If I were North American/West European/Australian, I would take BCG vaccination now against the novel coronavirus pandemic.

Jun Sato, March 26, 2020

jsatonotes.com/2020/03/if-i-were-north-americaneuropeanaustral.html

I am not a medical expert and this is just a hypothesis; taking BCG vaccination may strengthen immune to the novel coronavirus. If I were American/West European/Australian, I would take BCG vaccination now. Six reasons follow.

I declare that there is no conflict of interest for BCG vaccination but I have a big interest in stopping this pandemic. One of my businesses is an online tourism agency and its sales have dried up!

(Added on 4 Apr)
The comment system does not work on this post anymore. Too many comments? For discussion purposes, I created a new post. Please leave a comment on the post below.

https://www.jsatonotes.com/2020/04/please-leave-comments-here-regarding.html

1) Scientists have started to work on this hypothesis

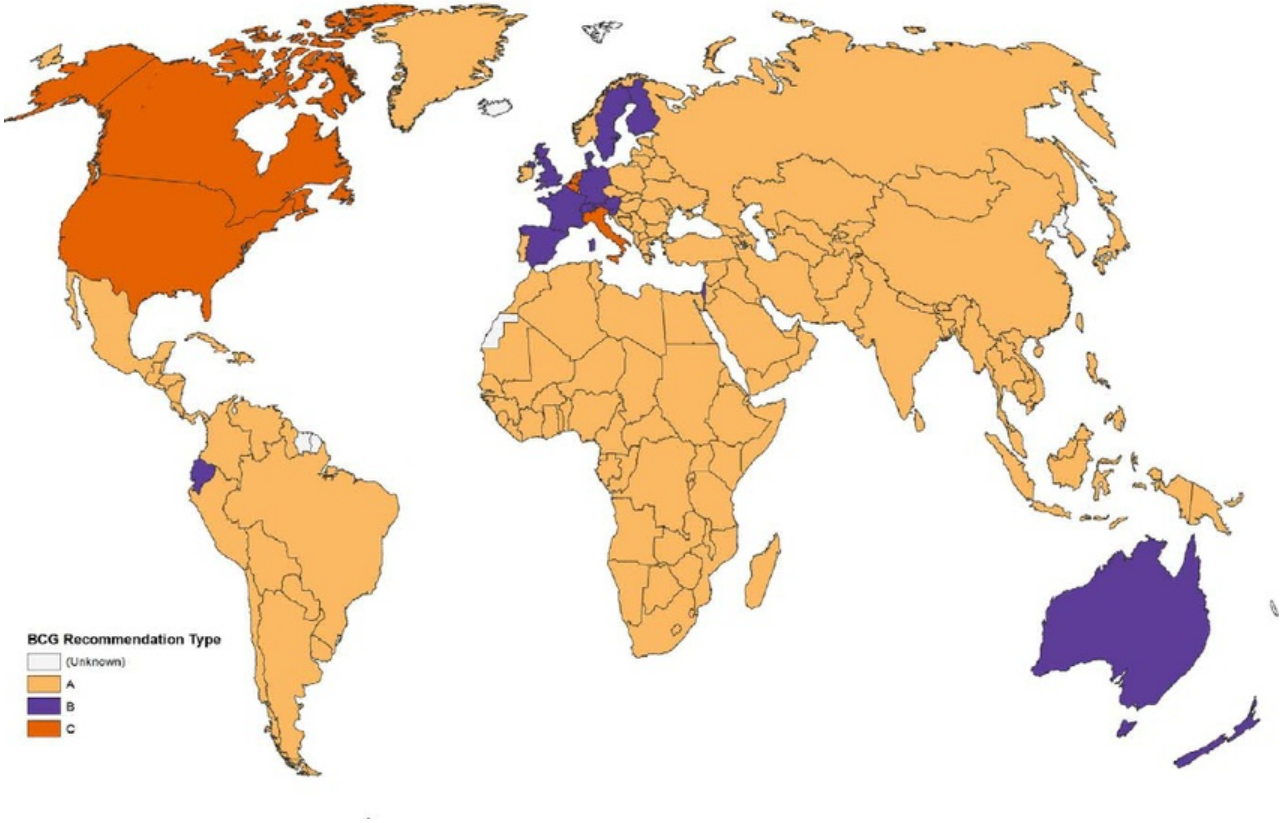
Can a century-old TB vaccine steel the immune system against the new coronavirus?
https://www.sciencemag.org/news/2020/03/can-century-old-tb-vaccine-steel-immune-system-against-new-coronavirus

(Added on 9 Apr) They seem to use only BCG Denmark. I strongly recommend using BCG Japan/Russia in those clinical trials. You will understand after reading this post.
https://mobile.twitter.com/nigeltwitt/status/1244576788283457536

The Max Planck Institute (the best German science institution with 33 Novel Prize winners that developed BCG vaccine a century ago)
Immune boost against the coronavirus
https://www.mpg.de/14610776/immune-boost-corona-virus

Some countries, the U.S. and Australia will start a trial to give BCG vaccine to healthcare workers.
https://foreignpolicy.com/2020/03/24/coronavirus-vaccine-health-care-workers-bcg/

2) If you look at the map displaying BCG vaccination policy by country, there seems to be a correlation to the speed of coronavirus spread and its spread among young people.



https://www.researchgate.net/figure/Map-displaying-BCG-vaccination-policy-by-country-A-The-country-currently-has-universal_fig2_50892386
A: The country currently has universal BCG vaccination program.*
B: The country used to recommend BCG vaccination for everyone, but currently does not.
The year the country stopped it; Spain 1981, Germany 1998, UK and France 2005-2007 etc.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3062527/
C: The country never had universal BCG vaccination programs.

* In Portugal the BCG vaccine was mandatory from 1965 to 2017. https://twitter.com/ruipalma79/status/1243304538469273600

The major correlations are;

- The spread speed is fast in Italy and western Europe and the U.S. while the spread speed among Russia, eastern European countries, and Asian countries except Wuhan city is slow.
- In Asian countries, there are few young infected people or almost zero serious cases among young people. However, in western Europe and the U.S., there are cases among young people.**
- In Western Europe, you can compare Italy vs Croatia, Spain vs Portugal***, UK vs Ireland, Sweden vs Norway, ex-West Germany vs ex-East Germany. In the former countries, BCG vaccine is not mandatory while in the latter countries, BCG vaccine is mandatory. Now, you can compare the U.S. and Mexico.
- I live in Tokyo and Brisbane. Though the normal social distance is much longer and less crowded in Brisbane and the government policy is 10 times stricter, the spread speed is faster in Brisbane than in Tokyo.

In Latin America, Ecuador is the only country that never had universal BCG vaccination programs and all the other countries have universal BCG vaccination programs according to the map above*. Total deaths per million, Ecuador: 2, Colombia: 0.08, Peru: 0.3, Brazil: 0.3.

* (Added on 5 Apr) A reader told me that Ecuador has its BCG program. However, it started in 1977. No strain information.
https://www.jsatonotes.com/2020/04/please-leave-comments-here-regarding.html?showComment=1586045707606#c3278707554083878141
According to http://www.bcgatlas.org/, the start year for Columbia: 1960, Peru: 1945, Brazil: 1976. Brazil was late to introduce the program but it uses BCG Moreau, which seems to be effective against COVID-19.

(Added on 29 Mar)
A reader told me there is a pre-print article (not yet certified by peer review)
https://www.medrxiv.org/content/10.1101/2020.03.24.20042937v1

The article has this chart. I believe if we can adjust for the timing of coronavirus spread, the correlation would be even higher.

