Iran COVID-19 epidemic models situation report No 36 – 2022-01-14

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Combine and visualize international periodically updated estimates of COVID-19 pandemic at the country level, countries without subnational level estimates Iran

Based on uptake 20220114 in https://github.com/pourmalek/covir2
Study update dates in uptake 20220114:
DELP 2022014, IHME 20220110, ***IMPE 20211226***, ***SRIV 2022013***

DELP: model by Massachusetts Institute of Technology, Cambridge
IHME: model by Institute for Health Metrics and Evaluation, Seattle
IMPE: model by Imperial College, London
SRIV: model by Srivastava, Ajitesh, University of Southern California, Los Angeles

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خلاصه فارسی

برآوردهای مورخ ۱۸ دی ۱۴۰۰ سناریوی اصلی موسسه اندازه گیری و ارزشیابی سلامت (آی اچ ام ای) دانشگاه واشنگتن در سیاتل: تعداد کل موارد جدید روزانه عفونت کووید ۱۹ (شامل موارد بدون علامت و موارد بیماری با علایم خفیف، متوسط و شدید) در ایران در ۱۸ دی ماه، ۷۹ هزار مورد است و در حدود ۲۷ بهمن به یک میلیون و صد و سی و هفت هزار (۱۱۳۷۷۷۵) نفر خواهد رسید. حد بالای عدم اطمینان: دو میلیون و هفت صد هزار (۲۷۰۰۰۰۰) در ۱۸ بهمن. حد پایین عدم اطمینان: یک میلیون و نود و سه هزار نفر (۱۰۹۳۰۰۰) در سوم اسفند ۱۴۰۰.

https://covid19.healthdata.org/iran-(islamic-republic-of)?view=infections-testing&tab=trend&test=infections

تزریق وسیع دوز سوم واکسن، حداکثر تعداد کل موارد جدید روزانه عفونت را به یک میلیون نفر در ۲۴ بهمن کاهش می دهد. استفاده ۸۰ درصد جمعیت از ماسک این تعداد را به شش صد هزار نفر در سوم اسفند کاهش می دهد.

تعداد موارد بیماری علامت دار، برآورد نشده، و به مراتب کمتر است. در سناریوی اصلی، تعداد مرگ روزانه در ۲۱ اسفند به ۱۰۰ نفر می رسد. بستری تخت عادی ۱۷۰۰۰ نفر و تخت آی سی یو ۸۰۰۰ نفر در ۱۷ اسفند. این برآوردها برای موج پنجم، مرگ روزانه ۶۴۲ نفر در ۴ شهریور، و بستری تخت عادی ۳۳ هزار و آی سی یو ۱۵ هزار نفر در ۲۶ مرداد بودند.

تعداد موارد بیماری قابل تشخیص می تواند در اواخر بهمن ماه تا اواسط اسفند ۱۴۰۰ به بیش از هشتاد هزار مورد در روز برسد که البته همه آن ها شدید نبوده و یا منجر به بستری نمی گردند.

دقت زمانی برآورد ها معمولا از یک تا دو هفته زودتر تا یک تا دو هفته دیر تر است.

The Omicron variant

The IHME model has included the Omicron variant. IHME Detected Infections vs. All Infections: "Probably detected infections at the **global** level will be ***three times*** that previous peak that we saw for delta." https://www.healthdata.org/covid/video/insights-ihmes-latest-covid-19-model-run

Scenarios of IHME model as of update 20211221:

S01 = Current projection [Status Quo, Reference scenario]
S02 = 80% mask use [Best scenario]
S03 = **High severity of Omicron [Worse scenario]**
S04 = Third dose of vaccine [Second best scenario]
S05 = Reduced vaccine hesitancy [Third best scenario]

IMPE has included the Omicron variant in their model, as explained here: https://mrc-ide.github.io/global-lmic-reports/News.html

"For certain countries the impact of the Delta variant is now included in the model. Timings for the delta variant are derived from CoVariants. For more information see updates to the model parameters and methods page.
DELP does not readily mentioned inclusion of Omicron in their model. However, their estimated cases show unprecedented increase.

SRIV does not readily mentioned inclusion of Omicron in their model, except, "Caution: Expect unreliable forecasts due to under-reporting around holidays and uncertainty in the prevalence of the Omicron variant." However, their estimated cases show unprecedented increase.

The Omicron variant, Farshad Pourmalek's take, 2021-12-15:

Given all available evidence so far, Omicron will most probably leave more cases, hospitalizations, and even deaths compared to previous waves, due to exponential growth – even with counterfactual scenarios of full lockdowns and highest coverages 3 doses of mRNA vaccines. Percent fatality and hospitalization lower than delta, but absolute numbers, higher.

Most politicians and half-politician-half-scientists repeat the same negligent mistakes with every new variant of concern. Refractory to treatment.

Farshad Pourmalek, December 15, 2021

Executive Summary

This report shows the trajectory of daily deaths, infections, bed needs, and ICU bed needs for Iran, estimated by five international and periodically updating COVID-19 epidemic models.

This report summarizes the results of a project named *CovidVisualized covir2*, an online tool developed to function as an early warning tool for technical advisers and health decision-makers.

Pre-print Data Note manuscript on Research Square, titled "CovidVisualized: Visualized compilation of international updating models' estimates of COVID-19 pandemic at global and country levels", 02 August 2021, PRE-PRINT (Version 1) available at Research Square [https://doi.org/10.21203/rs.3.rs-768714/v1] describes the methods and results of CovidVisualized tools: *CovidVisualizedCountry (for Canada),* CovidVisualizedGlobal (for global level), and covir2 (for Iran).

Farshad Pourmalek MD MPH PhD, who has created the *covir2* tool (and CovidVisualizedCountry and CovidVisualizedGlobal tools) and this report is a physician and epidemiologist who worked in School of Population and Public Health of University of British Columbia and Vancouver General Hospital, University of Washington, WHO, UNDEP, and UNICEF. ORCID ID https://orcid.org/0000-0002-2134-0771 , PubMed.

What is this report, and where does it come from?

This report is the *36th* situation report of predictions of five international and periodically updating COVID-19 epidemic models about the future trajectory of the epidemic in Iran. The report is based on the **"covir2"** online tool, that is a GitHub repository for sharing data and codes, available at https://github.com/pourmalek/covir2
This report is meant to serve as an offline and stand-alone version of the online tool. Situation Reports are available online at
https://github.com/pourmalek/covir2/tree/main/situation%20reports

Objectives of the "covir2" tool are to identify international and periodically updated models of the COVID-19 epidemic, compile and visualize their estimation results, and periodically update the compilations.

