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## Determinants of COVID-19 Vaccination Acceptance : A Survey Study from Japan

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# Determinants of COVID-19 Vaccination Acceptance

A Survey Study from Japan*

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## Key Points

### Question

What factors are associated with willingness to accept hypothetical COVID-19 vaccines in Japan.

### Findings

In this survey study of a sample of 15,000 Japanese adults, the technical attributes, such as efficacy and adverse side effects, and geopolitical attributes, such as origin of development and clinical trials, of vaccines were associated with preferences for a hypothetical vaccine. Additionally, compulsory vaccination slightly weakened the negative associations of side effects and foreign origins as a result of a decrease in free-riding concerns. In terms of attitudes toward vaccination in general, gender, age, income, and education did not substantially affect willingness to receive a vaccine.

### Meaning

Domestic development and clinical trials are substantially preferred; therefore, domestic production would increase vaccination rates. Moreover, compulsory vaccination might modestly help increase vaccination rates until safety and efficacy are established and domestic production begins.

## Abstract

### Importance

Vaccination is a critical measure to contain the COVID-19 pandemic. To persuade the public of Japan, a vaccine-hesitant nation, is essential.

### Objective

We survey determinants that affect Japanese acceptance of vaccines against COVID-19.

### Design

We conducted a randomized conjoint analysis survey on preference over choice of a vaccine. The survey assigned respondents 5 choice tasks. In each task, respondents evaluated 2 hypothetical COVID-19 vaccines and were asked whether they would choose vaccines A or B. The vaccine attributes included efficacy, major and minor adverse side effects, country of vaccine development and clinical trial, and vaccine type.

### Setting

We conducted the survey on the Internet.

### Participants

A nonprobability sample of 15,000 Japanese adults.

### Treatment

A choice task asked participant to select a vaccine from 2 hypothetical ones as optional or to make which one mandate, with a probability of 0.5 for each.

### Main Outcomes and Measures

We expected that country of development and clinical trial, vaccine type, and whether the vaccination is optional or compulsory would affect the preferences.

### Results

Domestic and US development compared to Chinese development raised the probability of choice by 131% (average marginal potential outcome increased from 0.29 to 0.67) and 96% (to 0.57), respectively. A domestic clinical trial increased it by 33% (from 0.43 to 0.57). A rise in efficacy from 50% to 90% increased it 43% (from 0.41 to 0.59). A decrease in the risk of severe side effects from 1 per 10 thousands to 1 per 1 million increased it by 38% (from 0.42 to 0.58). Vaccine type was irrelevant. Making vaccination compulsory

raised the acceptance probability of China- and Russia-developed vaccines by 6% and 4%, respectively, and raised that of taking a high-risk vaccine by 5% and a modestly effective (70%) vaccine by 4%. General vaccination hesitancy, political positions, and demographic characteristics were irrelevant.

**Conclusions and Relevance**

A domestically development or clinical trial would substantially increase willingness to take the vaccine. Making vaccination compulsory would modestly reduce penalty on a vaccine with side effects, geopolitical, and efficacy concerns. The tendency is common across background characteristics, including attitudes toward vaccination in general.

# Introduction

Hesitancy about vaccines is a factor that hinders the achievement of herd immunity, and the reason for the hesitancy could be multidimensional.[1234] Such hesitancy is a critical issue, even amid the pandemic of COVID-19, with high uncertainty of efficacy and possible adverse side effects,[5678910111213141516171718] along with the pecuniary costs of vaccination,.[19] Ideally, it would be best to control the technical uncertainty of vaccines.[2021] However, if we believe vaccination could be effective to contain the pandemic despite the remaining technical uncertainty, we must find a way to persuade people to get vaccinated. One possible approach is to identify what people are most concerned about with respect to the entire process of development, clinical trials, and provisioning and then to address the issue, as attempted by.[22] Among the possible settings used to measure stated preference, randomized conjoint experiments,[2324] where vaccination attributes are randomly combined, are effective to identify what people like and dislike, as implemented in China prior to the COVID-19 pandemic[25] and as implemented to find better vaccination against COVID-19 in the US[262728] and France.[29] These studies report that efficacy has a positive impact and side effect risk has a negative impact on hypothetical vaccine choice.

Japan is not an exception to vaccination hesitancy.[30] Furthermore, Japan does not have any vaccination production capacity as of April, 2021. Thus, we implemented a randomized conjoint experiment on 15,000 respondents to identify factors associated with a more acceptable hypothetical vaccine.

# Methods

We conducted an online survey in March, 2021 to measure individual valuation of hypothetical COVID-19 vaccines. The Ethical Review Board of the Institute of Social Science, The University of Tokyo approved this study. Each respondent was asked which of two hypothetical vaccines she/he would prefer.

