

Analysis and forecasting of COVID-19 in Ho Chi Minh city

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Tech4Covid Team

August 13, 2021

Extremely Important Notes

- Any policy implemented always has a lag reflected through numbers → the numbers seen today are the result of policies/actions from 1-2 weeks ago
 - If looking at symptomatic cases → after 11 days
 - If the situation is overloaded, looking at number of deaths → after 5 days
 - If looking at number of deaths → 19 days
- Effects of policies are usually immediate but we can't measure them so there is a lag when they are reflected through other indicators
- Should look at the 7-day average instead of absolute daily numbers to understand trends
- FO screening is a measurement tool → currently losing this tool as the number of tests decreases

Current Situation

- Number of F0 cases is flattening at a high level despite reduced testing
- Overload of the community and city healthcare system → increasing mortality rate
- Non-uniform compliance with social distancing between localities → people showing signs of complacency → infection rate not decreasing
- The epidemic situations in neighboring provinces such as Binh Duong, Dong Nai, Long An, Tien Giang, Ba Ria - Vung Tau, Tay Ninh are progressing very badly, with F0 cases continuing to increase.
- A bright spot is that vaccination progress is going well

Questions

- How will policies be updated after August 15, 2021 and in the following weeks?
 - The necessity of data-driven decision support tools?
- Experience in implementing technological applications to support epidemic prevention in other countries?
 - Testing, vaccination, social distancing, safe zones, risk warning
- What is the roadmap to return to the new normal?
 - Criteria and testing

Statistics and Forecasting Needs

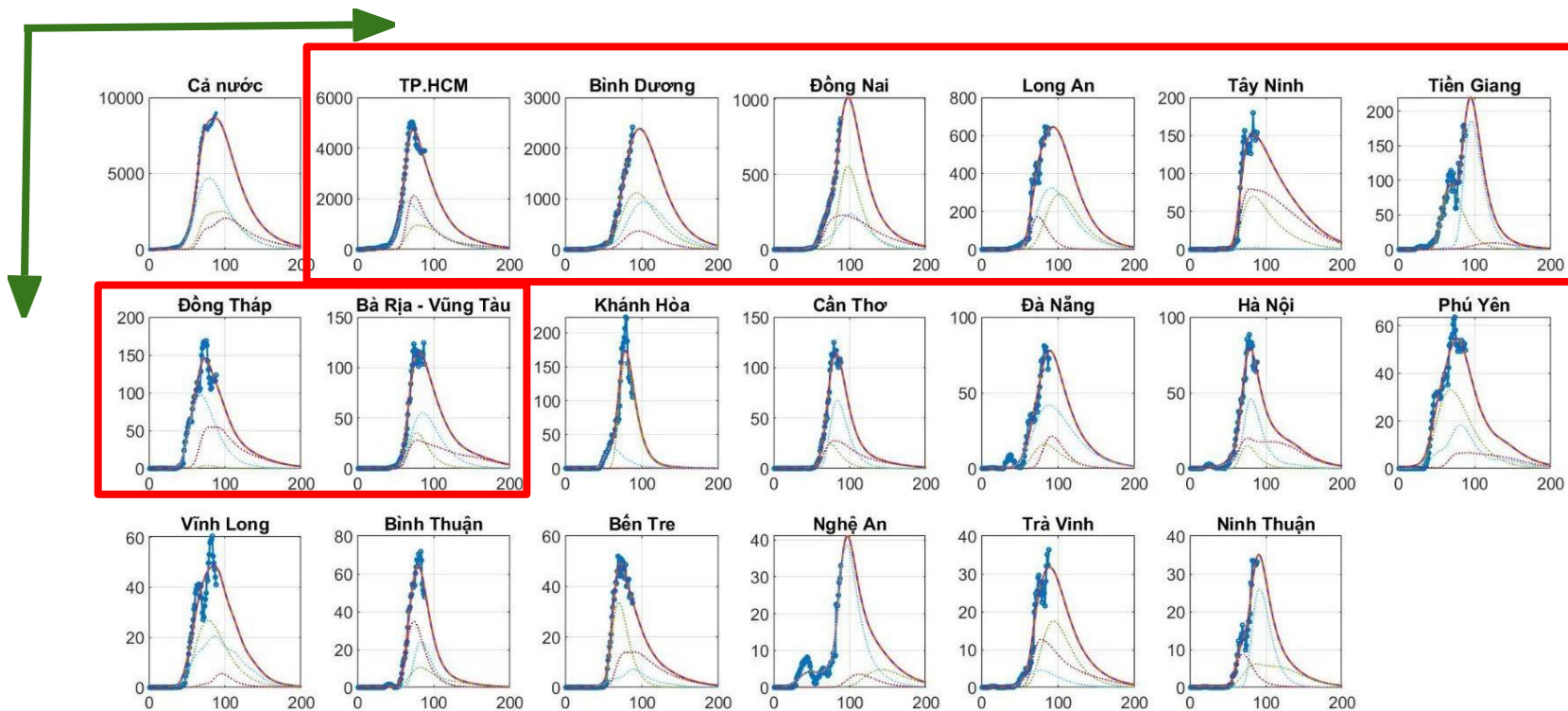
- Statistics
 - Getting an overall picture of the epidemic situation including: number of F0 cases by district, treatment capacity of hospitals, number of deaths, overload (number of severe cases needing ICU treatment but no vacancies), compliance with distancing, vaccination situation
 - → HCMC already has related tools, but the problem lies in data (accuracy, updates) and dashboards to support decision making → needs improvement
- Forecasting
 - Needed for long-term planning, resource preparation, cost estimation, damage forecasting
 - Answering the question for the next 2 weeks, 4 weeks, quarter, year?
 - How to prepare if prolonged distancing is required?
 - How to open trade when neighboring provinces have a complicated epidemic situation?
 - Needed to assess potential outbreaks in districts for timely decisions

Analysis – Forecast

**Model by A/Prof. Dr. Truyen Tran
Deakin University, Australia**

Data source: Tech4Covid Team (Dept of Information & Communications, HCDC/Dept of Health), Rapid Response Information Team, 5F Team.

Overall national situation, HCMC and surrounding cluster leading!