The ultimate objective is to provide an ***early warning system*** for technical advisors to the decision-makers. When the predictions of one or more models show an increase in daily cases or infections, hospitalizations, or deaths in the near future, ***technical advisors to the national and subnational decision-makers*** may consider suggesting augmentation of non-pharmacologic preventive interventions and vaccination. In doing so, the strengths and weaknesses of individual models need to be considered and those of this work. Models' estimates demonstrate the trajectory of COVID-19 deaths, cases or infections, and hospital-related outcomes in one to three months into the future.

The "CovidVisualized" project includes https://github.com/pourmalek/covir2 for Iran, https://github.com/pourmalek/CovidVisualizedCountry for Canada and its provinces, and https://github.com/pourmalek/CovidVisualizedGlobal for the global level.

Methods and technical details of this work are available in a pre-print Data Note manuscript on Research Square, titled "CovidVisualized: Visualized compilation of international updating models' estimates of COVID-19 pandemic at global and country levels", 02 August 2021, PRE-PRINT (Version 1) available at Research Square [https://doi.org/10.21203/rs.3.rs-768714/v1] describes the methods and results of CovidVisualized tools: *CovidVisualizedCountry (for Canada),* CovidVisualizedGlobal (for global level), and covir2 (for Iran).

Strengths and weaknesses of international and periodically updating COVID-19 epidemic models are discussed in Pourmalek F, Rezaei Hemami M, Janani L, Moradi-Lakeh M. Rapid review of COVID-19 epidemic estimation studies for Iran. BMC Public Health. 2021 Feb 1;21(1):257. doi: 10.1186/s12889-021-10183-3. PMID: 33522928.

Stata codes written and used for this whole work can be examined online and/or downloaded and re-run to check, securitize, verify, or flag any mistakes.
https://github.com/pourmalek/CovidVisualizedCountry#iii-inner-works-of-this-repository-1

Five international and periodically updating COVID-19 epidemic models:

DELP, IHME, IMPE, ~~LANL~~, SRIV; and JOHN (these abbreviations are used in the graphs)

DELP: DELPHI. Differential Equations Lead to Predictions of Hospitalizations and Infections. COVID-19 pandemic model named DELPHI by Massachusetts Institute of Technology, Cambridge. *Reference:* COVID Analytics. DELPHI epidemiological case predictions. Cambridge: Operations Research Center, Massachusetts Institute of Technology. https://www.covidanalytics.io/projections and https://github.com/COVIDAnalytics/website/tree/master/data/predicted

IHME: Institute for Health Metrics and Evaluation. COVID-19 pandemic model by Institute for Health Metrics and Evaluation, Seattle. *Reference:* Institute for Health Metrics and Evaluation (IHME). COVID-19 mortality, infection, testing, hospital resource use, and social distancing projections. Seattle: Institute for Health Metrics and Evaluation (IHME), University of Washington. http://www.healthdata.org/covid/ and http://www.healthdata.org/covid/data-downloads

IMPE: Imperial. COVID-19 pandemic model by Imperial College, London. *Reference:* MRC Centre for Global Infectious Disease Analysis (MRC GIDA). Future scenarios of the healthcare burden of COVID-19 in low- or middle-income countries. London: MRC Centre for Global Infectious Disease Analysis, Imperial College London. https://mrc-ide.github.io/global-lmic-reports/ and https://github.com/mrc-ide/global-lmic-reports/tree/master/data

LANL: Los Alamos National Laboratories. COVID-19 pandemic model by Los Alamos National Laboratories, Los Alamos. *Reference:* Los Alamos National Laboratory (LANL). COVID-19 cases and deaths forecasts. Los Alamos: Los Alamos National Laboratory (LANL). https://covid-19.bsvgateway.org // Retired on 20210926.

SRIV: Srivastava, Ajitesh. COVID-19 pandemic model by University of Southern California, Los Angeles. *Reference:* Srivastava, Ajitesh. University of Southern California (USC). COVID-19 forecast. Los Angeles: University of Southern California. https://scc-usc.github.io/ReCOVER-COVID-19 and https://github.com/scc-usc/ReCOVER-COVID-19/tree/master/results/historical_forecasts

*

JOHN: Johns Hopkins. Coronavirus resource center, Johns Hopkins University, Baltimore. Curation of official reports of countries to World Health Organization. **Ground truth for comparison**. *Reference:* Johns Hopkins University. Coronavirus resource center. https://coronavirus.jhu.edu/map.html and https://github.com/CSSEGISandData/COVID-19

*

Graphs

Graphs of the most recent models' updates are shown here. These graphs, as well as graphs of previous updates, are available online at https://github.com/pourmalek/covir2

Logical order of graphs:

(1) *Outcomes*: Daily deaths, Daily cases or infections, Hospital-related outcomes, Daily deaths estimated to reported ratio, Daily cases or infections estimated to reported cases ratio.

Followed by additional outcomes estimated by IHME and added starting from uptake 20210916, i.e., R effective, Daily Infection-outcome ratios, Daily mobility, Daily mask use, and (Percent) cumulative vaccinated.

(2) *Calendar time of estimates coverage*: All-time, followed by 2021. To view the whole epidemic trajectory and further focus on the near future.

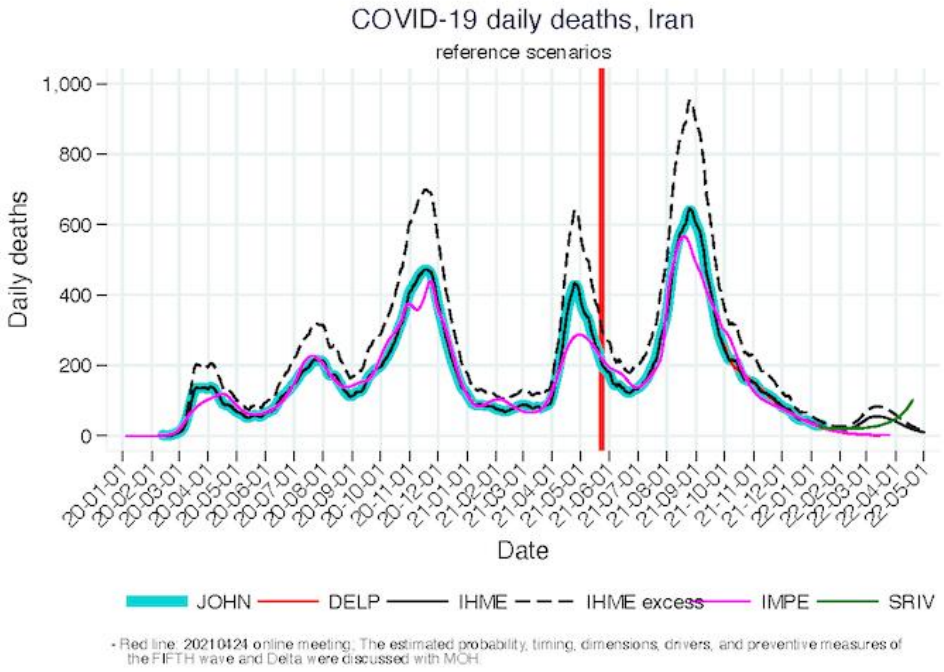
(3) *Scenarios*: Reference scenarios, followed by alternative scenarios. To examine the main or reference (aka. status quo) scenario and alternative (better and worse) scenarios.