## Randomized conjoint analysis

Randomized conjoint analysis originates from market research and has recently been applied in public health, including research to identify factors that affect attitudes toward COVID-19 vaccination in the US.[26][27]

## Survey

### Attributes

In this survey, respondents were informed about vaccines being supplied and under development. Each hypothetical vaccine profile consisted of 6 categories: a) risk of severe adverse side effects that result in hospitalization or death, b) risk of mild adverse side effects resulting in flu-like symptoms, c) efficacy to protect against severe symptoms, d) type of vaccine, namely, messenger-RNA, inactivated virus, or weakened virus, e) country of development (Japan, US, China, UK, or Russia), and f) country of clinical trial between (in Japan or not in Japan). The attributes are summarized in Table 1. For each category, one attribute level was randomly drawn to characterize a hypothetical vaccine. Two such hypothetical vaccines were shown to a respondent, who was then asked to make a choice. We did not allow respondents to opt out, such that between two levels of an attribute, the relatively disliked level was selected with a probability

less than 0.5 and the preferred level was selected with a probability greater than 0.5. Each respondent participated in 5 selection tasks, such that 10 outcomes, including the chosen vaccine and not chosen vaccine for each task. In sum, we collected 10 (outcomes) $\times$ 15,000 respondents = 150,000 samples.

Table 1: Attributes and attribute levels.

| | | | |
|---|---|---|---|
| Country of development | Japan<br>US<br>China<br>UK<br>Russia | Country of clinical trial | in Japan<br>not in Japan |
| Risk of severe side effects (hospitalization or death ) | 1 in10,000<br>1 in 1,000,000 | Mild side effects (flu-like symptoms) | 1 in 10<br>1 in 30 |
| Efficacy (protection against severe symptoms) | 50%<br>70%<br>90% | Type of vaccine | Messenger RNA<br>Inactivated virus<br>Weakened virus |

**Treatment: Two scenarios**

Before introducing the hypothetical vaccines, we randomly presented two different scenarios to the respondent. One asked the respondent which vaccine she/he preferred for herself/himself. The other asked which vaccine should be selected if the government made vaccination compulsory. Theoretically possible differences between these scenarios include that the former self-choice scenario might include the free-rider problem effects. Not every individual needs to get vaccinated to achieve herd immunity. For example, if most people other than myself get vaccinated, I would be protected by the herd immunity built by the efforts of other people and might have incentive to avoid riskier vaccinations. The latter scenario of compulsory vaccination would reduce such free-riding concerns.

## Data collection

We recruited 15,000 Japanese adults using the Rakuten Insight platform between February 16 and March 15, 2021. The sample does not differ substantially from the overall Japanese population. Detailed information about Rakuten Insight's respondent pool is available from its website.[1] Along with demographic characteristics, such as gender, age, income, and education, we asked about past experience of COVID-19 infection, general attitude toward vaccination, past vaccination or vaccination refusal experience, trust in licensing vaccination, and trust in doctors' advice, considering possibilities that such factors might affect willingness to receive a vaccine. Descriptive statistics are presented in Table 2.

Gender takes a value of 1 if the respondent is female and 0 otherwise. Working and marital statuses take a value of 1 if the respondent works and is married, respectively. The maximum value of the number of children is 5, such that an answer "5" might include more than 5. Previous COVID-19 infection is also dummy variable such that the mean 0.022 means 2.2% had a previous COVID-19 infection. NA indicates how many respondents chose "I do not want to answer." Previous experience of refusal or postponing vaccination are among measures of general vaccination hesitancy.[31] Education and income strata are represented by dummy variables such that the mean values indicate the proportion of the sample in the stratum. The Liberal Democratic Party has been the ruling party for most of the period since its creation in 1955. Approval rates of the other parties, which include the center-left Constitutional Democratic Party, the center-right government coalition Clean Government Party, and the leftist Japanese Communist Party, are less than 0.1 (10%). The values for the dissatisfaction with current politics are between 5 (substantially dissatisfied) and 1 (substantially satisfied). When

[1] https://insight.rakuten.co.jp/download/PanelProfile_EN.pdf and https://insight.rakuten.co.jp/download/PanelCharacteristicSurveyEN.pdf

Table 2: Descriptive statistics of the background characteristics.