Situation in neighboring provinces - most optimistic scenario

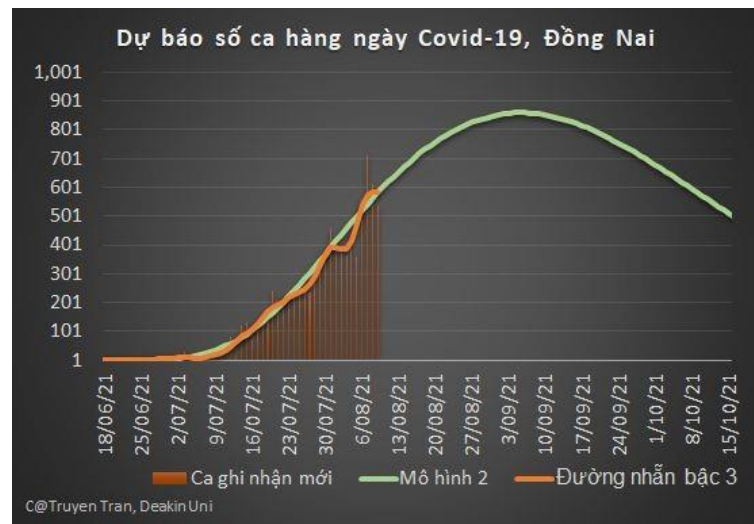
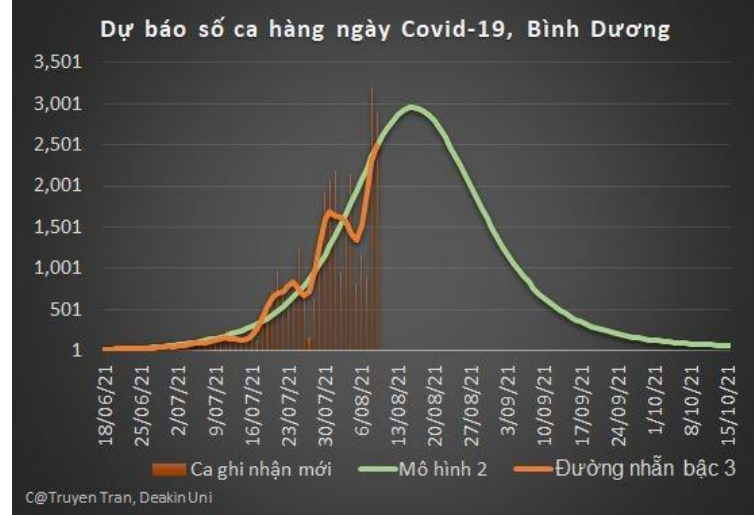
Provinces with outbreaks are on the rise, reaching peaks 10-30 days slower than HCMC.

At the end of the epidemic, Binh Duong will have 4-6% of the population infected with Covid, Dong Nai 2-3%, other provinces 1-2% according to reported data.

Actual number infected may be 1.5-5 times higher.

The pessimistic scenario could be 5 to 10 times higher, even reaching herd immunity in Binh Duong industrial zones, if the province fails to contain the epidemic.

If provinces do not control well, the epidemic will spread back to HCMC, reflected in numbers in September.



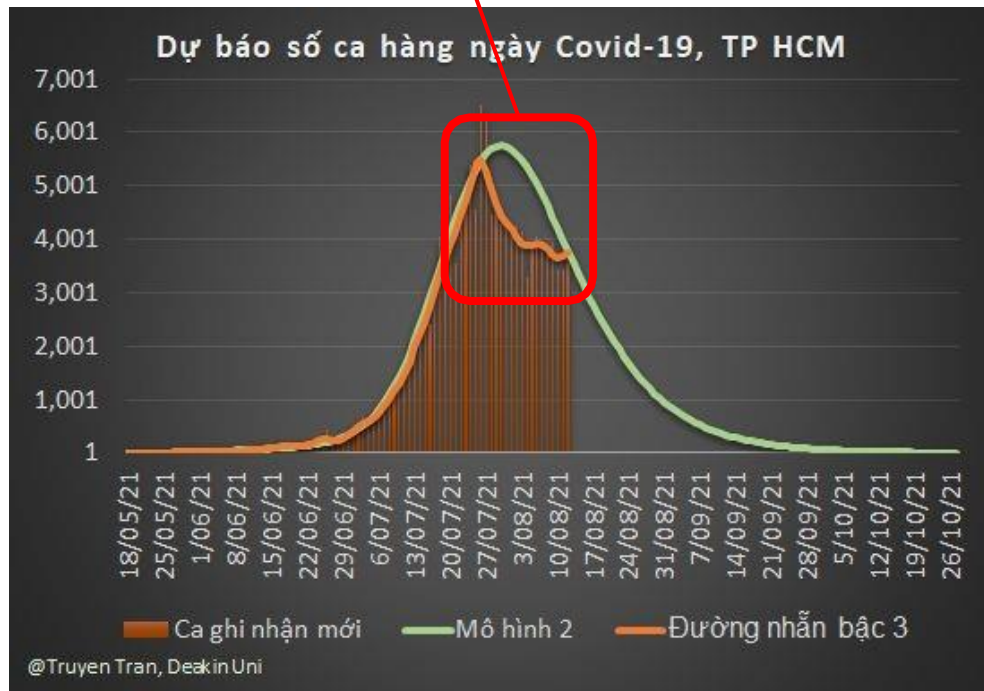
The gap between the theoretical curve built on July 25 and the reported F0 numbers after July 27.

F0 Analysis

Currently the City is focusing on treatment so the number of F0 is about 25% lower than reality.

However, this number of F0 will be reflected in reports in other ways, which is spreading more deeply because they are not isolated.

The reported F0 curve has a "longer tail" than expected (see next slide).