(4) *Five models*: Different models *within* each graph (for which model estimates update release dates are maximally synchronized), plus official reports of the country to WHO (curated by Johns Hopkins University) as the under-reported benchmark for trends. To examine how heterogeneity in methods used by different models results in heterogeneous results for the same outcome (same time-place-person aggregated units)

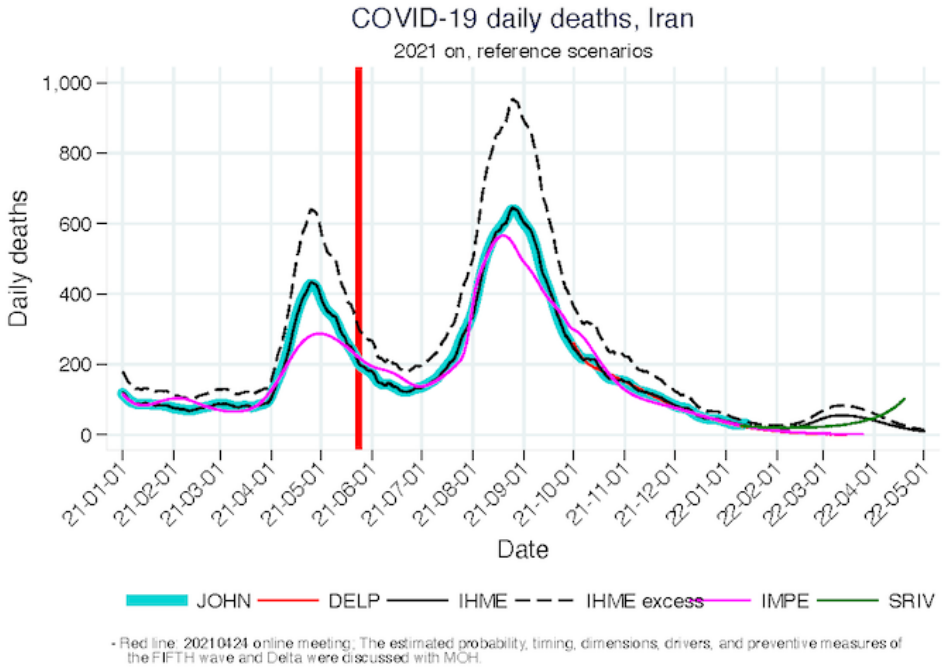
Names of models/studies in Farsi:

(JOHN) دانشگاه جانز هاپکینز، انعکاس گزارش های رسمی کشور ها به سازمان جهانی بهداشت (منحنی آبی رنگ)
(DELP) مطالعه دلفی، انستیتوی فناوری ماساچوست کمبریج (منحنی قرمز رنگ)
(IHME) مطالعه موسسه آی اچ ام ای، دانشگاه واشنگتن سیاتل (منحنی سیاه رنگ)
(IMPE) مطالعه ایمپریال کالج لندن (منحنی صورتی رنگ)
(SRIV) مطالعه اسریواستاوا در دانشگاه کالیفرنیای جنوبی (منحنی سبز رنگ)

