10.1177/0049124120914940>.
- Evans, M.D.R., and Jonathan Kelley. 2011. "US Attitudes Towards Human Embryonic Stem Cell Research." *Nature Biotechnology* 29(6):484-488, plus on-line supplement, pages 1-20.
- Evans, MDR, Jonathan Kelley and Sarah Kelley. 2020. "Let's Spend the Night Together: A Challenge for Medically Optimal Coronavirus Social Distancing Policies." SocArXiv. doi: 10.31235/osf.io/tsqyb.
- Freeman, Daniel, Bao S. Loe, Andrew Chadwick, et al. 2020. "Covid-19 Vaccine Hesitancy in the Uk: The Oxford Coronavirus Explanations, Attitudes, and Narratives Survey (Oceans) Ii." *Psychological Medicine* 11 December 2020(1-15. doi:10.1017/S0033291720005188). doi: . doi:10.1017/S0033291720005188
- Graham, Amanda, Francis T. Cullen, Justin T. Pickett, Cheryl Lero Jonson, Murat Haner and Melissa M. Sloan. 2020. "Faith in Trump, Moral Foundations, and Social Distancing Defiance During the Coronavirus Pandemic." *Socius* 6 (September 10, 2020): <https://doi.org/10.1177/2378023120956815>
- IHME_2021(February) "COVID-19 Results Briefing: The United States of America." Available at http://www.healthdata.org/sites/default/files/covid_briefs/briefing_United_States_of_America.

- Liotta, G., Marazzi, M. C., Orlando, S., & Palombi, L. 2020. "Is social connectedness a risk factor for the spreading of COVID-19 among older adults? The Italian paradox". *Plos One* 15(5): e0233329.
- Lin, Cheryl, Pikuei Tu and Leslie M. Beitsch. 2021. "Confidence and Receptivity for Covid-19 Vaccines: A Rapid Systematic Review." *Vaccines* 9(1):article 16. doi: 10.3390/vaccines9010016.
- Larson HJ, de Figueiredo A, Xiaohong Z, et al. (2016) The State of Vaccine Confidence 2016: Global Insights Through a 67-Country Survey. *EbioMedicine* 12: 295- 301. DOI :10.1016/j .ebiom.2016.08 .042.
- McFadden, S. M., Malik, A. A., Aguolu, O. G., Willebrand, K. S., & Omer, S. B. 2020. "Perceptions of the adult US population regarding the novel coronavirus outbreak." *Plos One* 15(4): e0231808.
- Millera, Elaine R., Pedro L. Moroa, Maria Canoa, and Tom Shimabukuro. 2015. "Deaths following vaccination: What does the evidence show?" *Vaccine*; 33(29): 3288–3292. doi:10.1016/j.vaccine.2015.05.023.
- Morens, David M. and Anthony S. Fauci. 2020. "Emerging Pandemic Diseases: How We Got to COVID-19." *Cell*. Published online August 15, 2020. <https://doi.org/10.1016/j.cell.2020.08.021>
- Morning Consult+Politico. 2020(July 24-26). "National Tracking Poll Project 200797(N=1997 Registered Voters)" Pps 1-23.
- Motta, Matthew. 2020. "Can a COVID-19 Vaccine Live up to Americans' Expectations? A Conjoint Analysis of How Vaccine Characteristics Influence Vaccination Intentions." *SocArXiv*. August 27. doi:10.31235/osf.io/kxmw7
- Motta, Matt, PhD, Steven Sylvester, Timothy Callaghan, and Kristin L. Trujillo. 2020. "Encouraging COVID-19 Vaccine Uptake Through Effective Health Communication." *SocArXiv*. September 8. doi:10.31235/osf.io/4d25e.
- Nexøe, Jørgen, Jakob Kragstrup and Jes Søgaard. 1999. "Decision on Influenza Vaccination among the Elderly: A Questionnaire Study Based on the Health Belief Model and the Multidimensional Locus of Control Theory." *Scandinavian Journal of Primary Health Care* 17(2):105-10. doi: 10.1080/028134399750002737.
- Pew. 2020a, "<https://www.pewresearch.org/science/2020/12/03/Intent-to-Get-a-Covid-19-Vaccine-Rises-to-60-as-Confidence-in-Research-and-Development-Process-Increases/>".
- Pew, 2020b. www.pewresearch.org/science/2020/09/17/u-s-public-now-divided-over-whether-to-get-covid-19-vaccine
- Rosenstock, Irwin M. 1974. "The Health Belief Model and Preventive Health Behavior." *Health education monographs* 2(4):354-86. doi: 10.1177/109019817400200405.
- Salmon, Daniel A., Lawrence H. Moulton, Saad B. Omer, M. Patricia deHart, Shannon Stokley and Neal A. Halsey. 2005. "Factors Associated with Refusal of Childhood Vaccines among Parents of School-Aged Children." *Archives of pediatrics & adolescent medicine* 59(5):470-76. doi: 10.1001/archpedi.159.5.470.
- Siddiqui, Mariam, Daniel A Salmon, and Saad B Omer. 2013. "Epidemiology of vaccine hesitancy in the United States". *Human Vaccines & Immunotherapeutics* 9:12, 2643–2648;
- Springer, Victoria A., I. Stephanie Vezich, Samuel C. Lindsey, and Peter J. Martini. 2016. "Practice-Based Considerations for Using Multi-Stage Survey Design to Reach Special Populations on Amazon's Mechanical Turk." *Survey Practice* 9(5):1-10.
- Vermandere, Heleen, Marie-Anne van Stam, Violet Naanyu, Kristien Michielsens, Olivier Degomme and Frans Oort. 2016. "Uptake of the Human Papillomavirus Vaccine in Kenya: Testing the Health Belief Model through Pathway Modeling on Cohort Data." *Global Health* 12(November):Article 72. doi: <https://doi.org/10.1186/s12992-016-0211-7>.