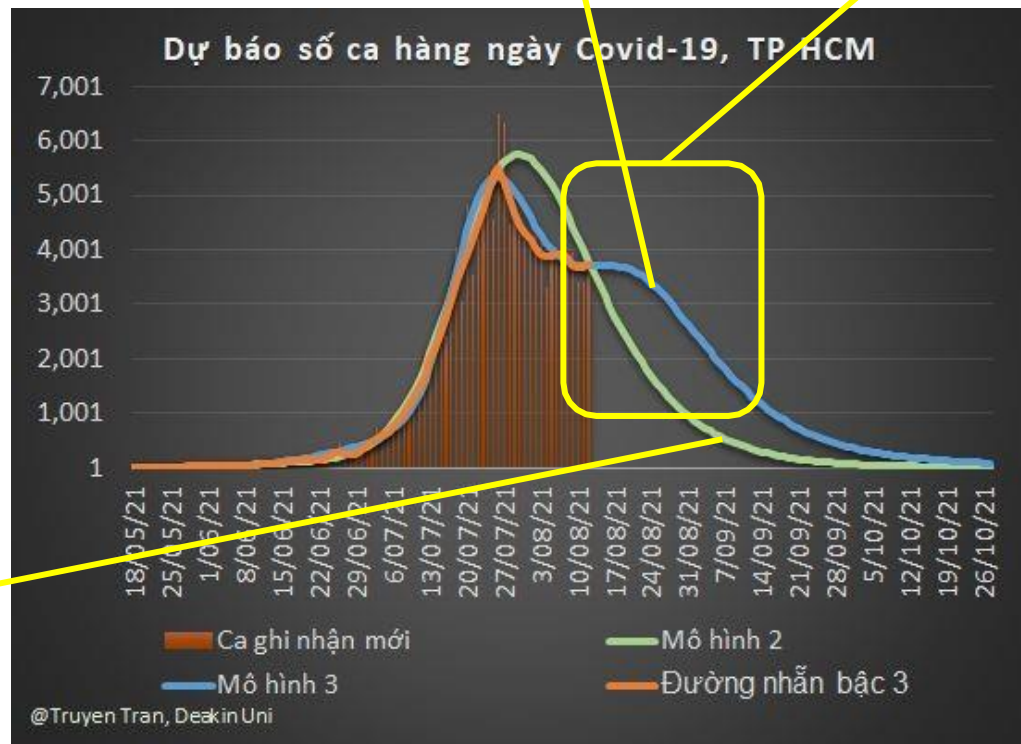
Risk of a new wave, optimistic estimate

F0 number is a measurement tool, abandoning this tool only relies on treatment data, often 5-10 days late, missing the golden time for decision making.

Reported F0 model on July 25

New reported F0 model on August 13

New wave



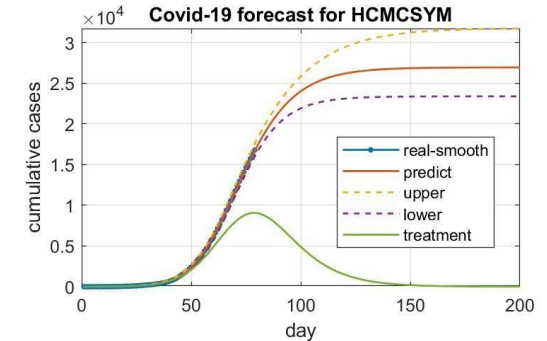
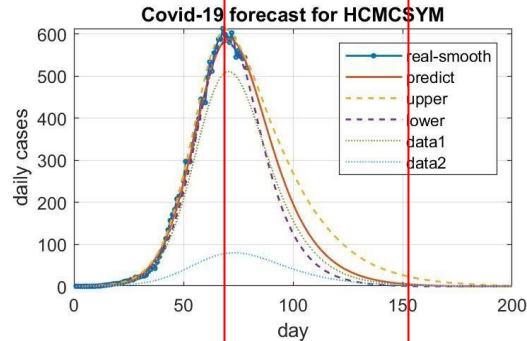
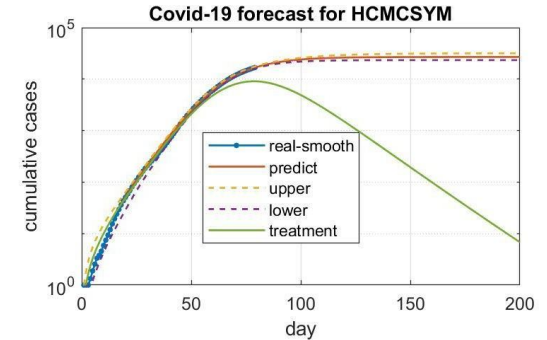
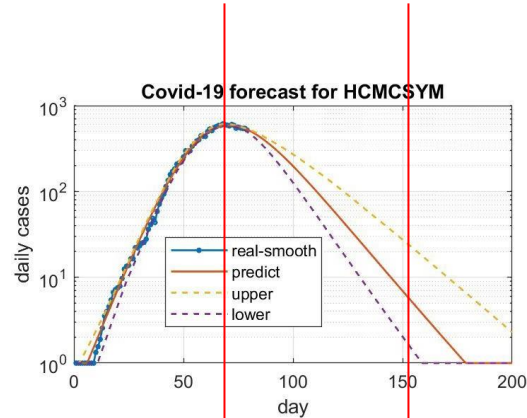
Forecast of symptomatic cases for the whole city, most optimistic scenario

A total of 24-31 thousand cumulative symptomatic cases, corresponding to a rate of about 13% of F0 cases.

At the peak in mid-August, there will be over 9,000 cases needing care.

By the end of October, the epidemic will truly end if distancing is strictly maintained.

→ Refer to the approach of Victoria, Australia in 2020.