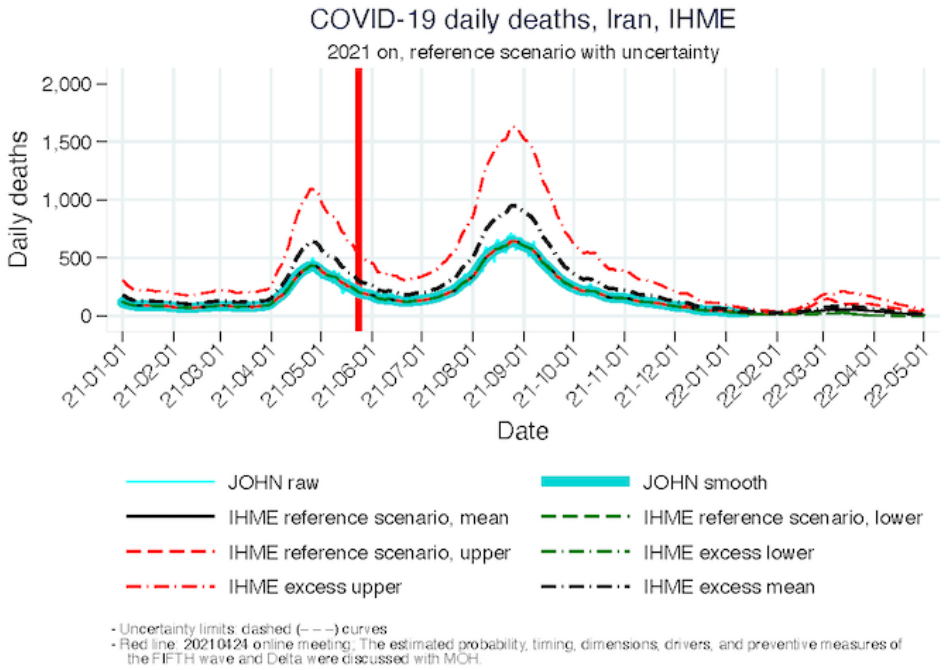
(1) Iran Daily deaths, all time



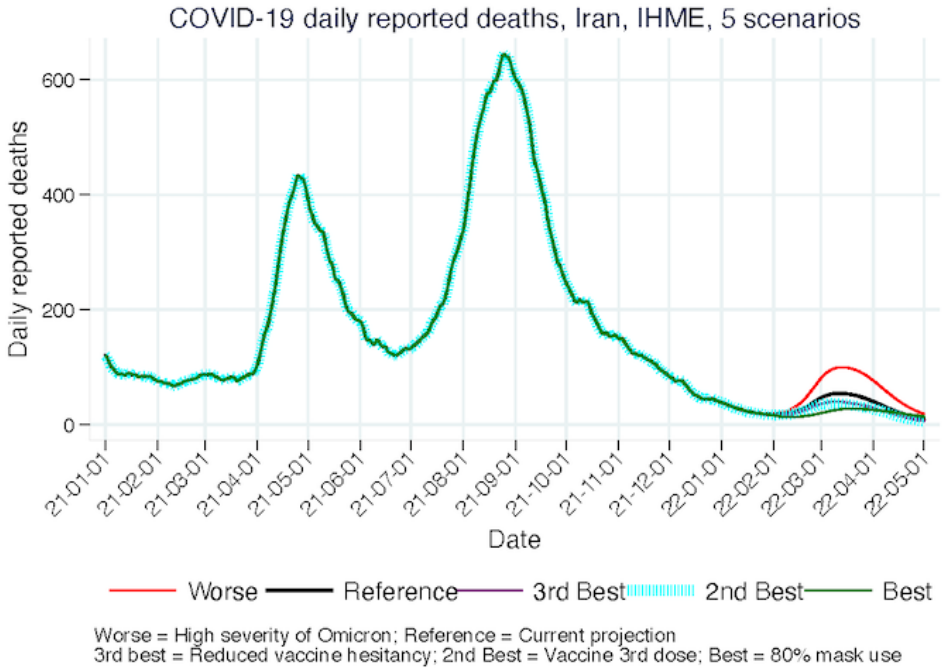
(2) Iran Daily deaths, 2021 on



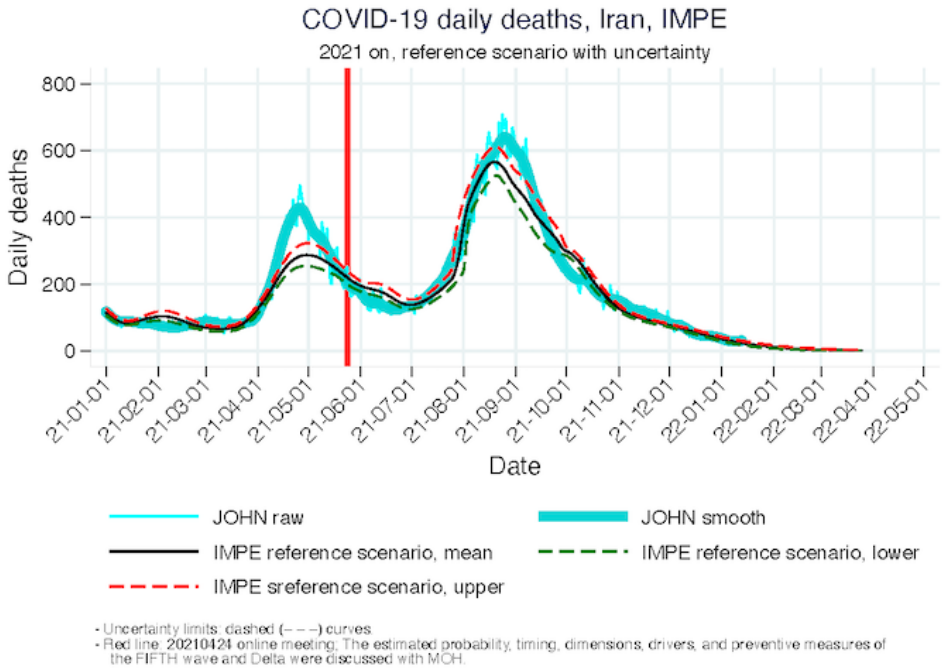
(3) Iran [Daily deaths, 2021 on, reference scenario with uncertainty, IHME]



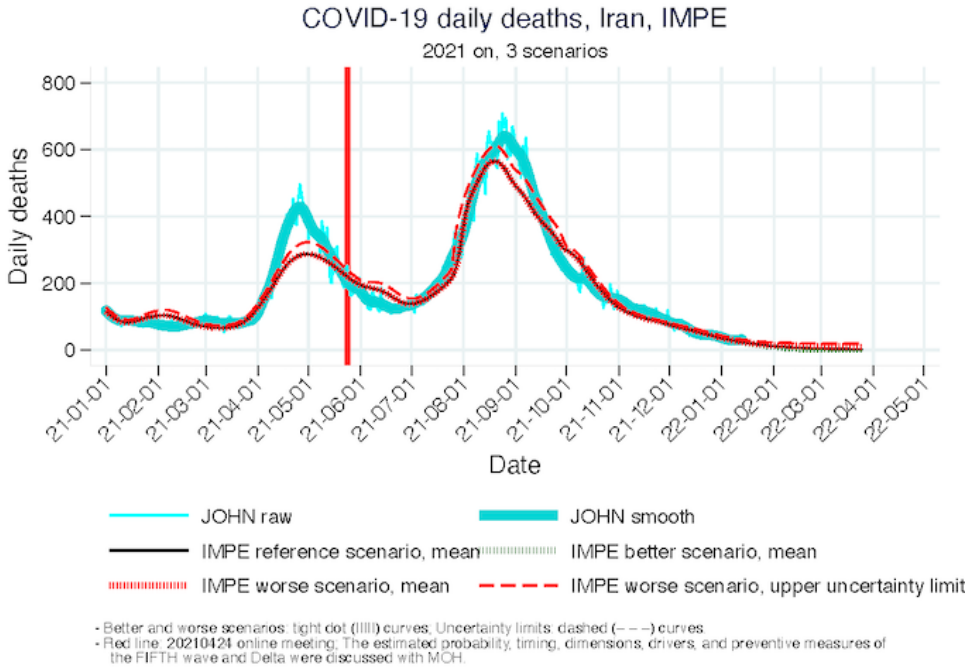
(4) Iran [Daily deaths, 2021 on, 5 scenarios, IHME]



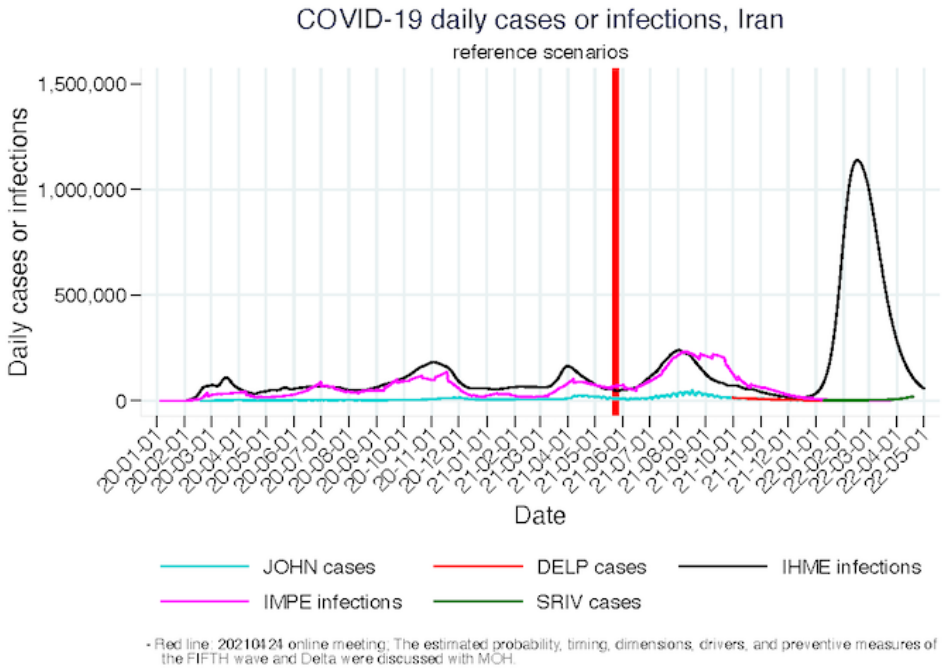
(5) Iran Daily deaths, 2021 on, reference scenario with uncertainty, IMPE