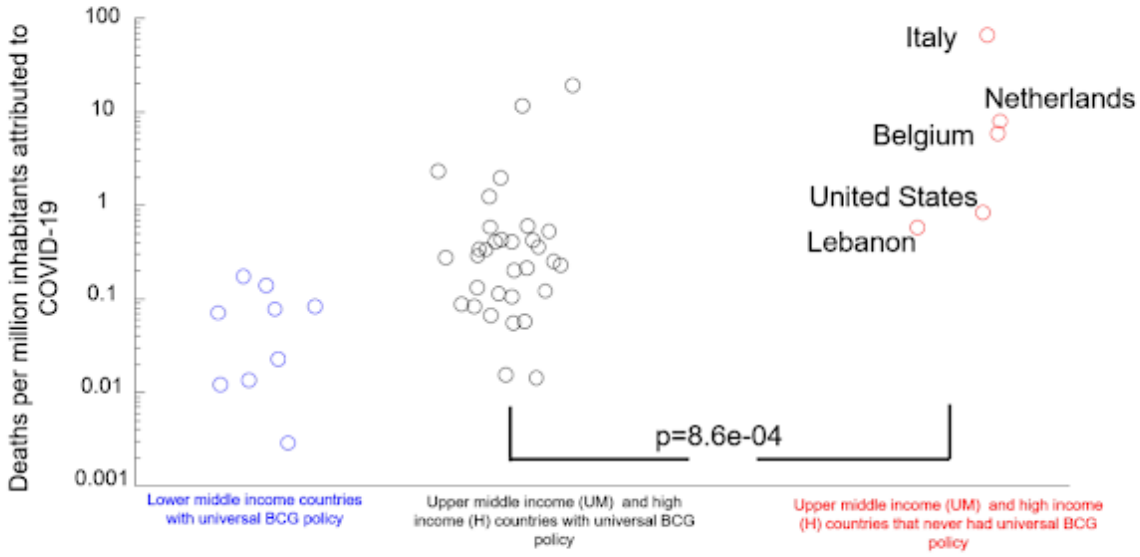
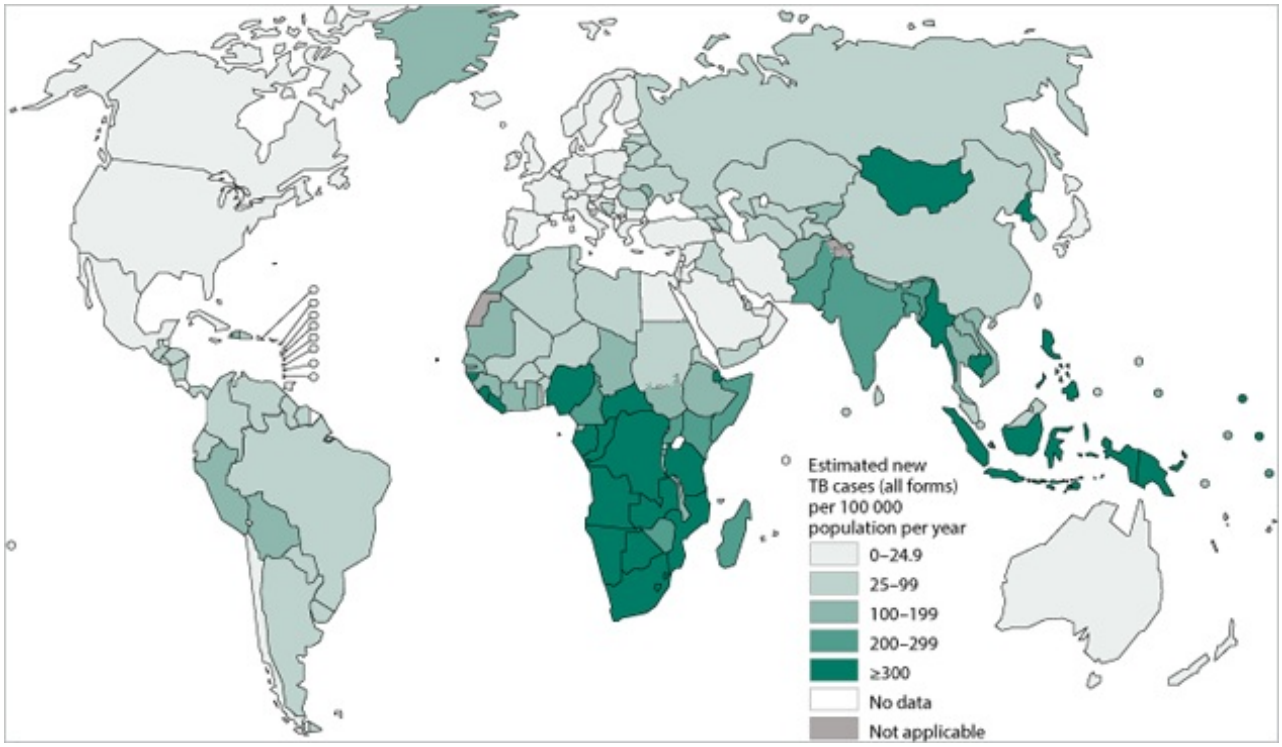


Figure 1: Higher death rates were presented in countries that never implemented a universal BCG vaccination policy.

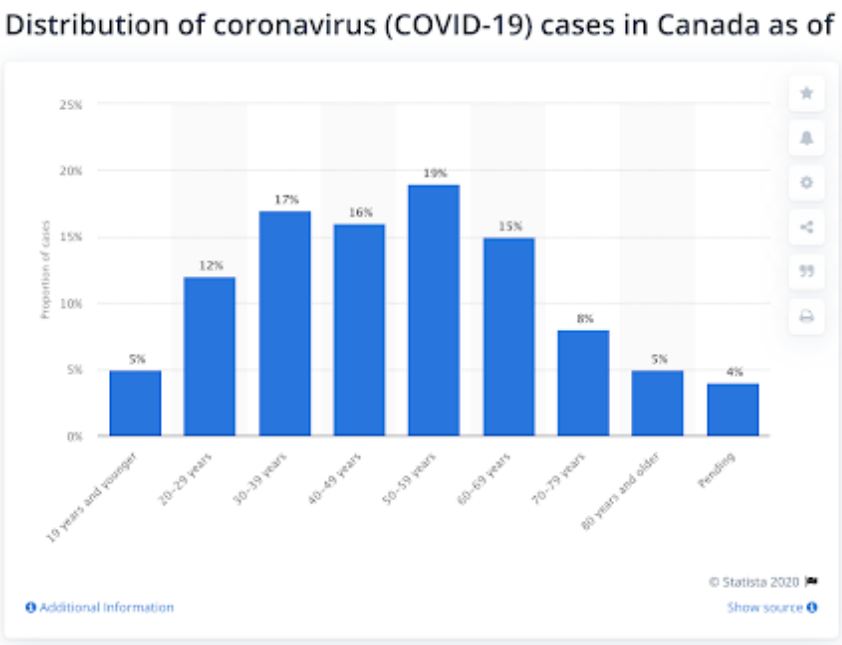
(Added on 10 Apr)
BCG vaccine contains an attenuated form of the bacteria (germ) that causes TB (I learned this in this April...). Then the prevalence of TB can correlate with COIVD-19. Below is the map of TB prevalence from WHO. You can easily see the correlation. I guess that the amount of BCG vaccine + TB prevalence is the key driver. Interestingly, Iran's TB prevalence is as low as western Europe. Immunologists' explanations are welcomed.



https://www.who.int/publications/10-year-review/tb/en/index1.html
https://twitter.com/takainou_0907/status/1247338851099504640

(Added on 30 Mar)
In the world map of the BCG vaccine policies above, Canada is in orange and categorized in C: The country never had universal BCG vaccination programs. However, if you look at Canada in http://www.bcgatlas.org/, it seems that Canada had a "routine" BCG vaccination program until 1960s-1970s (Please correct me if I read wrongly). This means people elder than 40s mostly vaccinated! This may be the reason why Canada has a low death rate compared with the U.S. And Canada used ~~BCG Tokyo strain~~.

(Added on 14 Apr) Canada had used BCG Connaught, not Tokyo. Please check this post for the detail. And if you check the post below, please skip the next section grayed out.
https://www.jsatonotes.com/2020/04/the-bcg-hypothesis-age-group-comparison.html
One more weak fact. In Canada, people elder than the 60s had a BCG vaccine while people younger than 50s had not. Then, look at the age distribution of COVID-19 cases in Canada. Skew to people younger than the 50s?! But infection rate may not vary by age, only hospitalization/ICU/death rate may vary by age. I'm looking for that data and BCG vaccine penetration data by age group for Canada.



https://www.statista.com/statistics/1107149/covid19-cases-age-distribution-canada/

(Added on 6 Apr)
Ultra-Orthodox Jews are said to refuse BCG vaccination historically. In New York or Israel, huge spikes of COVID-19 (more than 40% of the community infected) are reported in the Ultra-Orthodox Jews communities. The articles say their pray style or lifestyle can be the causes but I believe this is because of lacking the BCG vaccine.
https://www.haaretz.com/us-news/.premium-as-coronavirus-spreads-these-u-s-jewish-communities-pray-they-re-not-next-1.8728042
https://time.com/5815426/israel-orthodox-jewish-coronavirus/

** I couldn't find good stats on this. Only anecdotal news stories. Eg. Greta Thunberg got infected by the novel coronavirus. Well, she is Swedish and born in 2003. Sweden stopped BCG vaccination in 1975.(Added on 13 Apr) Finally, I get a quantitative analysis of this! Please check this post.

https://www.jsatonotes.com/2020/04/the-bcg-hypothesis-age-group-comparison.html

*** Among West European countries that had/have universal BCG vaccination program, Spain and Portugal are (one of) the last countries introduced it in 1965. And Spain is (one of) the first country to stop it in 1981 and Portugal stopped it in 2017. Portuguese elder than 55 may have a low BCG vaccination rate, which may result in a high death rate than the other western Europe, but probably better than Spain.