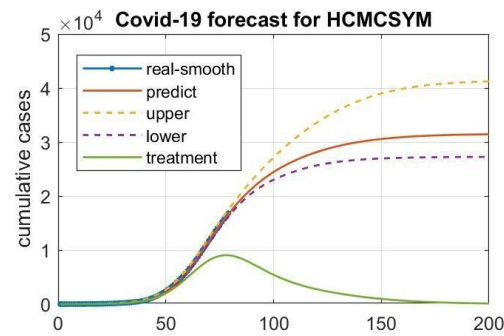
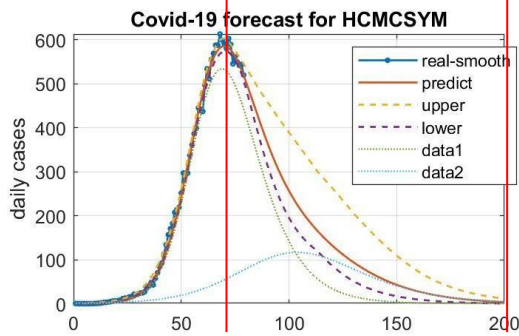
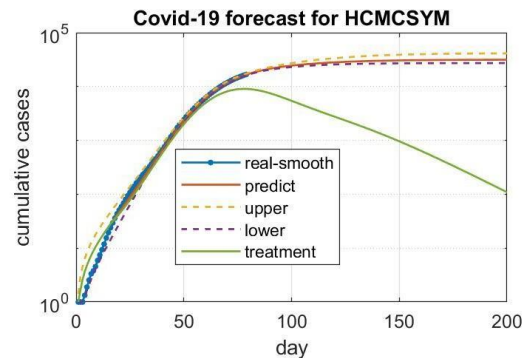
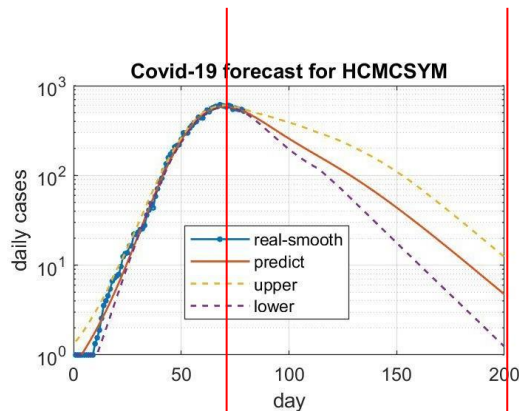
2/8/2021

20/10/2021

Forecast of symptomatic cases for the whole city, less optimistic scenario

A total of 28-41 thousand cumulative symptomatic cases.

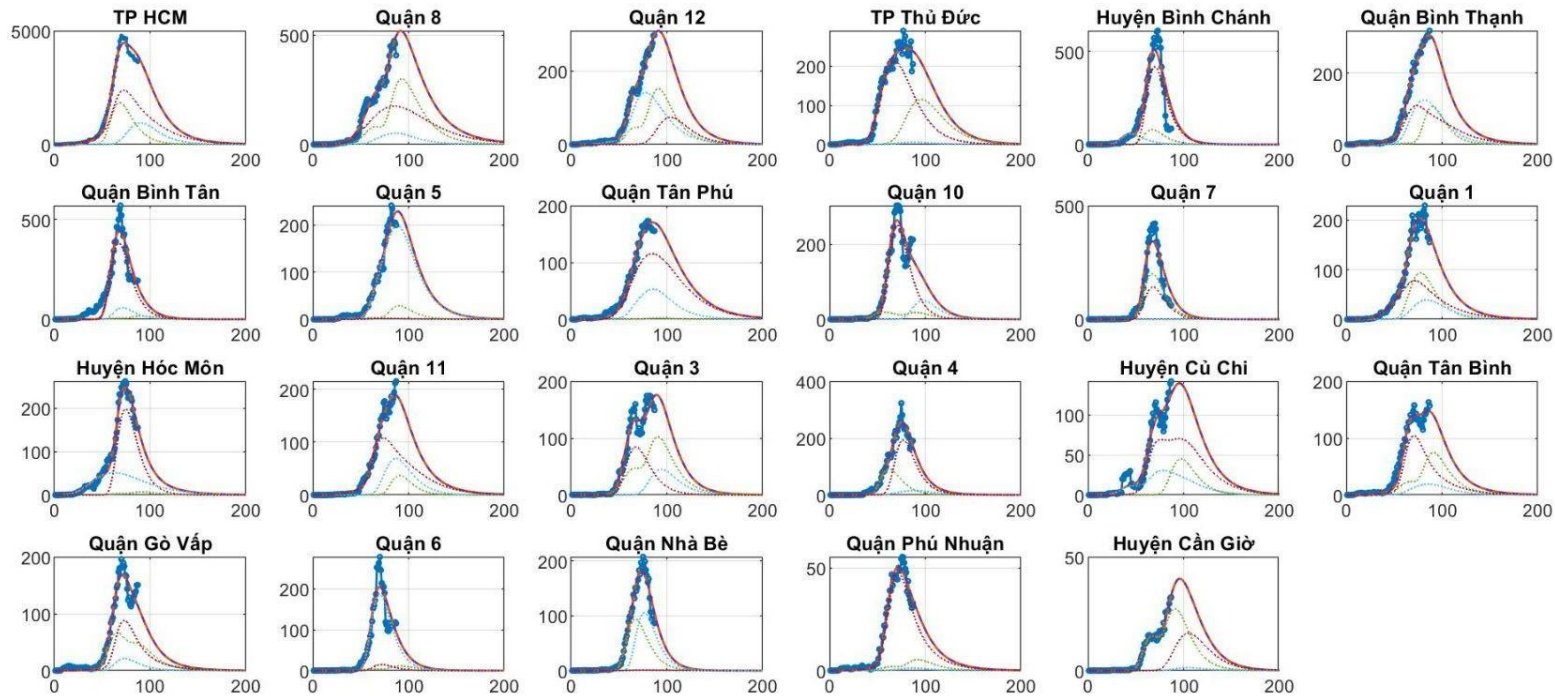
By mid-December, the epidemic will truly end if distancing is gradually relaxed.