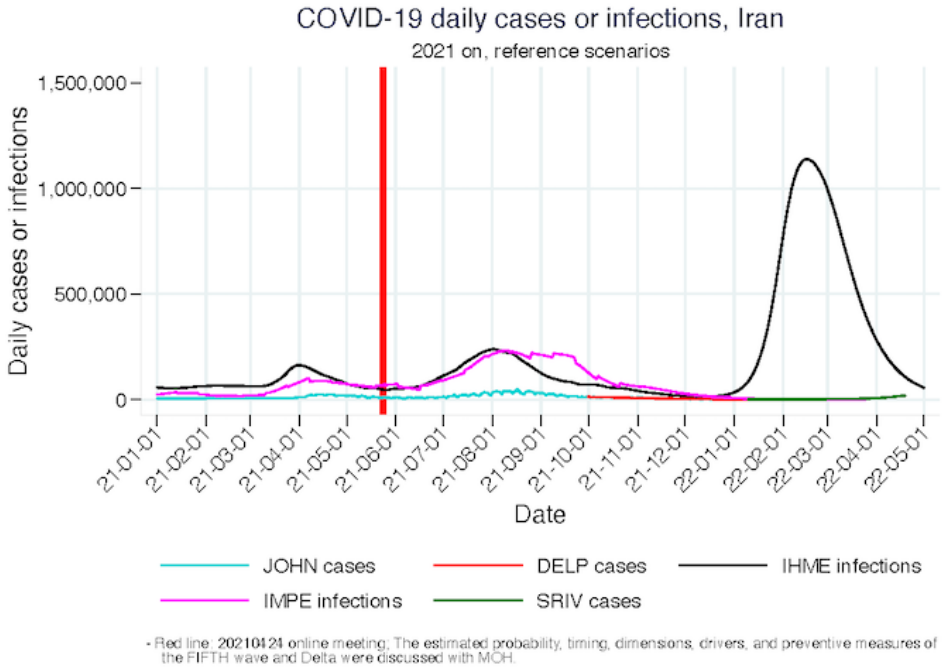
(6) Iran Daily deaths, 2021 on, 3 scenarios, IMPE



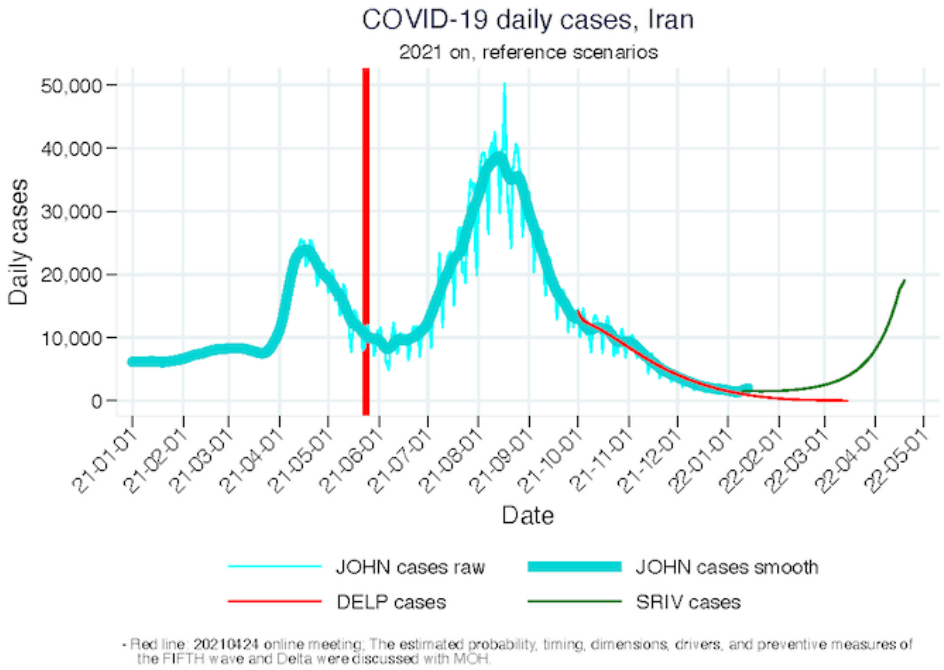
(7) Iran [Daily cases or infections, all time]



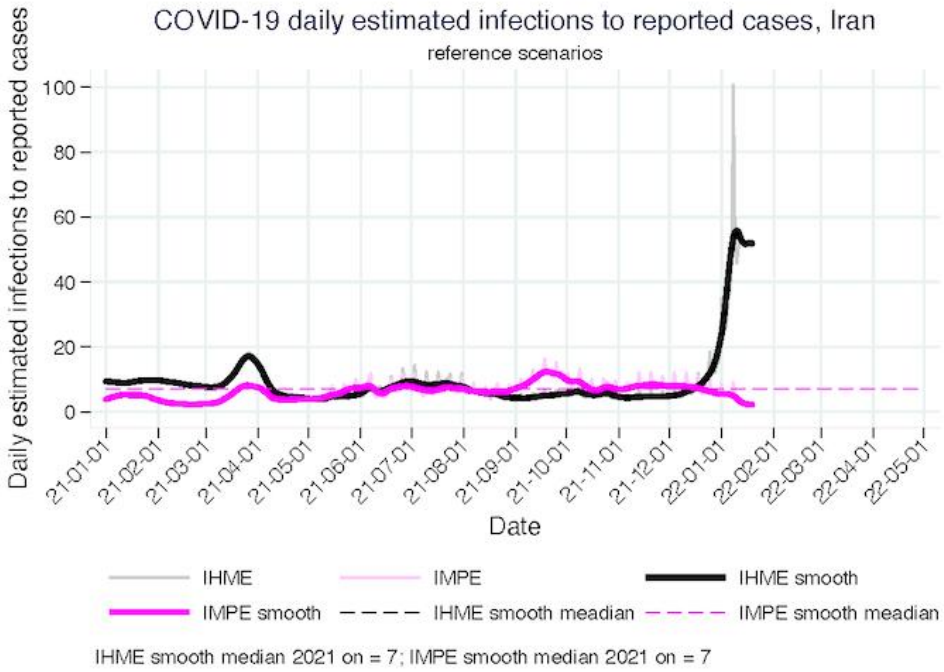
(8) Iran [Daily cases or infections, 2021 on]