| Statistic | N | Mean | St. Dev. | Min | Max |
|---|---|---|---|---|---|
| Gender | 15,000 | 0.504 | 0.500 | 0 | 1 |
| Age | 15,000 | 47.610 | 13.901 | 18 | 79 |
| Marital status | 14,936 | 0.632 | 0.482 | 0.000 | 1.000 |
| Number of children | 14,975 | 1.112 | 1.126 | 0.000 | 5.000 |
| Previous COVID-19 infection | 14,973 | 0.022 | 0.148 | 0.000 | 1.000 |
| Previous COVID-19 infection: NA | 14,973 | 0.016 | 0.125 | 0.000 | 1.000 |
| Experience of vaccinations against other than COVID-19 | 14,906 | 0.470 | 0.499 | 0.000 | 1.000 |
| Whether feel vaccination is safe | 14,904 | 0.643 | 0.479 | 0.000 | 1.000 |
| Whether feel vaccination is important | 14,645 | 0.810 | 0.392 | 0.000 | 1.000 |
| Whether trust in licensing vaccination by MHLW | 14,886 | 0.693 | 0.461 | 0.000 | 1.000 |
| Experience of refusing vaccination | 14,923 | 0.187 | 0.390 | 0.000 | 1.000 |
| Experience of postponing vaccination | 14,908 | 0.090 | 0.287 | 0.000 | 1.000 |
| Whether trust in doctors for vaccination | 14,956 | 0.702 | 0.457 | 0.000 | 1.000 |
| Whether agree with compulsory vaccination | 14,933 | 0.468 | 0.499 | 0.000 | 1.000 |
| Whether the government should bear all cost for COVID–19 vaccination | 14,813 | 0.843 | 0.364 | 0.000 | 1.000 |
| Working status | 14,966 | 0.727 | 0.445 | 0.000 | 1.000 |
| Own income: Less than JPY 0.5 million | 14,952 | 0.167 | 0.373 | 0.000 | 1.000 |
| Own income: JPY0.5–0.99 million | 14,952 | 0.074 | 0.262 | 0.000 | 1.000 |
| Own income: JPY1–1.49 million | 14,952 | 0.075 | 0.263 | 0.000 | 1.000 |
| Own income: JPY1.5–1.99 million | 14,952 | 0.056 | 0.231 | 0.000 | 1.000 |
| Own income: JPY2–2.49 million | 14,952 | 0.077 | 0.267 | 0.000 | 1.000 |
| Own income: JPY2.5–2.99 million | 14,952 | 0.063 | 0.243 | 0.000 | 1.000 |
| Own income: JPY3–3.99 million | 14,952 | 0.119 | 0.323 | 0.000 | 1.000 |
| Own income: JPY4–4.99 million | 14,952 | 0.109 | 0.312 | 0.000 | 1.000 |
| Own income: Higher than JPY5 million | 14,952 | 0.260 | 0.438 | 0.000 | 1.000 |
| Household income: Less than JPY0.5 million | 14,980 | 0.028 | 0.166 | 0.000 | 1.000 |
| Household income: JPY0.5–0.99 million | 14,980 | 0.012 | 0.109 | 0.000 | 1.000 |
| Household income: JPY1–1.49 million | 14,980 | 0.022 | 0.145 | 0.000 | 1.000 |
| Household income: JPY1.5–1.99 million | 14,980 | 0.031 | 0.173 | 0.000 | 1.000 |
| Household income: JPY2–2.49 million | 14,980 | 0.050 | 0.218 | 0.000 | 1.000 |
| Household income: JPY2.5–2.99 million | 14,980 | 0.051 | 0.219 | 0.000 | 1.000 |
| Household income: JPY3–3.99 million | 14,980 | 0.116 | 0.320 | 0.000 | 1.000 |
| Household income: JPY4–4.99 million | 14,980 | 0.122 | 0.328 | 0.000 | 1.000 |
| Household income: JPY5–5.99 million | 14,980 | 0.120 | 0.325 | 0.000 | 1.000 |
| Household income: JPY6–6.99 million | 14,980 | 0.092 | 0.289 | 0.000 | 1.000 |
| Household income: JPY7–7.99 million | 14,980 | 0.087 | 0.281 | 0.000 | 1.000 |
| Household income: JPY8–8.99 million | 14,980 | 0.069 | 0.254 | 0.000 | 1.000 |
| Household income: JPY9–9.99 million | 14,980 | 0.053 | 0.224 | 0.000 | 1.000 |
| Household income: Higher than JPY10 million | 14,980 | 0.148 | 0.355 | 0.000 | 1.000 |
| Education: Junior high school | 14,972 | 0.014 | 0.118 | 0.000 | 1.000 |
| Education: High school | 14,972 | 0.228 | 0.419 | 0.000 | 1.000 |
| Education: Vocational college | 14,972 | 0.124 | 0.330 | 0.000 | 1.000 |
| Education: 2-year college | 14,972 | 0.091 | 0.288 | 0.000 | 1.000 |
| Education: Technical college | 14,972 | 0.012 | 0.111 | 0.000 | 1.000 |
| Education: 4-year college | 14,972 | 0.471 | 0.499 | 0.000 | 1.000 |
| Education: Graduate school | 14,972 | 0.059 | 0.236 | 0.000 | 1.000 |
| Approval of the Liberal Democratic Party | 14,970 | 0.229 | 0.420 | 0.000 | 1.000 |
| Degree of dissatisfaction with current politics | 14,975 | 3.836 | 1.057 | 1.000 | 5.000 |
| Subjective degree of right-leaning | 14,634 | 6.183 | 1.396 | 1.000 | 10.000 |
| Subjective social status | 14,764 | 3.487 | 1.831 | 0.000 | 9.000 |