2/8/2021

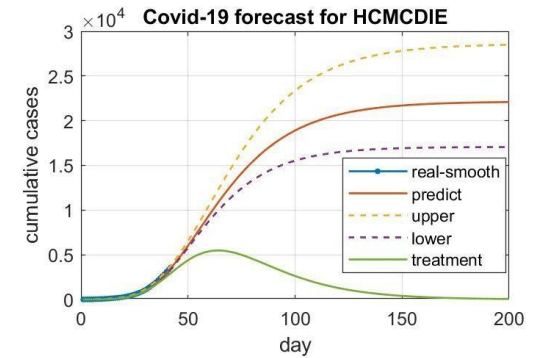
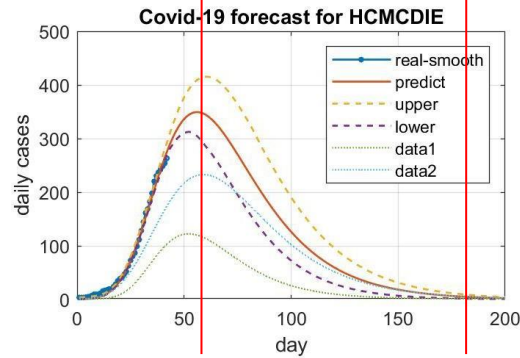
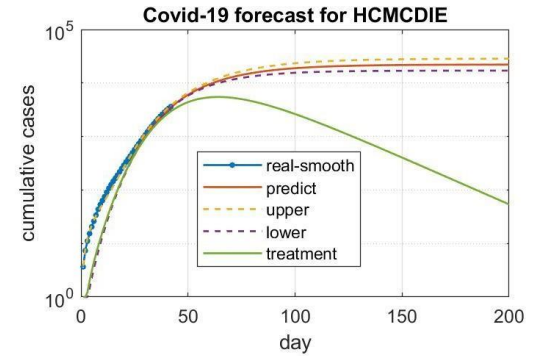
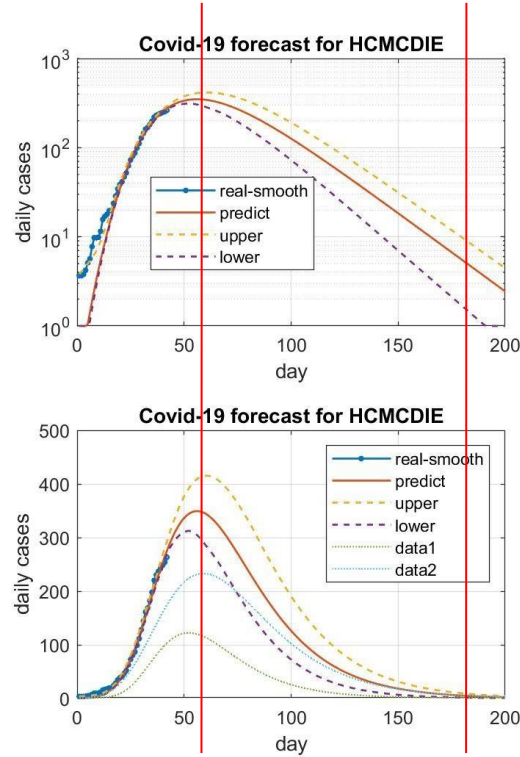
10/12/2021

Forecast of reported F0 cases by district



Forecast of deaths, less optimistic scenario for the city

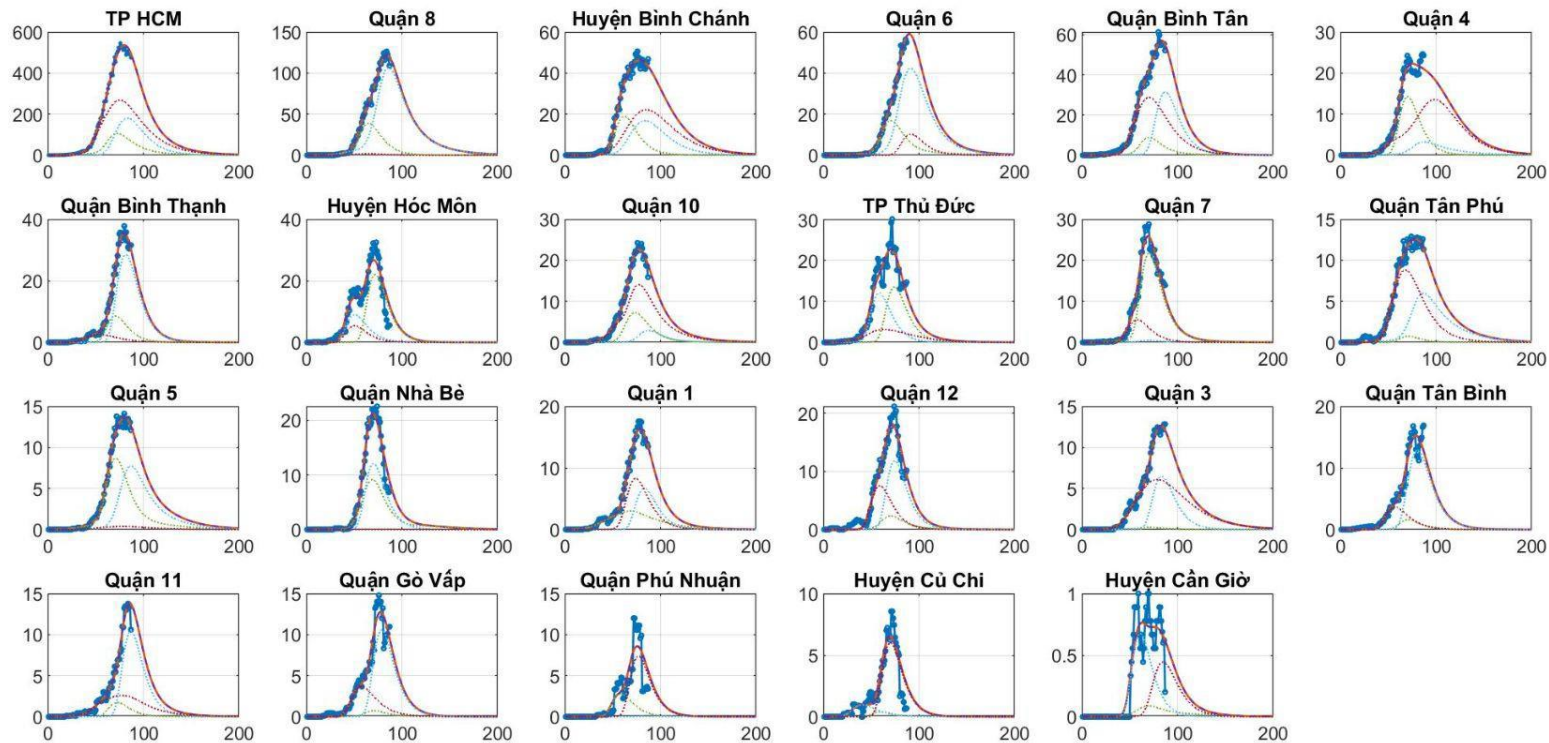
A total of 17 to 28 thousand deaths, in the case the epidemic lasts until the end of December 2021, and there is no change in the effectiveness of treating severe cases.