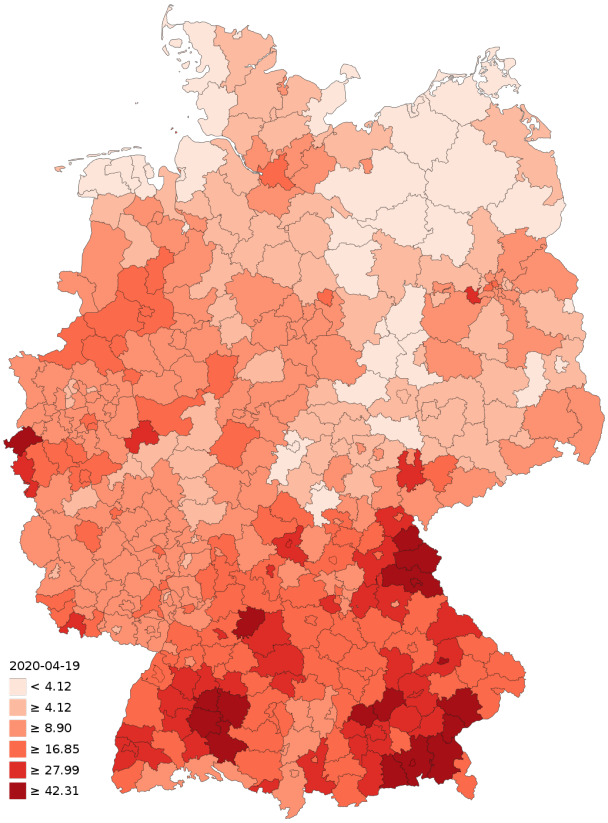
3) There are several strains of BCG vaccination and Japan/Russia strains may be the most effective against the novel coronavirus.

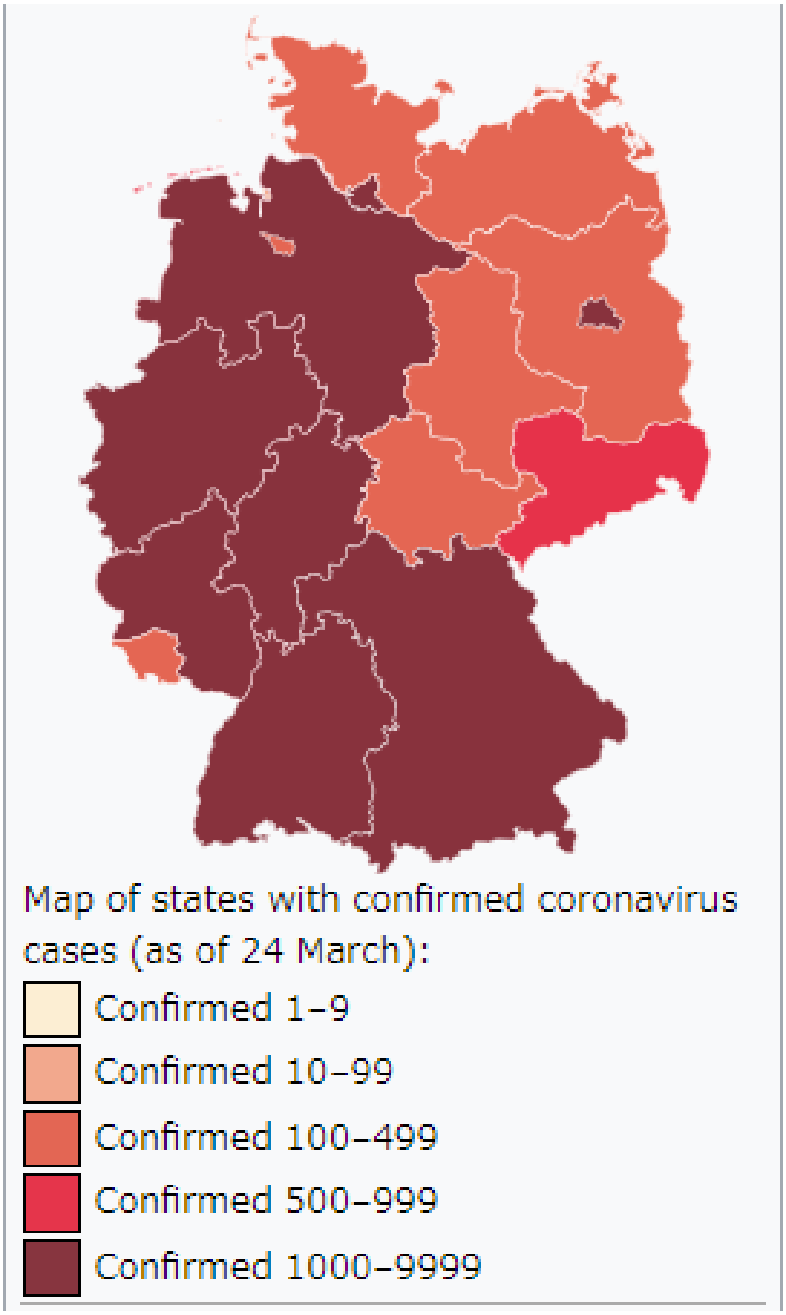
This comment by Tiger Paw sounds most plausible regarding the country differences though the article itself is worthless.
https://www.japantimes.co.jp/opinion/2020/03/21/commentary/japan-commentary/japan-still-coronavirus-outlier/#comment-4843977551
* The comment was deleted for some reason. The initial idea of this section attributes to Tiger Paw. If I hadn't read his comment, I would not know there are multiple types of BCG vaccine.

Soviet/Japan strains of BCG vaccination are old-type and similar while Western European stains are recent and different.

Below is a map of German states with confirmed coronavirus cases. **You can see the difference between ex-East Germany and ex-West Germany.** The density of the population doesn't explain this much difference.East Germany had used BCG S4-Jena* that is the second generation of BCG vaccinations and West Germany had used BCG Denmark that is the third generation of BCG vaccination and stopped its mandatory vaccination in 1998. The vaccination strains/policies may be the cause of the difference. (I added a table of BCG vaccination policy in Germany in the next post.)

* https://twitter.com/shirogoma_kinak/status/1247091133903024128
https://mra.asm.org/content/4/2/e00296-16.full


2020-04-19
< 4.12
≥ 4.12
≥ 8.90
≥ 16.85
≥ 27.99
≥ 42.31



https://en.wikipedia.org/wiki/2020_coronavirus_pandemic_in_Germany

Then, look at the number of deaths by state. Summing up by ex-West Germany and ex-East Germany (excluding Berlin), **the number of deaths per 100K of ex-West Germany states is 0.35 while ex-East Germany is 0.11 and Berlin is in between; 0.21 (as of 27 Mar).**

as of 27/03/2020 12:00 AM	Electronically submitted cases				
Federal State	Number	cases/100,000 pop.	Number of deaths	ex-East or ex-West	deaths/10 0,000 pop.
Hamburg	1,693	92	2	ex-West	0.11
Baden-Wurttemberg	8,161	74	70	ex-West	0.63
Bavaria	9,481	73	55	ex-West	0.42
Berlin	1,955	52	8	Berlin	0.21
North Rhine-Westphalia	9,235	52	72	ex-West	0.40
Saarland	505	51	2	ex-West	0.20
Rhineland-Palatinate	1,971	48	8	ex-West	0.20
Hesse	2,323	37	7	ex-West	0.11
Bremen	241	35	1	ex-West	0.15
Lower Saxony	2,810	35	10	ex-West	0.13
Saxony	1,305	32	7	ex-East	0.17
Schleswig-Holstein	812	28	4	ex-West	0.14
Thuringia	542	25	4	ex-East	0.19
Brandenburg	537	21	1	ex-East	0.04
Saxony-Anhalt	458	21	2	ex-East	0.09
Mecklenburg-Western Pomerania	259	16	0	ex-East	0.00
Total	42,288	51	253		0.30
Sub-Total	37,232	56	231	ex-West	0.35
	3,101	25	14	ex-East	0.11
	1,955	52	8	Berlin	0.21

https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Situationsberichte/2020-03-27-en.pdf?__blob=publicationFile
https://twitter.com/takainou_0907/status/1243754536138731521/photo/1
You can see this table updated on 4 Apr.
https://www.jsatonotes.com/2020/04/please-leave-comments-here-regarding.html
https://twitter.com/takainou_0907/status/1246684588287488000

(Added on 4 Apr)
A reader did a fantastic analysis regarding ex-West/East Germany. He/she separated ex-West/East within Berlin and categorized regions by the population. Within Berlin, the deaths/per 0.1M population in ex-East is 0.24 while it in ex-West is 0.76. Three times different!
This would be not only one of the critical evidence of this hypothesis but also counter-evidence of the other hypotheses such as virus mutation variation hypothesis or the virus arrival timing hypothesis, etc.