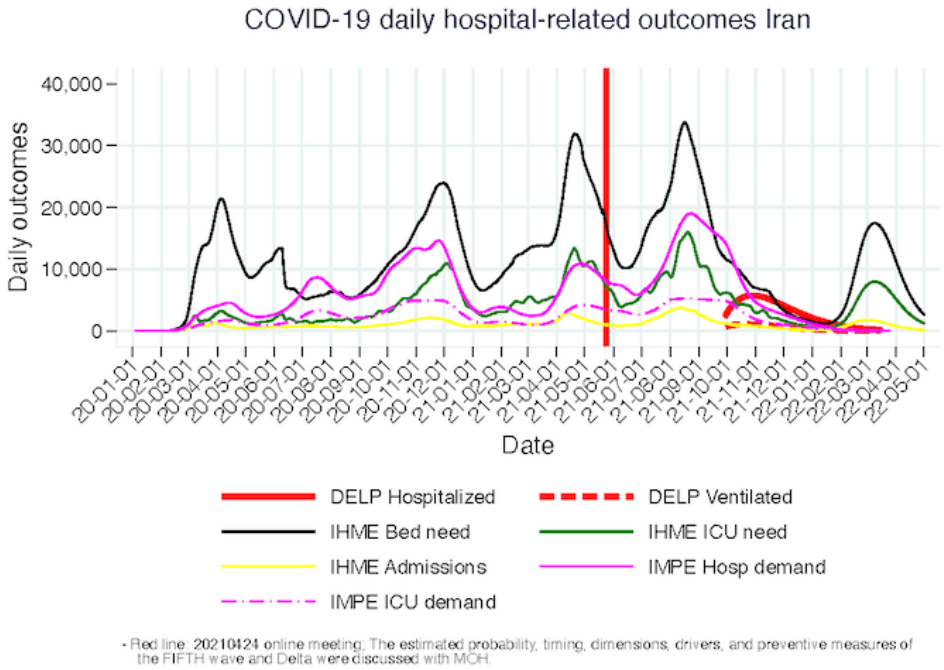
(8b) Iran Daily cases, 2021 on



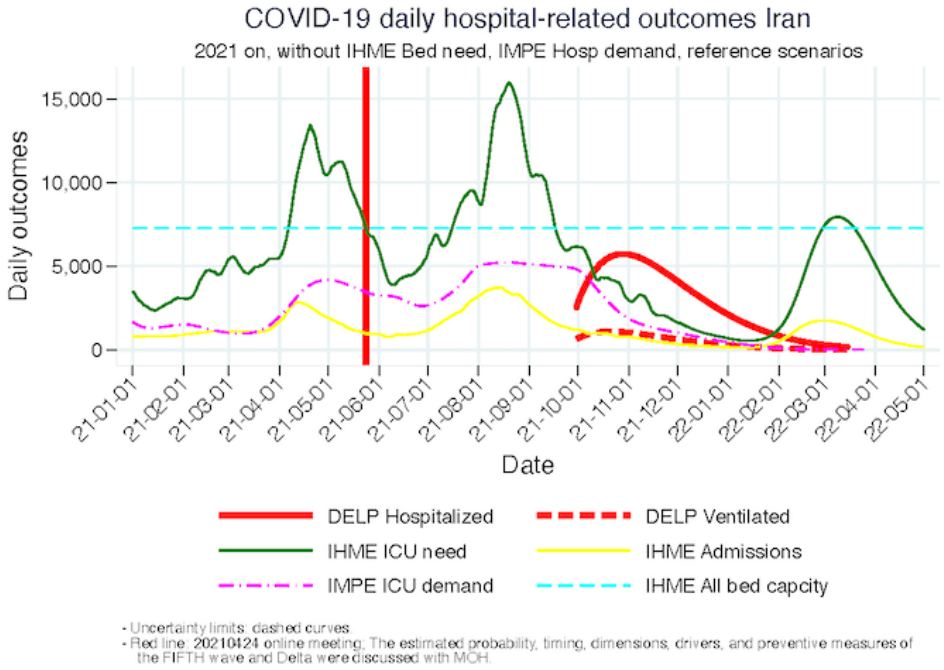
(8c) Iran Daily estimated infections IHME IMPE to reported cases JOHN, main scenarios, 2021 on



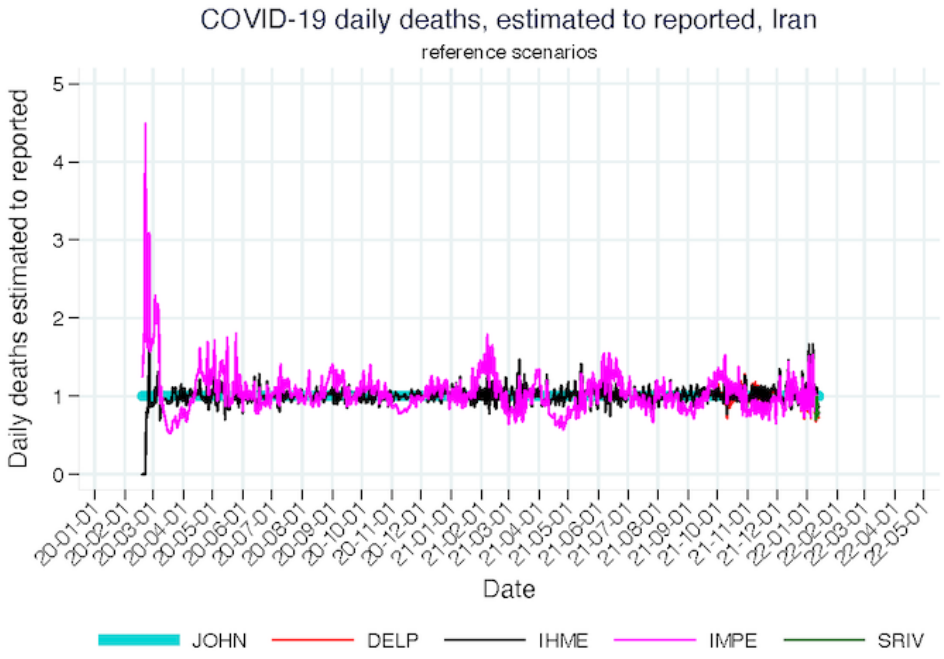
(9) Iran [Hospital-related outcomes, all time]