the respondent agreed with neither idea, we assigned a value of 3/5. The values for the subjective degree of individualism are between 1 (national interest is more prioritized than individual interest) and 5 (individual interest is more prioritized than the national interest). The values of subjective degree of right-leaning are between 10 (the rightest) and 0 (the leftest). The values for the subjective social status are 10 (the highest) and 0 (the lowest). The difference between the sample number and 15,000 indicates the number of respondents who skipped the question.

# Estimation strategy

## Identification

Let $Y_{ij}(\boldsymbol{a}, d)$ be a potential outcome indicator, which takes = 1 if respondent $i$ chooses alternative $j$ and = 0 otherwise. $\boldsymbol{a} = [\boldsymbol{a}_j, \boldsymbol{a}_{-j}]$ is a set of two vectors of attributes, where $\boldsymbol{a}_j$ and $\boldsymbol{a}_{-j}$ are attribute vectors of alternative vaccines $j$ and $-j$ shown to respondent $i$, respectively. $d$ is an indicator of the scenario, which takes = 1 if the scenario shown to the respondent assumed that the government was to make vaccination compulsory and = 0 if the scenario asked the respondent to choose a hypothetical vaccine for themselves.

Let denote $\boldsymbol{A}_{ij}$ a hypothetical vaccine selected by respondent $i$, and let $D_i$ denote a scenario that was shown to respondent $i$. The estimate of our primary interest is

$$E\left[Y_i(\boldsymbol{a}, d = 1) - Y_i(\boldsymbol{a}, d = 0)\right]. \tag{1}$$

Because observed $\boldsymbol{A}_{ij}$ and $D_i$ are randomized, the average marginal potential outcome is identified as

$$E\left[Y_i\left(\boldsymbol{a}, d\right)\right] = E\left[Y_{ij}^{obs} | \boldsymbol{A}_{ij} = \boldsymbol{a}, D_i = d\right]. \tag{2}$$

In our estimation, we focus on the marginal value given a level of attribute $l$;

$$\sum_{\boldsymbol{a}_{-lj}, \boldsymbol{a}_{-j}} E\left[Y_i\left(\boldsymbol{a}_{lj}, \boldsymbol{a}_{-lj}, \boldsymbol{a}_{-j}, d\right)\right] \times f\left(\boldsymbol{a}_{-lj}, \boldsymbol{a}_{-j}\right), \tag{3}$$

where $\boldsymbol{a}_{-lj}$ denotes a vector created by removing element $l$ from $\boldsymbol{a}_j$ and $f$ denotes the joint density function.

## Estimation

To estimate conditional means $E\left[Y_{ij}^{obs} | \boldsymbol{A}_{ij} = a, D_i = d\right]$ in equation (2), the augmented inverse propensity score weight is employed. The conditional mean is defined as

$$E\left[Y_{ij}^{obs} | \boldsymbol{A}_{ij} = \boldsymbol{a}, D_i = d\right] = E\left[M_{ij} | \boldsymbol{A}_{ij} = \boldsymbol{a}, D_i = d\right], \tag{4}$$

where

$$M_{ij} = \mu_d\left(\boldsymbol{A}_{ij}\right) + \frac{I\left(D_i\right) \times \left(Y_i^{obs} - \mu_d\left(\boldsymbol{A}_{ij}\right)\right)}{e(\boldsymbol{A}_{ij})},$$

$\mu_d\left(\boldsymbol{a}\right) = E\left[Y_{ij}^{obs} | \boldsymbol{A}_{ij} = \boldsymbol{a}, D_i = d\right]$, and $e\left(\boldsymbol{a}\right) = E\left[D_i | \boldsymbol{A}_{ij} = \boldsymbol{a}\right]$. The identification results imply the following estimation process.

1. Estimate $\mu_d\left(\boldsymbol{a}\right)$ by any high-quality estimation method. In this case, 20-fold cross-fitted highly adaptive LASSO[3233] is employed. $e\left(\boldsymbol{a}\right)$ is fixed as 0.5 in our experimental design since we did not allow respondents to opt out when choosing between two hypothetical vaccines. The highly adaptive LASSO is implemented according to hal2009[34] with the default hyperparameter values.