Infections of COVIT-19 in East and West Berlin and by population size in the former East and West German cities and counties

		Population	cases	deaths	cases/100,000	deaths/100,000
Berlin	Former East Berlin	1,238,918	784	3	63.3	0.24
	Former West Berlin	2,515,500	2,687	19	106.8	0.76

	population size of Cities and Counties	Population	cases	deaths	cases/100,000	deaths/100,000
Former East Germany	< 100,000	1,675,156	756	8	45.1	0.48
	100,000=< <300,000	8,471,041	3,811	36	45.0	0.42
	300,000=<(except for Berlin)	2,404,798	1,704	18	70.9	0.75
Former West Germany	less than 100000	4,774,590	6,134	111	128.5	2.32
	100,000=< <300,000	34,825,260	39,814	634	114.3	1.82
	300,000=< <600,000	19,045,126	19,288	259	101.3	1.36
	600,000=<(except for Berlin)	8,178,416	10,800	70	132.1	0.86

(Source: RKI https://npgeo-corona-npgeo-de.hub.arcgis.com/search?groupIds=b28109b18022405bb965c602b13e1bbc)

*3. April, 2020. The prevailing administrative boundaries in Berlin are not fully coincided with the boundaries of the former East and West Berlin.

https://twitter.com/Iku42888817/status/1246368330409099265
https://twitter.com/Iku42888817/status/1247163231715508225

I obtained a map showing which strains are used in each country though this map maybe not perfectly correct.

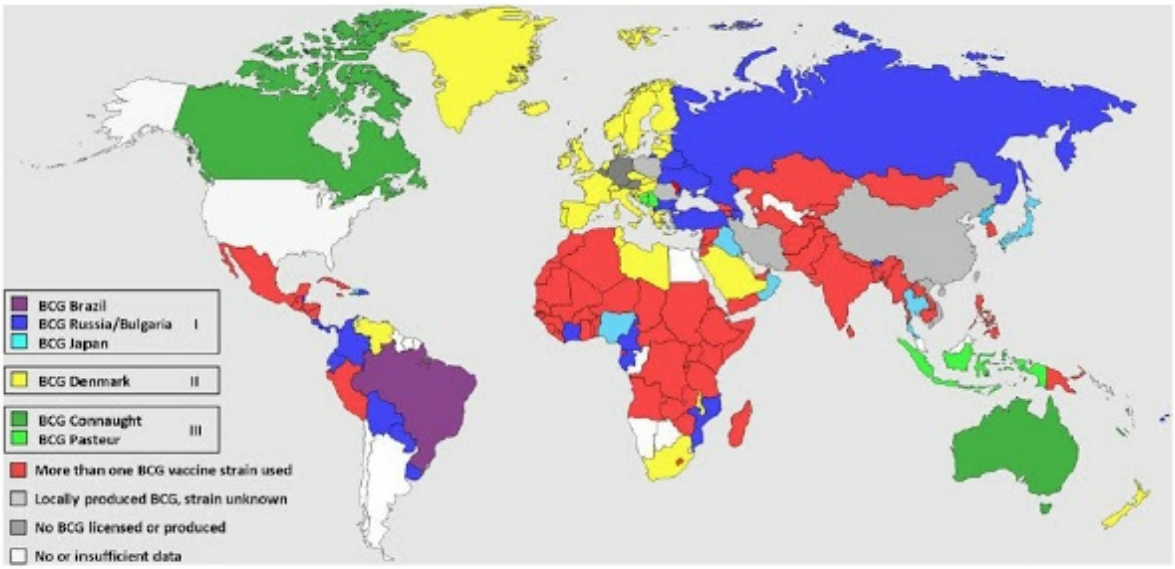


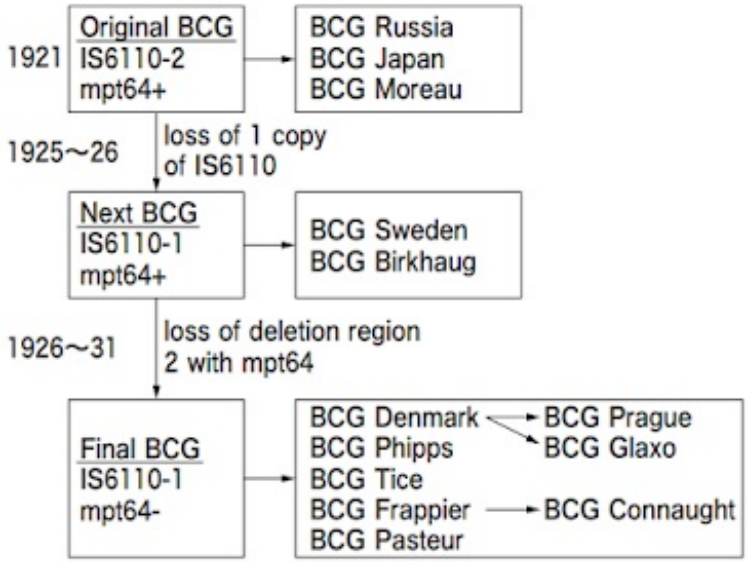
Figure 1. BCG vaccine strains used between 2003 and 2007 worldwide. Boxes surround BCG vaccines strains that are most genetically similar. Box I includes BCG vaccine strains that were obtained from the Pasteur Institute before 1926. Boxes II are III are strains obtained at later dates.

https://twitter.com/io302/status/1243441971709894657
https://twitter.com/io302/status/1243441971709894657/photo/1

High-level impression; BCG Brazil, BCG Russia/Bulgaria, BCG Japan countries may immune to novel coronavirus. Countries that use more than one BCG vaccine strain look immune, too. BCG Brazil, BCG Russia/Bulgaria, BCG Japan are categorized in "I" and this may be the effective strain category.

Then, I looked into how BCG strains are categorized. I found the chart below. BCG Russia/Japan/Moreau(Brazil) is the first generation of the BCG vaccines.

図2　BCG 亜株の系統図



(文献：Behr MA, Small PM：Vaccine 17：915-922, 1999.)

In the same article, there is a table that shows the differences in each strain character. Though I don't understand any jargon in the first row, I can see there is quite a difference between BCG Tokyo/Moreau(Brazil)/Russia/Sweden and BCG Copenhagen(Denmark)/Glaxo/Pasteur/Tice. BCG Denmark is the common strain among Western Europe.

表1　BCG 亜株の性状の違い

	MPB 64	MPB 64 gene	MPB 70	MPB 80	Methoxy-mycolates	*Bst* E II RFLP	IS 6110 RFLP
BCG Copenhagen	−	−	−	−	−	similar	1
BCG Glaxo	−	−	−	−	−		1
BCG Pasteur	−	−	−	−	−		1
BCG Tice	−	−	−	−	−		1
BCG Tokyo	+	+	+	+	+	similar	2
BCG Moreau	+	+	+	+	+		2
BCG Russia	+	+	+	+	+		2
BCG Sweden	+	+	+	+	+		1
M.bovis	+	+	+	+	+		2
M.tuberculosis H37 Rv	+	+	−	−			
M.tuberculosis H37 Ra	+	+	−	−			

https://jata.or.jp/rit/rj/tenbo/48toida.pdf

https://twitter.com/xcvbnm67890/status/1243723927907471361

(Added on 7 Apr)
The number of living bacteria/ml is high in BCG Japan and Russia, and relatively low in BCG Brazil. This may be the cause that BCG Japan/Russia seems very effective against COVID-19.