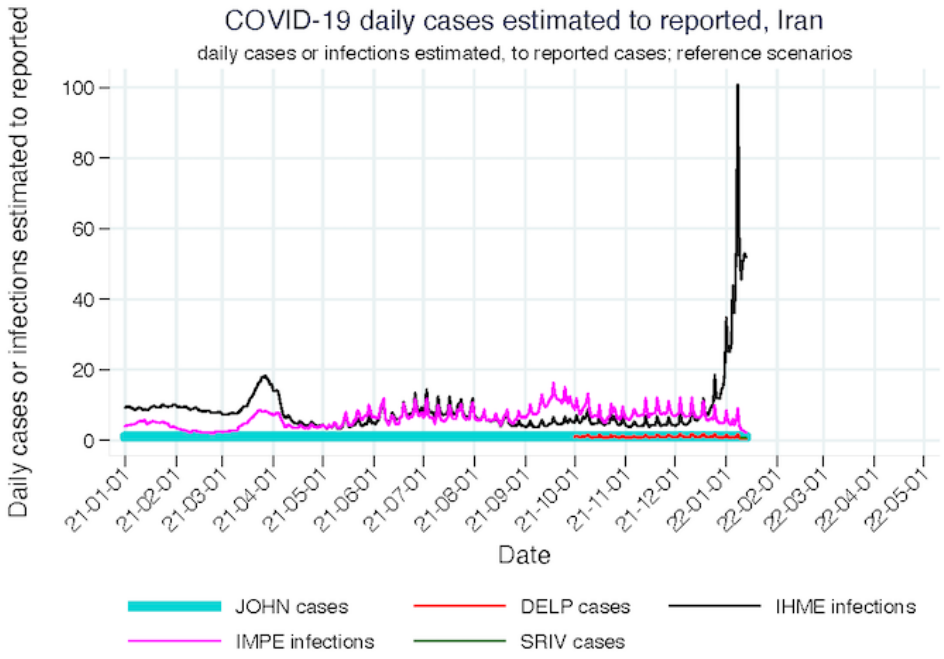
(10) Iran [Hospital-related outcomes, 2021 on]



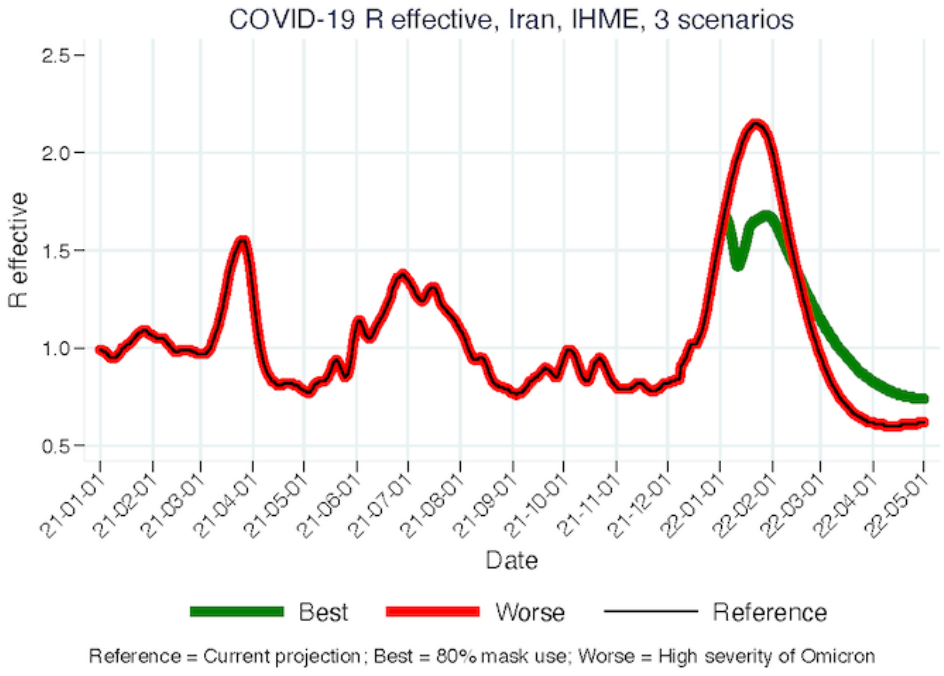
(11) Iran [Daily deaths estimated to reported, all time]



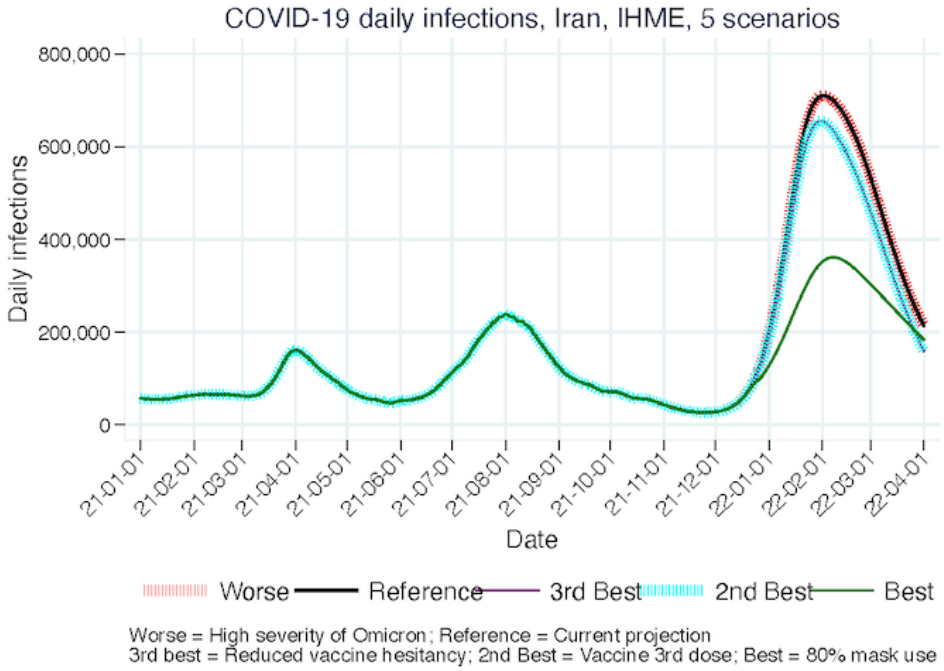
(12) Iran [Daily cases or infections estimated to reported cases, 2021 on]