2. Calculate the estimated score function $\tilde{M}_{ij} = \tilde{\mu}_d^{-k(i)} + \frac{I(D_i=d) \times (Y_i^{obs} - \tilde{\mu}_d^{-k(i)})}{0.5}$, where

$\tilde{\mu}_d^{-k(i)}$ is the average potential outcome, which is estimated excluding the fold that includes respondent $i$.

3. Regress $\tilde{M}_{ij}$ on $\boldsymbol{A}_{ij}$ to estimate $\sum_{\boldsymbol{a}_{-j}} E\left[Y_{ij}\left(d, \boldsymbol{a}_j, \boldsymbol{a}_{-j}\right)\right] \times f\left(\boldsymbol{a}_{-j}\right)$.

# Results

## Average marginal potential outcome

The average marginal potential outcome, defined by equation (3), is presented in Figure 1, which reports the results of the scenario of self-choice without considering a government ordinance to make vaccination compulsory.

Figure 1: Average marginal potential outcomes of vaccine attributes.

INSERT Figure 1 HERE

Country of development is the most strongly associated with willingness to receive a vaccine. A change from a China-produced vaccine to Russia-produced increased willingness by 41% (from 0.29 to 0.41), a change to a UK-produced vaccine increased willingness by 93% (to 0.56), a change to a US-produced vaccine increased willingness 97% (to 0.57), and a change to a Japan-produced vaccine increased willingness by 131% (to 0.67). In our setting, the reference point is 0.5 so that while both China-produced and Russia-produced vaccines were penalized, the penalty was much greater for the China-produced vaccine. A similar penalty on China-produced vaccines has been reported in the US[2635] and in France.[29] As Kreps and colleagues find for the geopolitical penalty on China-produced vaccines,[2635] Japanese respondents penalized China the most, followed by Russia.

The second largest impacts were observed for the location of the clinical trials and risk of severe side effects. Preference for a hypothetical vaccine increased by 33% (from 0.43 to 0.57) if the probability of severe adverse side effects decreased from 1 per ten thousands to 1 per 1 million, and willingness to receive the vaccine rose by 38% (from 0.42 to 0.58).

Third, efficacy showed modest impacts. An increase in efficacy to prevent severe symptoms such as hospitalization or death by 50% to 70% raised willingness by 24% (from 0.41 to 0.51), and an efficacy of 90% raised willingness by 44% (to 0.59).

Fourth, vaccine type did not affect willingness to receive a vaccine.

## Treatment effects

Finally, to estimate equation (1), we calculate

$$\sum_{\boldsymbol{a}_{-lj},\boldsymbol{a}_{-j}} E\left[Y_i\left(\boldsymbol{a}_{lj},\boldsymbol{a}_{-lj},\boldsymbol{a}_{-j},1\right)-Y_i\left(\boldsymbol{a}_{lj},\boldsymbol{a}_{-lj},\boldsymbol{a}_{-j},0\right)\right]\times f\left(\boldsymbol{a}_{-lj},\boldsymbol{a}_{-j}\right). \tag{5}$$

The results are presented in Figure 2.

Figure 2: Difference in average marginal component outcomes of vaccine attributes.

INSERT Figure 2 HERE

As indicated in equation (5), Figure 2 shows the difference in willingness to receive a hypothetical vaccine between the cases when it was optional or government mandated by subtracting the former's value from the latter's value. While the effects of making the vaccine compulsory are modest across the board, the penalty on a China-produced vaccine decreased by 6%, that on a Russia-produced vaccine decreased by 4%, and that on a high-risk vaccine (1 per 10 thousands) decreased by 5%. Additionally, the support for a hypothetical vaccine with modest efficacy (70%) increased by 4%.

Figure 3 reports the impact of making the vaccine compulsory on the interactions between critical elements.

Figure 3: Impacts of compulsory vaccination on interactions between vaccine attributes.

INSERT Figure 3 HERE

The results indicate that making the vaccination compulsory increases the willingness to receive highly risky China-, Russia-, and UK-produced vaccines by 1% but does not affect Japan- or US-produced vaccines, less risky vaccines, and the most effective vaccines.

We screened interactions between vaccine attributes and background characteristics, including previous COVID-19 infection experience, general attitudes toward vaccination, past vaccination or vaccination refusal experience, trust in doctors' advice, trust in the government's vaccine licensing, education, income, and political positions, as indicated in Table 2, but these characteristics did not have substantial impacts on preference for hypothetical vaccines. The irrelevance of past vaccination experience is in line with the results of Kreps and Krner.[35] Therefore, we conclude that some attributes of vaccines impact vaccination preference across the diverse background characteristics.