25/8/2021

30/12/2021

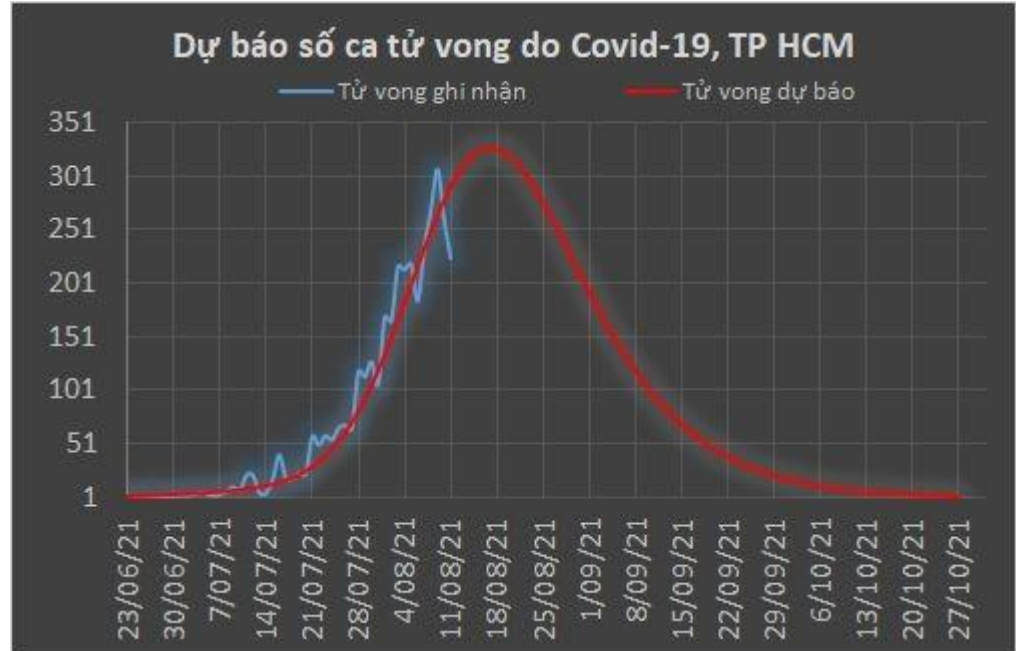
Forecast of symptomatic cases by district



Forecast of deaths, relatively optimistic scenario for the city

A total of 13-19 thousand deaths if there is no change in the effectiveness of treating severe cases.

The actual number may be higher if deaths at home are not clearly recorded as to the cause.



Analysis – Forecast
Model by Dr. Quoc Tran
Walmart Labs, USA

(Based on symptomatic case data up to Aug 8)

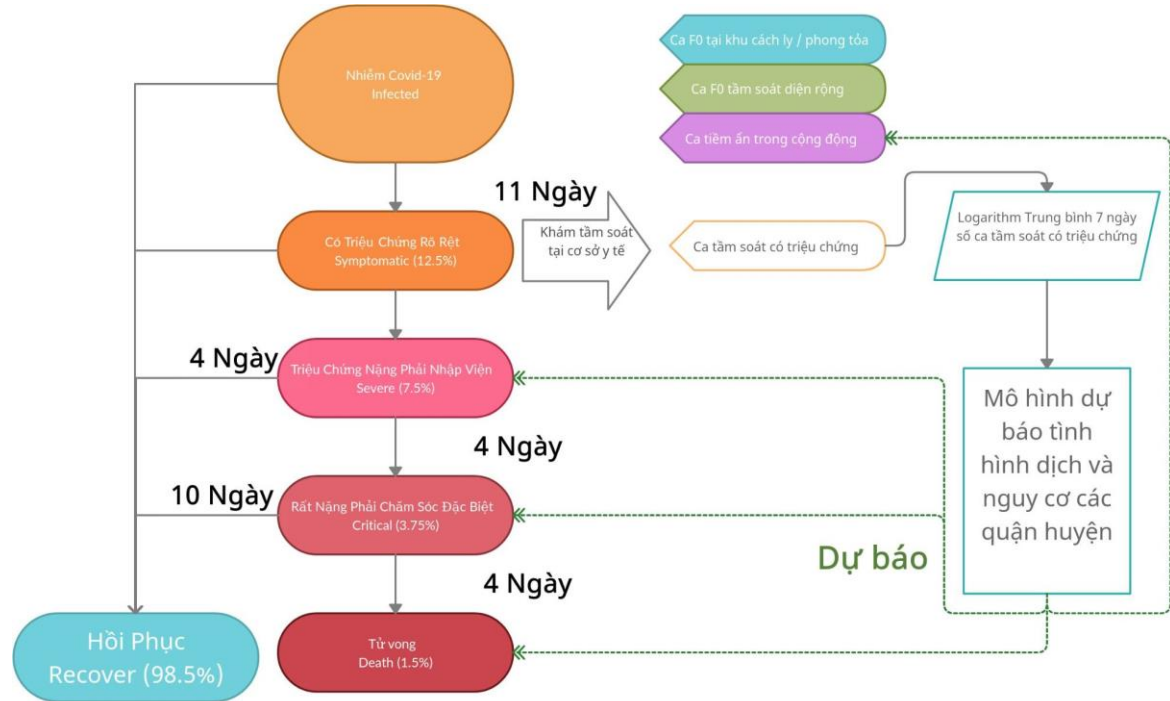
<https://covid19.aipert.org/>

PWLLoS Model - General Assessment

- 11 days after starting enhanced Directive 16 implementation, the number of screened symptomatic cases peaked and started decreasing from Aug 2. Infection rate $R_0=0.98$. At the current rate of decrease, it will not be until early October that the epidemic situation returns to the level of early July, when Directive 16 began.
- The number of daily new severe cases will continue to increase until around Aug 11. At the same time, the daily number of deaths will continue to increase and only peak in mid-August. As all treatment levels are already overloaded, the pressure on the healthcare system is very large and may increase the mortality rate by about 30% during the overload period because severe patients have no place for treatment.
- Except for District 8 which is flattening at a high level with an increasing trend, the infection forecast curves for other districts are all good, with 13 districts having a decreasing trend, 10 districts having a flattening trend at a low level.
- The accuracy of the model depends heavily on the accuracy of the number of reported screened symptomatic cases. When changing the isolation model for F1 and asymptomatic F0, the F0 number will lose its meaning in assessing the epidemic situation, the number of screened symptomatic cases becomes very important. In addition, the number of new severe cases or daily deaths can be used.