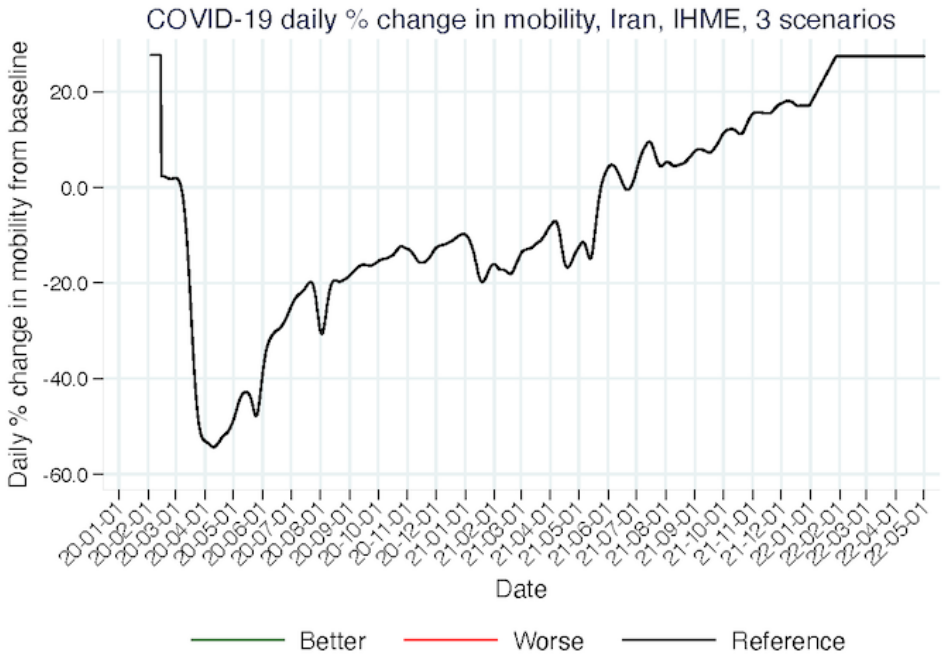
(13) Iran [R effective, 3 scenarios, 2021 on, IHME]



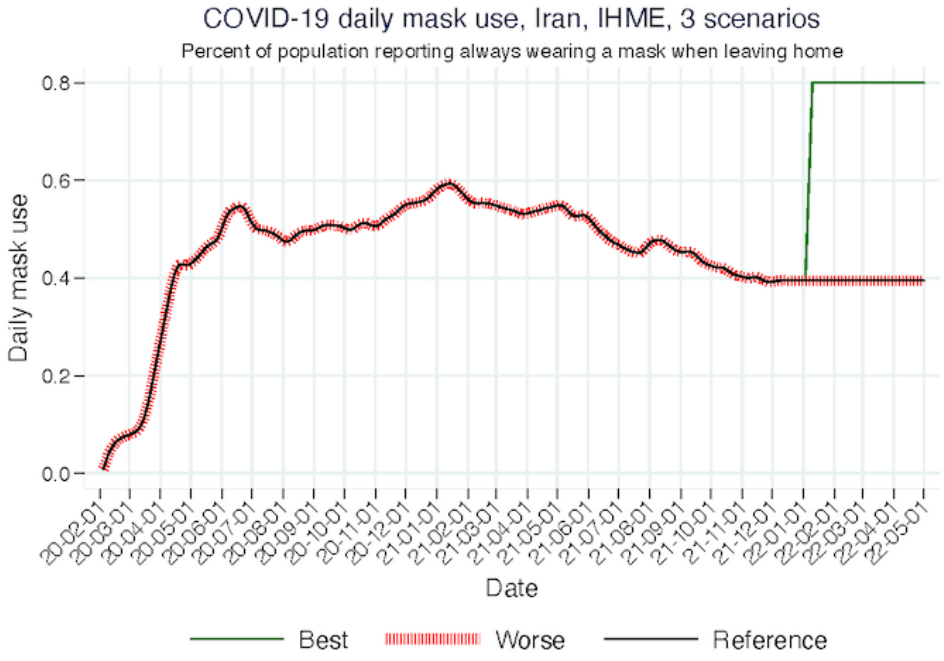
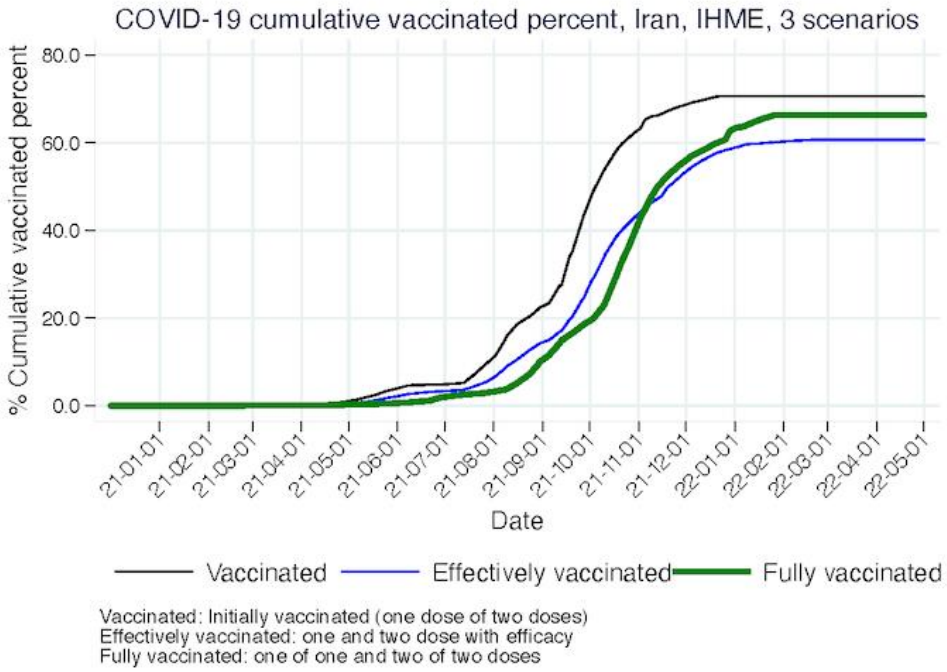
(14) Iran [Daily Infection-outcome ratios, 5 scenarios, 2021 on, IHME]



(15) Iran [Daily mobility, 3 scenarios, all time, IHME]



(16) Iran [Daily mask use, 3 scenarios, all time, IHME]



(17) Iran [Percent cumulative vaccinated, 2021 on, IHME]