# Conclusions

Domestic production or domestic clinical trials are strongly preferred among Japanese adults. However, such vaccines cannot be expected in the very near future. The US-produced vaccines are preferred and are expected to be acceptable to participants. For compulsory vaccination, riskier, modestly effective, China-produced, and Russia-produced vaccines have increased support. If Japan cannot obtain a sufficient quantity

of US-produced vaccines and must deploy riskier, modestly effective, China-produced, or Russia-produced vaccines as substitutes, compulsory vaccination would be an effective way to reduce free-riding concerns.

The externality channel was asymmetric. If the reduction in the externality concerns channel was symmetric to both removal of negative externality (free-riding concerns) and materializing positive externality ("win-win" scenario between vaccine supporters and the vaccine hesitant), legislation for compulsory vaccination would have increased support for the most effective vaccines (90%), which was not observed in our experiment. These findings suggest that the public primarily expects the authorities to penalize the vaccine hesitant who want to be protected by herd immunity but do not want to be vaccinated for themselves.

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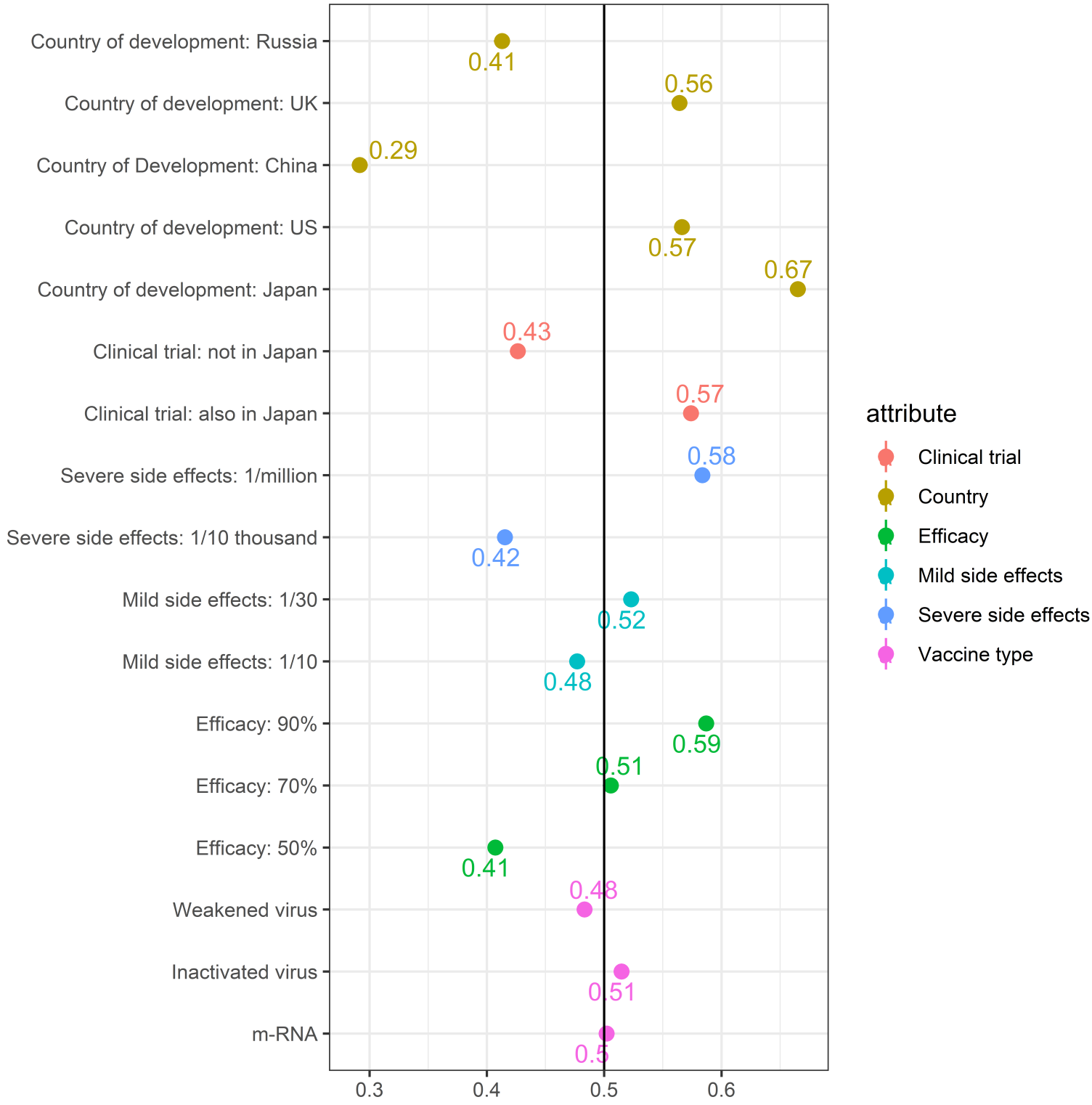
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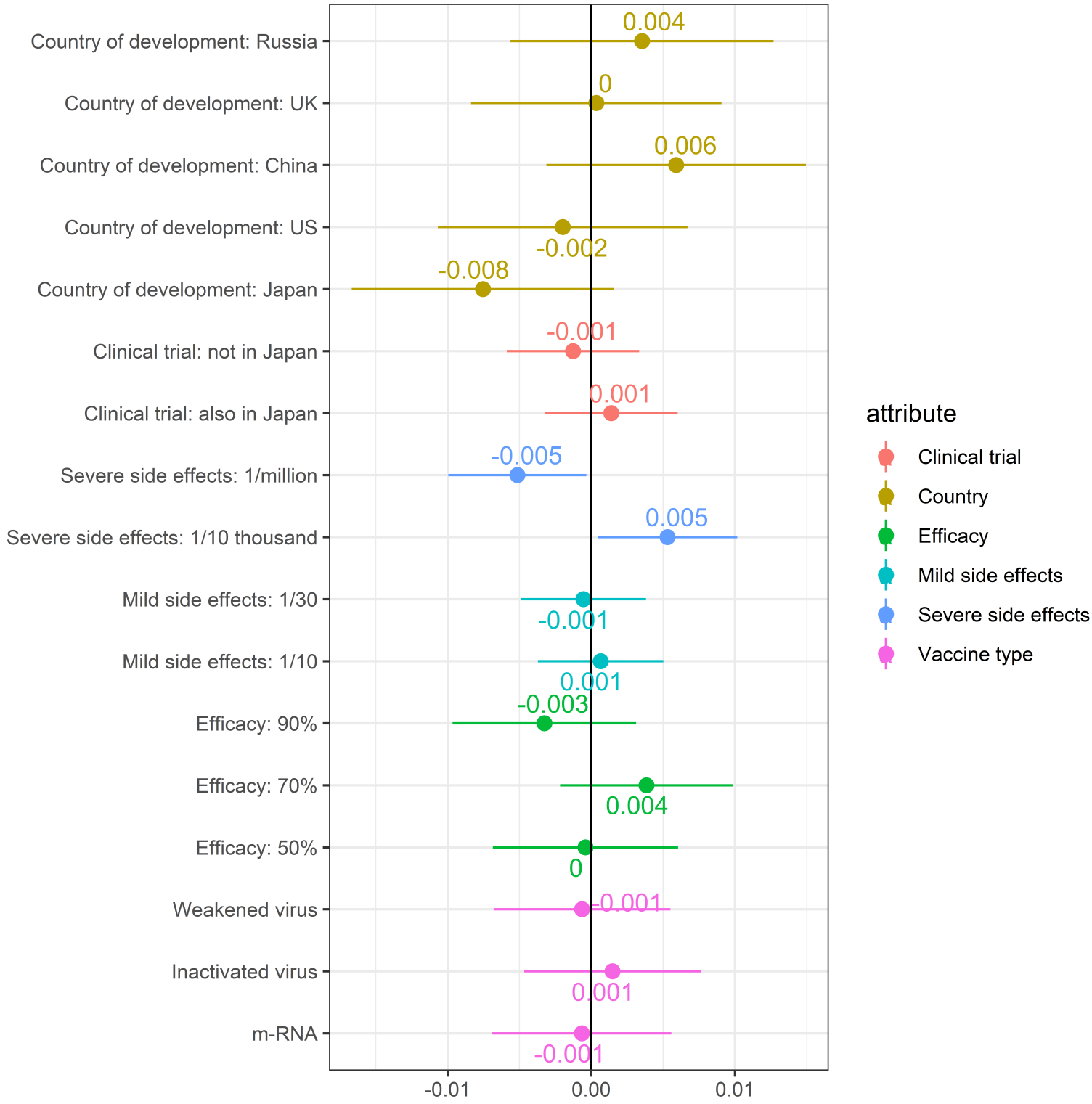
Country of development: UK
Country of Development: China
Country of development: US
Country of development: Japan
Clinical trial: not in Japan
Clinical trial: also in Japan
Severe side effects: 1/million
Severe side effects: 1/10 thousand
Mild side effects: 1/30
Mild side effects: 1/10
Efficacy: 90%
Efficacy: 70%
Efficacy: 50%
Weakened virus
Inactivated virus
m-RNA
0.41
0.56
0.29
0.57
0.67
0.43
0.57
0.58
0.42
0.52
0.48
0.59
0.51
0.41
0.48
0.51
0.5
0.3
0.4
0.5
0.6