PWLLLOS Model: based on number of community screened symptomatic cases

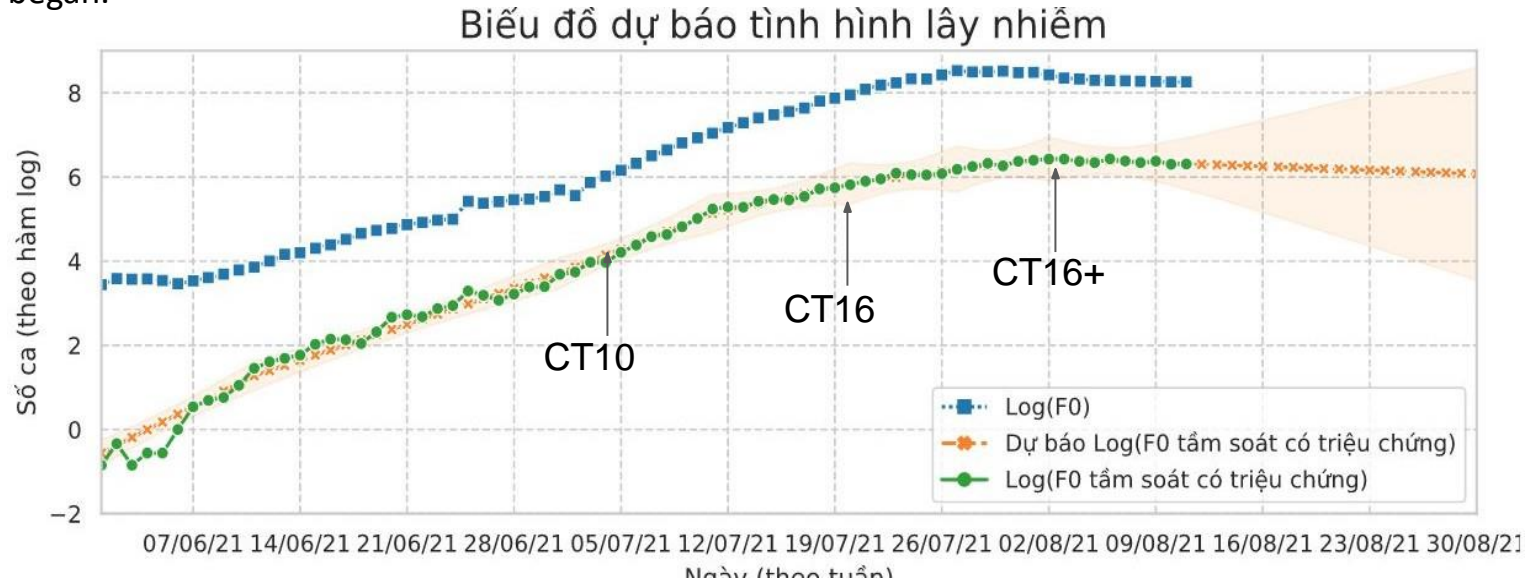
- Under the same social distancing policy, the logarithm line of the number of symptomatic infections screened in the community is a straight line, the "infection line".
- This infection line changes 11 days after a new policy takes effect (corresponding to the average number of days from initial infection to clear symptoms requiring hospital visit).
- The model depends on the accuracy of the number of screened symptomatic cases.



Notes: phân loại và tỉ lệ dựa theo <https://www.cebm.net/covid-19/global-covid-19-case-fatality-rates/>, <https://www.uptodate.com/contents/covid-19-clinical-features?topicRef=126981>

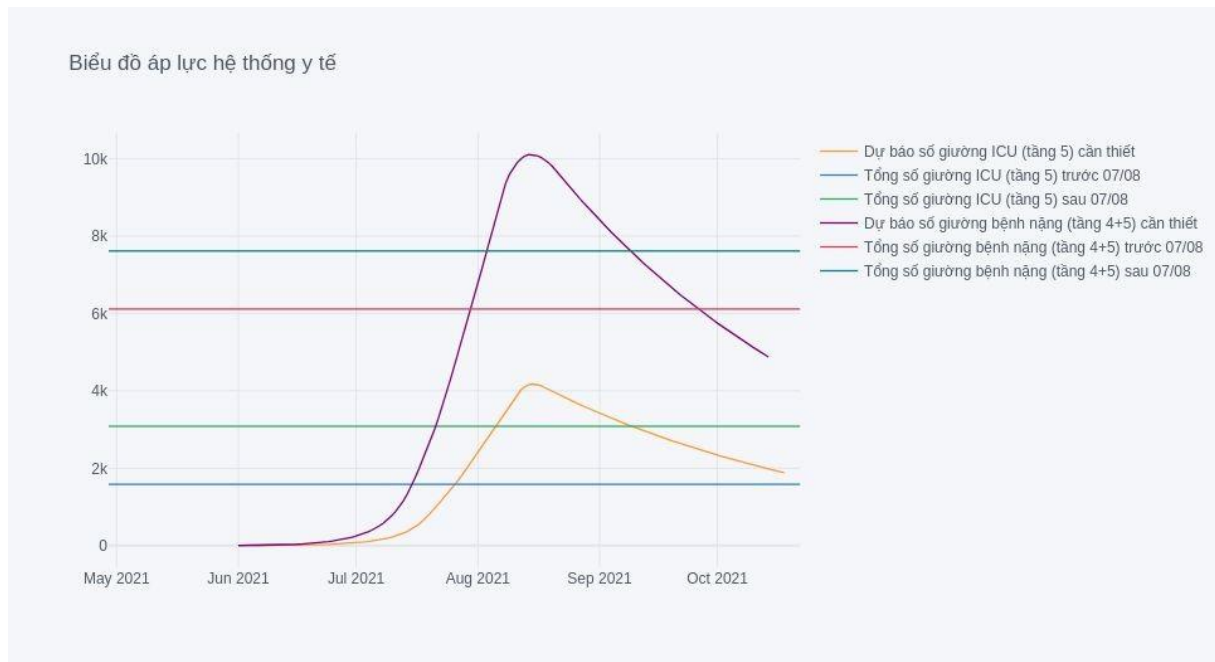
PWLLoS Model: citywide epidemic trend

- The Directive 16 period was similar to the Directive 10 period, the epidemic trend was still increasing because it was not tightened at production facilities and industrial zones.
- 11 days after starting the enhanced Directive 16 implementation, the number of screened symptomatic cases peaked and started decreasing from Aug 2. Infection rate $R_0=0.98$. At the current rate of decrease, it will not be until early October that the epidemic situation returns to the level of the second week of July, when Directive 16 began.