ワクチン中の生菌数

国	BCG亜株	生菌数（100万/ml）
日本	日本株	20~50
フランス	フランス株	1~10
オーストラリア	フランス株	7~15
オランダ	フランス株	1~10
デンマーク	デンマーク株	3~7
ドイツ	デンマーク株	1~3
イギリス	グラクソ株	8~26
ソ連	ソ連株	10~30
ブラジル	モロー株	2~10

https://news.yahoo.co.jp/byline/kimuramasato/20200405-00171556/
https://www.jstage.jst.go.jp/article/kekkaku1923/62/2/62_2_51/_pdf

While Iraq uses the Japan strain*, Iran uses different strains. According to http://www.bcgatlas.org/ Iran had used its local (original?) BCG vaccine from 1947 to 1984 and madee it compulsory in 1984. This means elderly people in Iran have less BCG vaccinated and for those who had it had a local(original?) BCG vaccine. Please check and compare Iraq and Iran figures. You will be surprised to see how different they are.
https://www.worldometers.info/coronavirus/
(Iran: 27 deaths per million, Iraq: 0.9 deaths per million as of 27 Mar; added)
* Additional source is welcomed. The map above says it BCG Japan but http://www.bcgatlas.org/ does not have Iraq's strain info. I suspect Iraq uses a different strain.

In Asian countries, China uses a different local produced strain and Korea uses basically BCG Denmark but sometime BCG Japan. Taiwan uses the Japan strain (though the map shows a locally produced strain).

BCG Japan(Tokyo) looks working quite well against the novel coronavirus. 1) Japan,

Thailand, Taiwan, Iraq, and Pakistan have used BCG Tokyo and all of them have low death rates though they are close to China or Iran. 2) And so far, it is not reported that any Japanese got severely infected or died in Italy or Western Europe. 3) In Japan, there are 1,349 cases reported, and 934 are Japanese and 415 are non-Japanese. Hmm, quite a high ratio of non-Japanese (as of 28 Mar).
https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000164708_00001.html#kokunaihassei

(Added on 10 Apr)
Below are the countries that have used the BCG Tokyo strain mostly and deaths per 1 million population. Pakistan and Iraq are next to Iran. Taiwan, Thailand, Japan had many Chinese visitors. The BCG Tokyo strain seems to be the most effective, more effective than BCG Russia.

- Japan 0.8
- Bangladesh 0.1
- Pakistan 0.3
- Iraq 2
- Saudi Arabia* 1
- Taiwan 0.2
- Thailand 0.5
- Kuwait 0.2
- Oman 0.6
- South Africa(~2000) 0.3
- Kazakhstan 0.4
- Bhutan 0
- Nigeria 0.03

* BCG Pasteur strain is also used and In 1976 in the Kingdom of Saudi Arabia (KSA) only 4.0% of the immunized individuals had BCG vaccination.

https://www.longdom.org/open-access/bacillus-calmettguerin-bcg-vaccination-an-overview-from-saudi-arabia-jaa-1000135.pdf

(Added on 5 Apr)
Let's do simple math. The New York state has 19 million population and Japanese consists of 0.3%, 52 thousand. As there happened 3,565 deaths by COVID-19 so far, there should be 0.3% = 10 deaths of Japanese. I have never heard of death or even severe conditions of Japanese living in the New York state. If we assume the death by COVID-19 comes equally to any people no matter of BCG vaccination, the possibility of no Japanese death in NY state so far is 0.01%. Even if we assume the number of Japanese to half (26 thousand), the possibility is 0.76%. Death by COVID-19 doesn't come equally at more than 99%.
Also, this calculation dismisses another hypothesis that the virus has evolved into a stronger mutation when arriving in western Europe and the U.S.

(Added on 1 Apr)
I am afraid that I hardly understand the mechanism of BCG vaccines but there seems to be a piece of medical evidence that BCG Tokyo works quite well against COVID-19.
https://www.jsatonotes.com/2020/03/if-i-were-north-americaneuropeanaustral.html?showComment=1585702586835#c4287423548330968127

The website, http://www.bcgatlas.org/, seems to have a lot of information about BCG vaccination though this is not perfect, either.

I am afraid that I cannot digest this detailed medical information. Expert explanations will be welcomed.

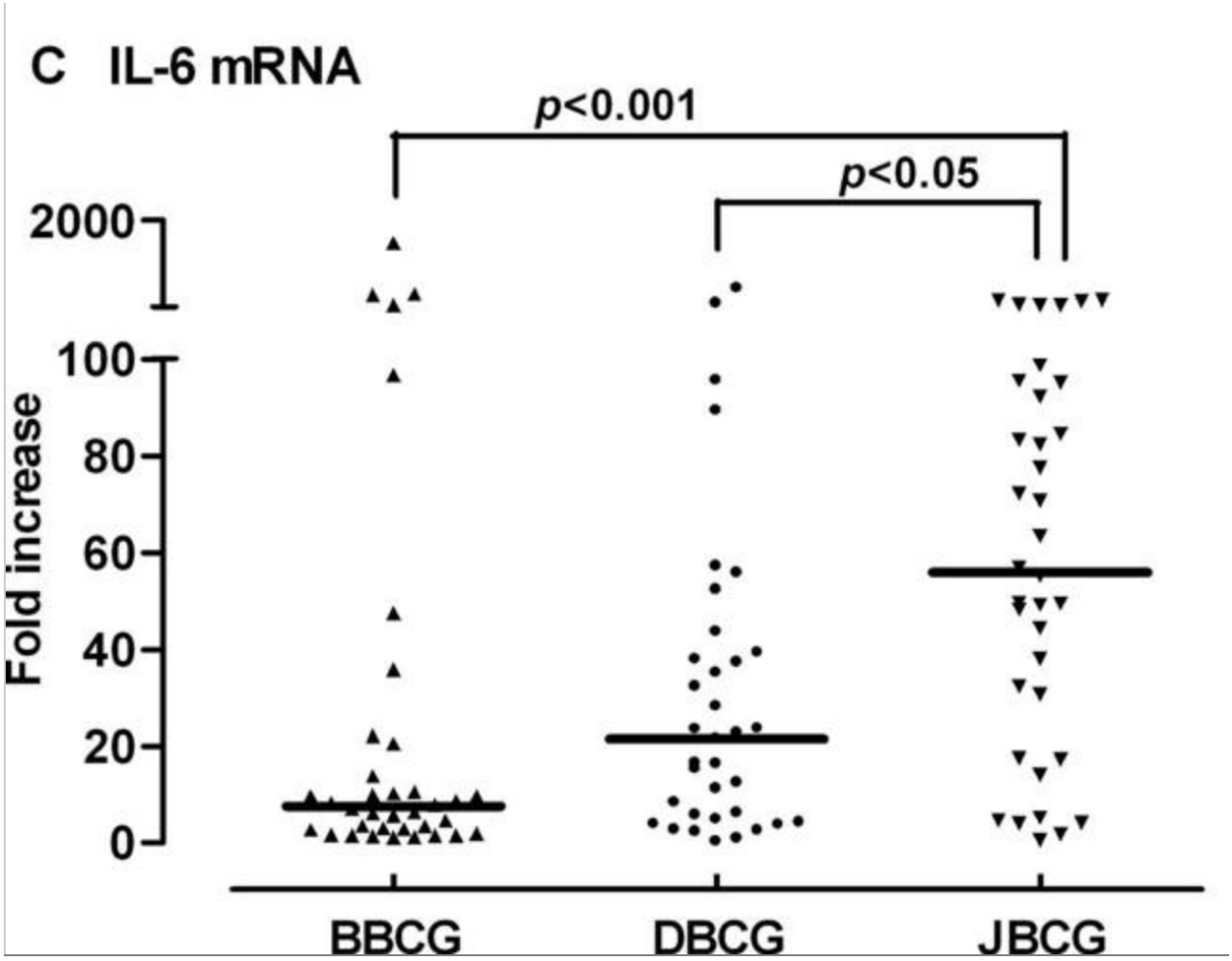
(Added on 31 Mar)
Dr. Toshio Hirano, one of the best authorities in immunology, best known for his discovery of interleukin-6, the 17th President of Osaka University, stated that this hypothesis could be right from the perspective of our immune system, citing my blog article.
https://en.wikipedia.org/wiki/Toshio_Hirano
https://www.facebook.com/toshio.hirano.79/posts/2817509081662367

(Added on 19 Apr)
Dr. Toshio Hirano and his colleague have published an article stating that the IL-6-STAT3 axis would be the key target to stop becoming severe from COVID-19.
https://marlin-prod.literatumonline.com/pb-assets/products/coronavirus/immuni4349_S5.pdf

The below paper could be key to understand why and how the different BCG strains work against COVID-19 differently.

> Unique Gene Expression Profiles in Infants Vaccinated with Different Strains of Mycobacterium bovis Bacille Calmette-Guérin.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1932948/
> https://twitter.com/ipatrioticmom2/status/1250581527701762048

The below chart of the paper looks the key. BBCG=BCG Moreau(Brazil), DBCG=BCG Denmark, JBCG=BCG Japan(Tokyo). I don't really understand but BCG Tokyo has more effect on IL-6 fold increase than BCG Denmark or BCG Brazil. I hope immunologists explain this part.