attribute
Clinical trial
Country
Efficacy
Mild side effects
Severe side effects
Vaccine type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Clinical trial: not in Japan
Clinical trial: also in Japan
Severe side effects: 1/million
Severe side effects: 1/10 thousand
Mild side effects: 1/30
Mild side effects: 1/10
Efficacy: 90%
Efficacy: 70%
Efficacy: 50%
Weakened virus
Inactivated virus
m-RNA
0.004
0
0.006
-0.002
-0.008
-0.001
0.001
-0.005
0.005
-0.001
0.001
-0.003
0.004
0
-0.001
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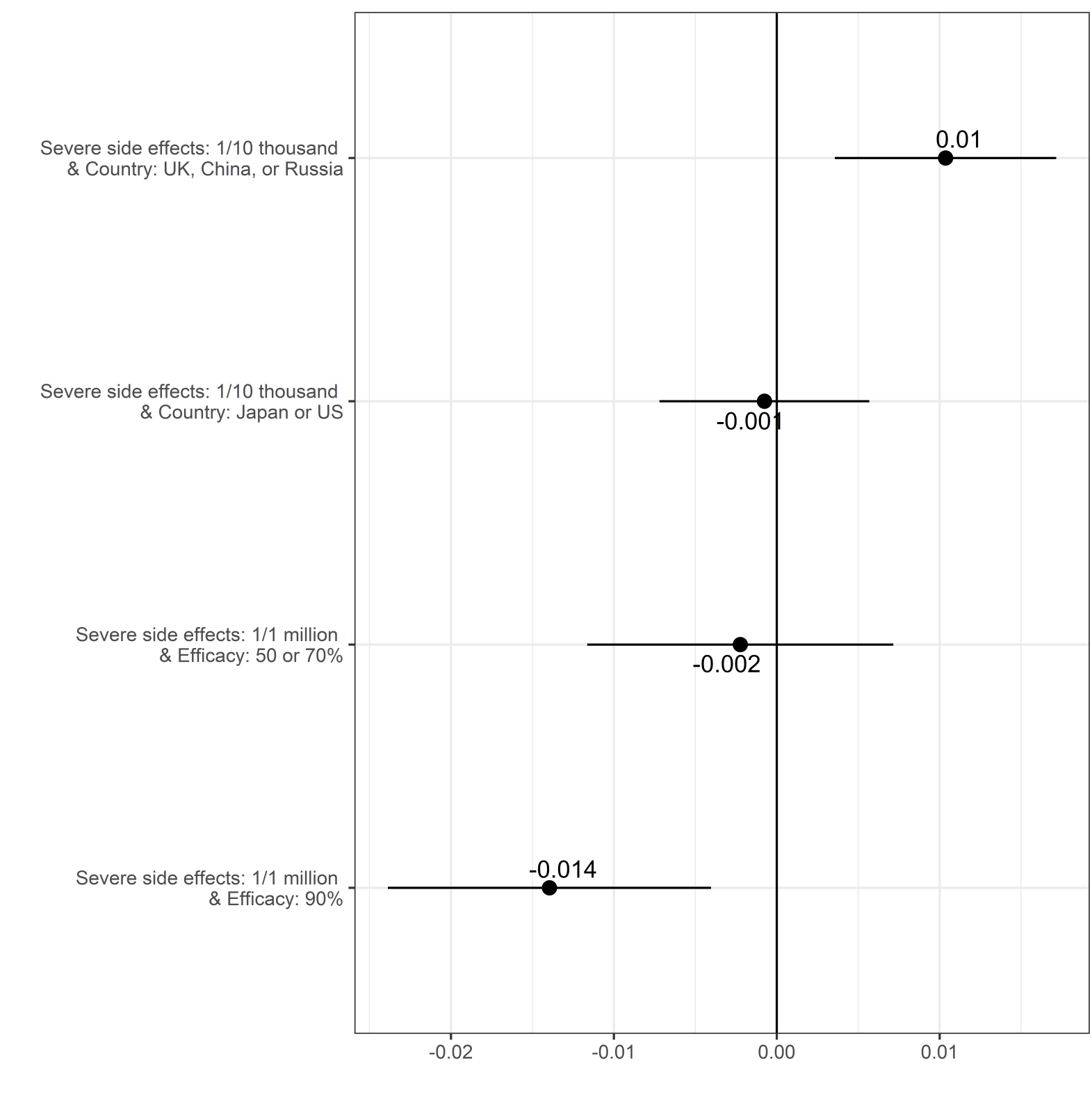
-0.01
0.00
0.01
attribute
Clinical trial
Country
Efficacy
Mild side effects
Severe side effects
Vaccine type


Severe side effects: 1/10 thousand & Country: UK, China, or Russia
0.01
Severe side effects: 1/10 thousand & Country: Japan or US
-0.001
Severe side effects: 1/1 million & Efficacy: 50 or 70%
-0.002
Severe side effects: 1/1 million & Efficacy: 90%
-0.014
-0.02
-0.01
0.00
0.01