- Ward, Jeremy K., Caroline Alleaume, and Patrick Peretti-Watel. 2020. "The French Public's Attitudes to a Future COVID-19 Vaccine: The Politicization of a Public Health Issue." *SocArXiv*. May 28. doi:10.31235/osf.io/xphe9.
- Warren, George and Ragnar Lofstedt. 2021. "Covid-19 Vaccine Rollout Risk Communication Strategies in Europe." *Journal of Risk Research* Online before print(08 Jan 2021):DOI: 10.1080/13669877.2020.1870533. doi: 10.1080/13669877.2020.1870533.
- Weinberg, Jill D., Jeremy Freese and David McElhattan. 2014. "Comparing Data Characteristics and Results of an Online Factorial Survey between a Population-Based and a Crowdsourcing-Recruited Sample." *Sociological Science* 1(1):292-310.
- Wong, Li Ping, Haridah Alias, Pooi-Fong Wong, Hai Yen Lee and Sazaly AbuBakar. 2020. "The Use of the Health Belief Model to Assess Predictors of Intent to Receive the Covid-19 Vaccine and Willingness to Pay." *Human vaccines & immunotherapeutics* 16(9):2204-14. doi: 10.1080/21645515.2020.1790279.

¹ Nomenclature in different literatures emphasizes different points on the vaccination spectrum, with those focusing on the positive agentic end usually talking about vaccination "intention", those focusing on the positive end, but viewing the general public as largely passive, talking about "receptivity", those focusing on the middle, or lower middle, talking about "vaccine hesitancy" and those focusing on the low end talking about vaccine "resistance" or "refusal". But insofar as their measurement includes the whole spectrum, these literatures all address the same substantive issue, employ similar predictor variables, and typically yield very similar findings, allowing for the reversal of signs, depending on which end of the spectrum is defined as "up".