I live in Tokyo and Brisbane and have been wondering why the spread speed is faster in Australia than Japan.
Tokyo is a very crowded city and it's impossible to keep the social distance. People are packed in a very crowded train twice a day and I expected a high speed of spread but the actual speed is low so far (though it's beginning to explode).
Here in Brisbane or the other Australian capital cities, the normal social distance is much longer than Tokyo and I expected a slower spread. But the speed of spread is faster.
I was wondering about this, and so far this hypothesis may seem to be the most plausible. Maybe ~60% probability.

4) Deaths and severe cases skew to people who probably have not BCG vaccinated.

In Japan and Portugal, the deaths come only to the age group without the mandatory BCG vaccine program period.

In Japan, all babies since 1951 have BCG vaccination and the coronavirus deaths in Japan are skewed drastically to the elderly born before 1951. 44 out of 45 deaths happen to

those older than 70 (as of 26 Mar, https://toyokeizai.net/sp/visual/tko/covid19/).

In Portugal, the BCG vaccine was mandatory from 1965 to 2017 (https://twitter.com/ruipalma79/status/1243304538469273600), which means between 3 and 55 years old are vaccinated. And it looks deaths happen only to over 50 (as of 27 Mar, https://www.dgs.pt/em-destaque/relatorio-de-situacao-n-024-26032020-pdf.aspx).

CARACTERIZAÇÃO DOS ÓBITOS OCORRIDOS

	NÚMERO DE CASOS	
GRUPO ETÁRIO	MASCULINO	FEMININO
00-09 anos	0	0
10-19 anos	0	0
20-29 anos	0	0
30-39 anos	0	0
40-49 anos	0	0
50-59 anos	3	1
60-69 anos	8	0
70-79 anos	14	1
80+	16	17

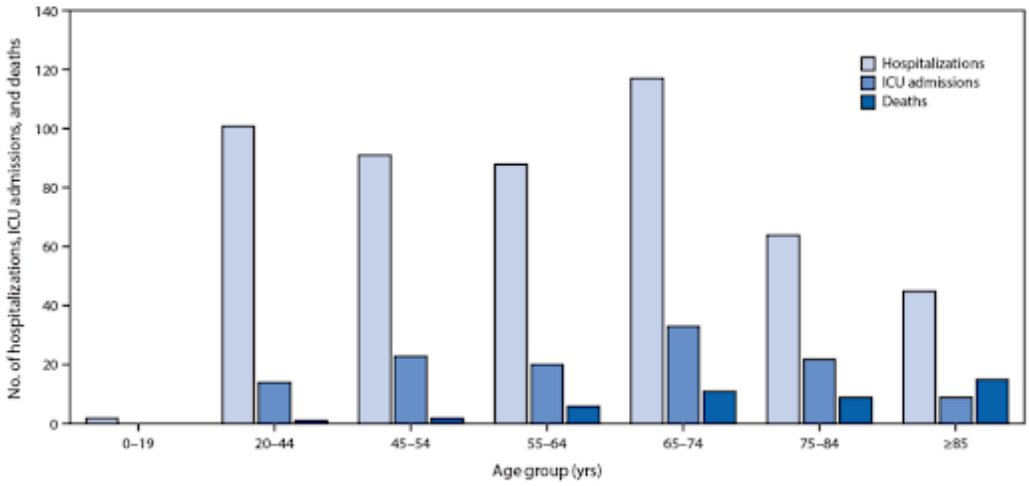
Also, as Portugal introduced the mandatory BCG vaccine program very late together with Spain, in 1965, and there should be many elderly who had not BCG vaccinated, I anticipate that the number of deaths per million will be higher than the other Western European countries where BCG vaccination programs were usually imposed in the 1950s. But Portugal should be better than Spain that stopped the program in 1981, though.

However, this hypothesis is weak since the fatality basically skews to the elderly worldwide. I saw some news that the younger generation became severely ill in Western Europe or the U.S. but have never seen that in Japan. More statistics are required to examine this hypothesis.

(Added on 13 Apr)
I did an age group comparison analysis between Italy, Spain, and Portugal. You can see the difference between those who were vaccinated and those who were not. This is important. Please check this!
https://www.jsatonotes.com/2020/04/the-bcg-hypothesis-age-group-comparison.html
If you check this, you can skip the three sections below I added on 30 Mar and 5 Apr. I made them grayout.

(Added on 30 Mar)
CDC is publishing hospitalization/ICU/death cases for the U.S. cases. The chart below shows that there are many hospitalizations and ICU cases below 54 years old though the fatality rate is very low so far. (Severe cases may cause aftereffects.) From China case, we know that the fatality rate is very low for the younger generation, which is the same case with the U.S. but the hospitalization/ICU ratio might be higher for the U.S. I cannot find a comparable data regarding hospitalization and ICU cases for China.

FIGURE 2. Coronavirus disease 2019 (COVID-19) hospitalizations,* intensive care unit (ICU) admissions,† and deaths,§ by age group — United States, February 12– March 16, 2020

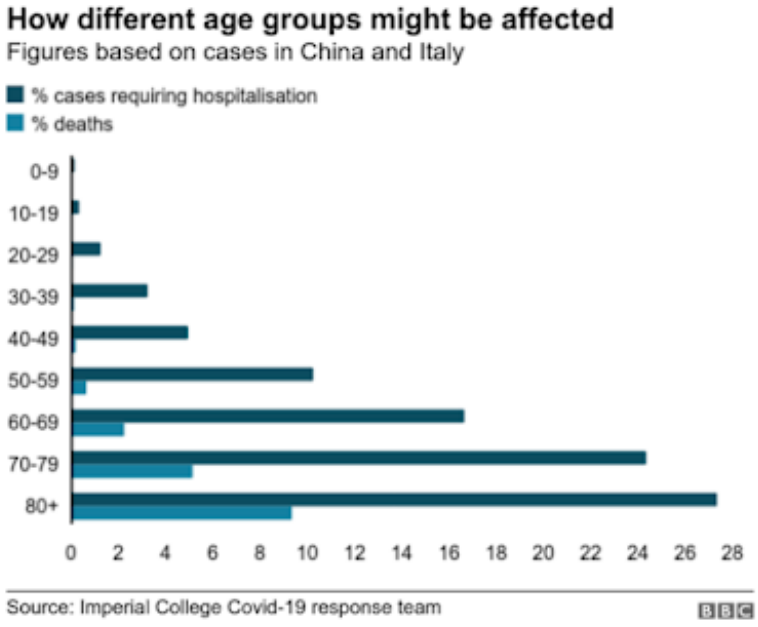


* Hospitalization status missing or unknown for 1,514 cases.

† ICU status missing or unknown for 2,253 cases.

§ Illness outcome or death missing or unknown for 2,001 cases.

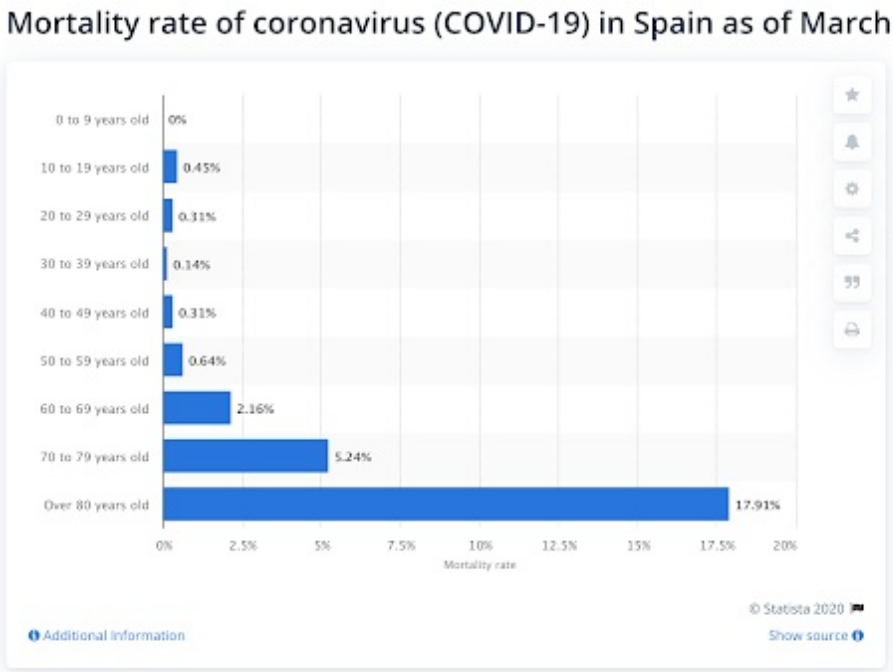
Please compare it with the China chart. Very different age distribution. I don't have good information of China BCG vaccine policy but my guess is that the young Chinese generation probably had a BCG vaccine.



Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020. MMWR Morb Mortal Wkly Rep 2020;69:343-346.

DOI: http://dx.doi.org/10.15585/mmwr.mm6912e2external icon.
https://twitter.com/DonaldDuckgo2/status/1244476092997566471?s=20

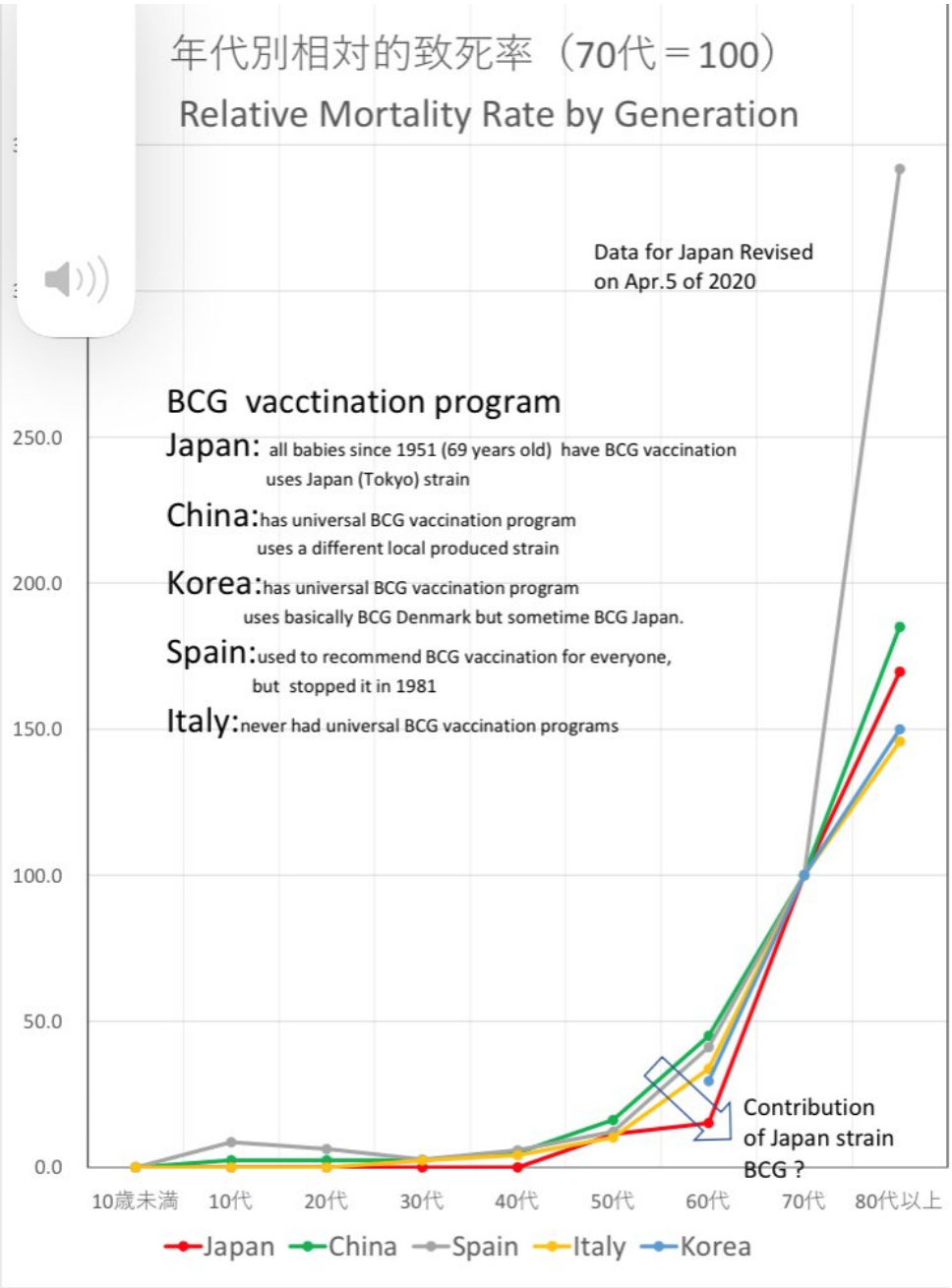
(Added on 30 Mar)
This can be one of the critical supporting facts for this BCG vaccine hypothesis. Below is a death rate of COVID-19 in Spain by age group. You can see a higher death rate in 10s and 20s than the 30s or 40s. Spain had a universal BCG vaccination program from 1965 to 1981, which means from 39 to 55 years old had a BCG vaccine. Well, you can see a little higher rate in the 10s and 20s. It is a very unusual pattern from what we learned from China. Yes, the absolute numbers may be small and not statistically significant. But this is a sign!



https://www.statista.com/statistics/1105596/covid-19-mortality-rate-by-age-group-in-spain-march/

(Added on 5 Apr)
A fantastic analysis is done by a reader. We know that the death/case is not reliable at all since the number of cases varies significantly by the country's test policy and numbers.

This reader set the death/case ratio of the 70s to 100 and see the relative mortality rate by generation. He highlights Japan's line but I would highlight Spain's line. Remember Spain had its universal vaccination program from 1965 to 1981, started late and stopped early. This may result in a relatively high mortality rate in the elderly and the young. Look at the chart below! I believe if we set the death/case ratio of the 40s to 100 and compare Spain, Italy, and Portugal, you can get a clear picture and quantify the effect of BCG Denmark.



https://twitter.com/shigetajyuuta/status/1246635554847899648

(Added on 31 Mar)
I received several inquiries regarding China. As there is little data about China's BCG vaccine policy on http://www.bcgatlas.org/, I had skipped China.
I found three facts regarding China's BCG vaccine policy.

1. China started its BCG vaccination program in 1978 (->42 years old), not universally but partially.
2. Penetration varies by province. Among high/middle/low penetration categories, Hubei Province(where Wuhan is) is in the low category. Beijing and Shanghai are in the high category.
3. China uses its own local strain produced in China.

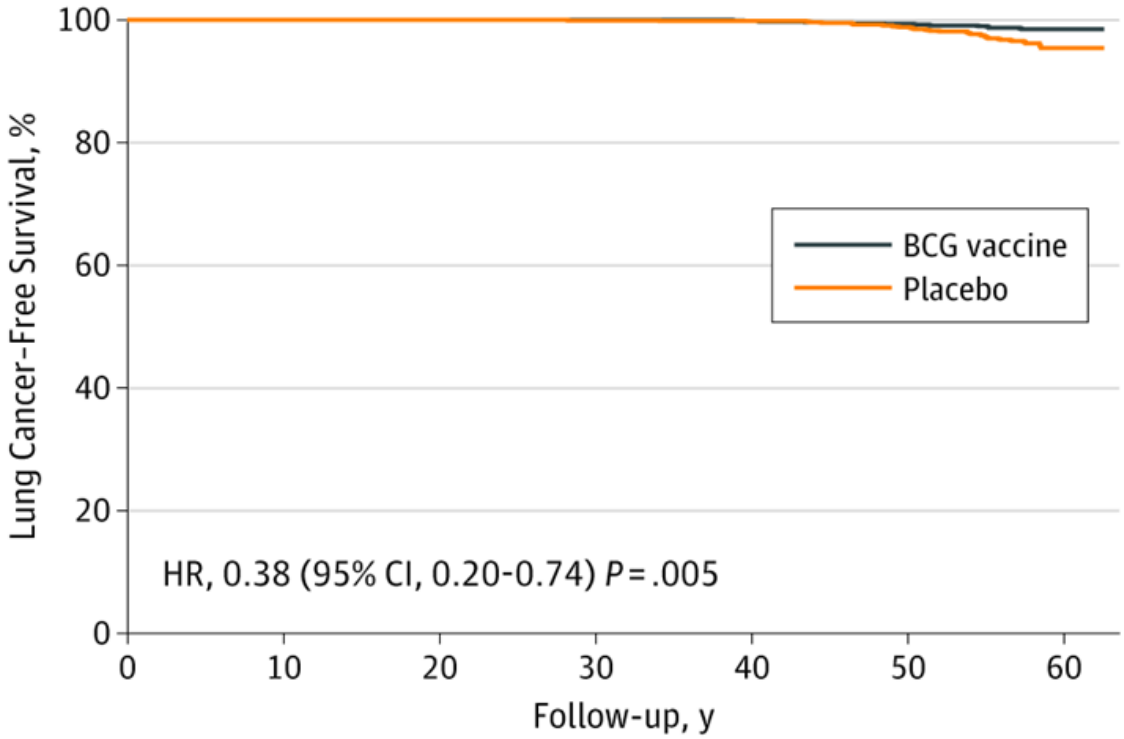
This can explain why the death from COVID-19 heavily skews to the elderly, why the spread of COVID-19 varies by province. Well, China strain may be effective against

COVID-19 since China controls quite well except Wuhan/Hubei.
https://www.huffingtonpost.jp/zhang-qian/compare-vaccine-policy_b_10982252.html
https://www.sciencedirect.com/science/article/pii/S1472979209000262

(Added on 21 Apr)
You may wonder how long the BCG vaccination effect lasts. Yes, I wondered too.
Probably this research looks at the most long-term effect. Of course, not against COVID-19, but against lung cancer.
https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2751896

> In this 60-year follow-up of a clinical trial of the BCG vaccine that included 2963 participants vaccinated at a median age of 8 years, those who received the BCG vaccine had a subsequent lung cancer rate of 18.2 cases per 100 000 person-years. Participants who received the placebo had a lung cancer rate of 45.4 cases per 100 000 person-years.

The risk of lung cancer reduced by 60% after 50 to 60 years since the BCG vaccination. This clinical trial used two BCG strains (strain 317 and strain 575). I don't know of these strains and expert explanations are welcome.



No. at risk							
BCG vaccine	1540	1485	1350	1266	1118	958	42
Placebo	1423	1322	1187	1135	1013	845	26

5) BCG vaccination has a long history and there seems no little downside to human beings.

BCG vaccination may not work but even in that case, there will be little downside.
CDC states the reason it is not recommended in the U.S.
https://www.cdc.gov/tb/publications/factsheets/prevention/bcg.htm
In Japan, all babies since 1951 have BCG vaccination and I have not heard a problem with it.

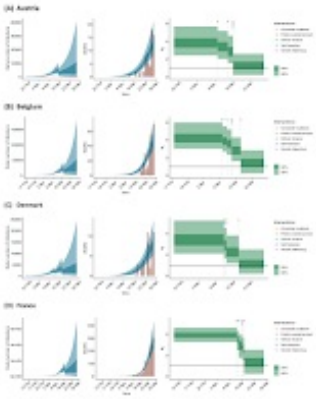
If I were North American/European/Australian, I would take BCG vaccination now.

(Added on 28 Mar)
I had carefully avoided talking about adult or elderly people to have BCG vaccination again as I don't know anything about the risk of re-vaccination. But I found a Japanese medical article about re-vaccination to bedridden elderly people published in 2003. BCG re-vaccination significantly reduced the probability of pneumonia.

https://medical.nikkeibp.co.jp/inc/all/hotnews/archives/237265.html

6) Lockdown reduces the reproduction rate significantly but lockdown may not be enough for the countries where BCG vaccination has not been mandatory.

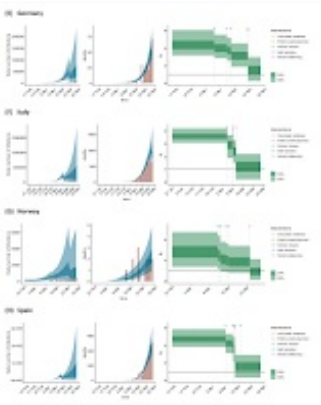
(Added on 1 Apr)
I checked the Imperial College COVID-19 report as of 30 Mar and read the chart of 13 west European countries. I am afraid that I don't check other than the chart below.
https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-Europe-estimates-and-NPI-impact-30-03-2020.pdf



My observation follows;

1. 12 out of 13 countries already implemented lockdown and have reduced their R1 significantly. Sweden is the only country not implementing lockdown and making the virus to spread fast (R1=3).
2. Sadly, lockdown may not be enough to contain COVID-19. All countries except one seem to have their R1>1. This is a very bad sign.
3. Hey, look at Norway! Norway seems to be the only country where its R1<1! And look at the first map I cited. Norway is the only one light orange country among these 13 countries; Mandatory BCG vaccine. To be precise, according to http://www.bcgatlas.org/, Norway had its compulsory BCG vaccine program from 1947 to 2009 for 62 years, which is the longest among these 13 countries.

What are the implications?



1. If a country doesn't have a long history of mandatory BCG vaccination program, lockdown may not be enough to contain COVID-19. Additional measures required. BCG vaccine?
2. If a country has a long history of mandatory BCG vaccination program even if it is BCG Denmark strain, a country can contain COVID-19 by the lockdown.

(Added on 2 Apr)
This analysis is done by my deep-learning machine, "Enpitsu Namename". So not explainable. Just for your reference.

1. BCG can reduce the infection rate by half no matter what strain is.
2. Lockdown can reduce the infection rate to 40%.
3. What BCG strain matter seems to be in the death rate. While weak strains such as BCG Denmark may not so effective to reduce the death rate, strong strains such as BCG Tokyo can reduce the death rate to one-tenth.

Below is a table for decision making for each country.
Healthcare capacity varies by country but I guess in terms of relative death rate below, 5 to 15 would be the maximum capacity.

	Relative infection rate (No BCG and Ordinary life = 100)		Relative death rate / population (No BCG and Ordinary life = 100)	
	Ordinary life	Lockdown	Ordinary life	Lockdown
No BCG	100	40	100	40~
Mandatory BCG with weak strain (Denmark, etc.)	60	24	10~40	4~16
Mandatory BCG with strong strain (Tokyo, etc.)	40	16	5	2

I would like to emphasize that BCG strain may matter very much. I have seen a few medical institutions have started to try BCG vaccination against the coronavirus. But I

have not seen any medical institution mentioning about the strains. Please try some strains and include strong strains such as BCG Tokyo.

(Added on 3 Apr)
I read the following tweet/article.

Probably the most exhaustive and most accurate estimate of COVID-19's lethality at this time. After correcting for data censoring errors and demographic differences, the overall result is 1.38%. A very important implication is that elaboration of treatment does not appear to have much effect on this figure.
https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30243-7/fulltext
https://twitter.com/idesan/status/1245052664502726656?s=12

Coincidentally, the result is the same as my deep-learning analysis. From my deep-learning analysis, the death rate (no BCG & Ordinary life) was estimated at 1.38%! And BCG Tokyo reduces it to around 0.1%.

I hope medical experts all over the world examine this hypothesis. I hear that developing a new vaccine will take two years but the BCG vaccine is already here. (Added on 2 Apr) If BCG vaccination works for all including people infected, drive-through BCG vaccination can be a quick and real solution for the U.S. Instead of drive-through PCR testing.

(Added on 5 Apr)
The U.S. and Irish medical and scientific experts have started to work on this. Please check this recording.
https://www.urotoday.com/video-lectures/covid-19-and-genitourinary-cancers/video/1716-the-bactir-trial-bcg-vaccination-against-sars-cov-2-to-protect-health-care-workers-by-enhanced-trained-immune-responses.html

1. BCG vaccination is safe for adults and healthcare workers.
2. The U.S. is expecting the second wave of the pandemic in fall/winter. BCG vaccine can prevent that second pandemic.
3. In the U.S., the BCG vaccine supply is limited and in shortage.
4. The researchers are BATTLING AGAINST THE CLOCK.

Below is their preprint article not peer-reviewed.
https://www.researchgate.net/publication/340224580_BCG_vaccination_may_be_protective_against_Covid-19

I guess they are working with Merck which seems to supply a weak type of strain. I believe the suppliers of BCG Russia/Tokyo should help this.

(Added on 6 Apr)
A miracle idea from a clinical doctor "Colors"! The Japanese method of BCG vaccination is the safest and effective but 99% of living bacteria don't go to under-skin space and get

wasted on skin. If we employ the bifurcated needle way, we don't waste any vaccine, which may mean increasing the number of people who can get BCG vaccination 100 times!
https://www.jsatonotes.com/2020/04/please-leave-comments-here-regarding.html?showComment=1586155267797#c7965025649119191953

BCG Russia/Tokyo looks promising. BTW, I had worked at the Tokyo office of Boston Consulting Group, which is called BCG Tokyo :)

(Added on 4 Apr)
The comment system does not work on this post anymore. Too many comments? For discussion purposes, I created a new post. Please leave a comment on the post below.
https://www.jsatonotes.com/2020/04/please-leave-comments-here-regarding.html

Please leave comments here regarding the BCG hypothesis, the correlation between COVID-19 and BCG vaccination

COVID-19 and the BCG hypothesis: age group comparison between Italy, Spain, and Portugal. You can get a size sense of herd immunity and individual immunity effect.