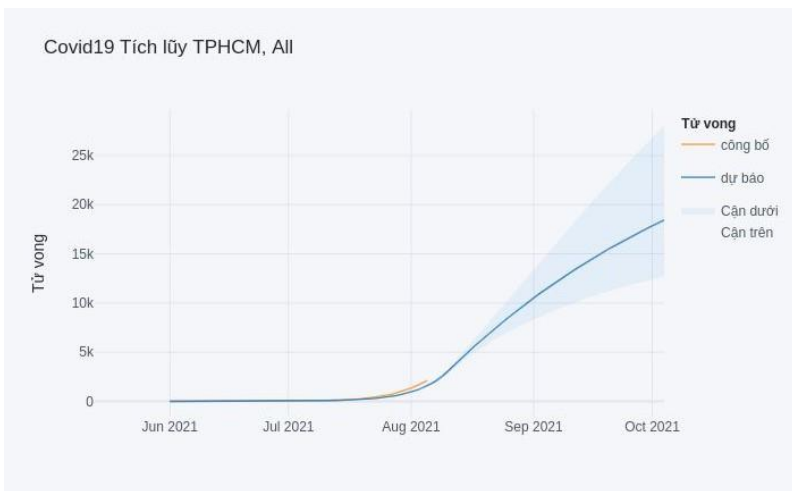
Forecast of pressure on the healthcare system

- The number of new severe cases per day will continue to increase until around Aug 11.
- The treatment level system will remain overloaded until early September.
- Lacking over 1000 Level 5 beds at the peak (Aug 15).



Death forecast

- The daily number of deaths will continue to increase and only peak in mid-August. Forecast based on death data provided by Dr. Nguyen Thu Anh and 5F team.
- When the Level 5 treatment system is overloaded, the number of deaths may increase by about 30% compared to this forecast.
- Need to collect data on deaths outside the hospital system to assess the level of overload.



Covid19 Số Hàng Ngày TPHCM, All



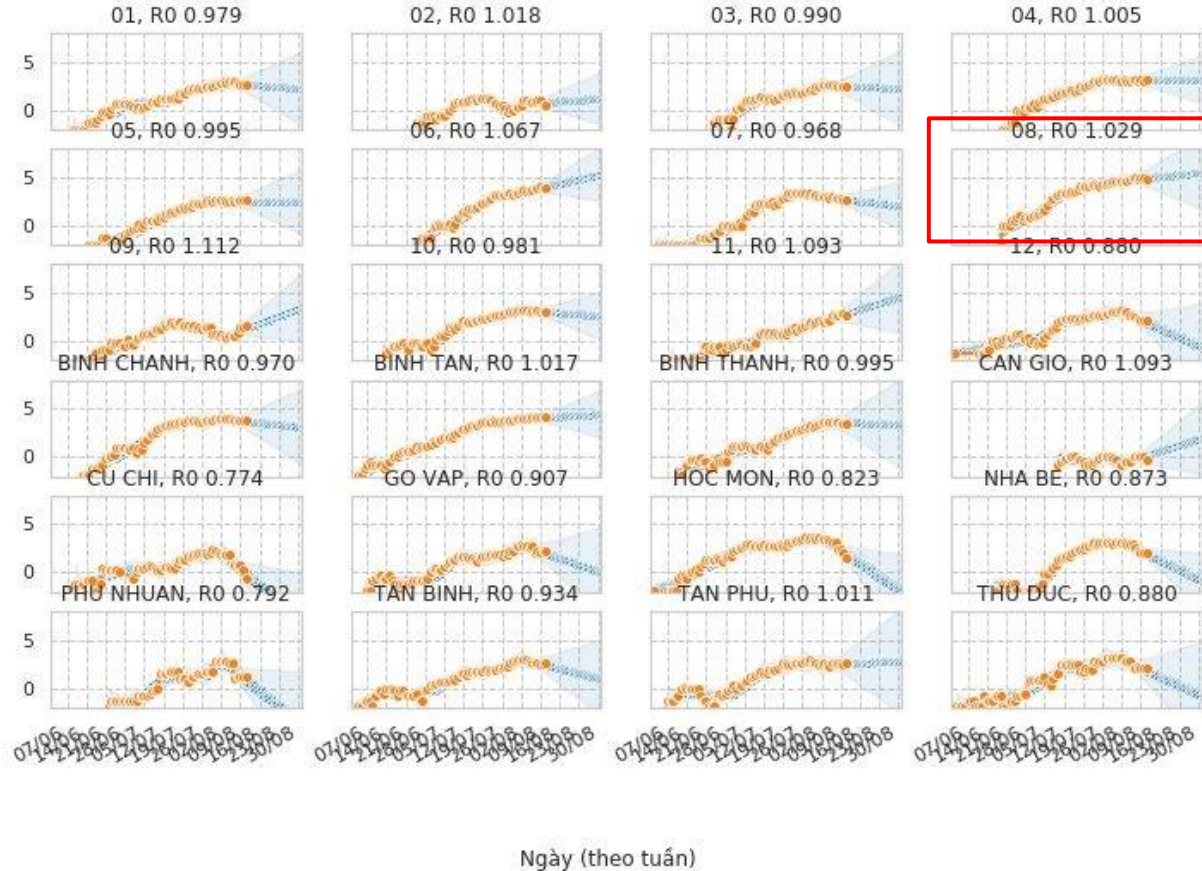
Đường logarithm của số ca tử vong hàng ngày



Dự báo tình hình dịch theo số ca tâm soát có triệu chứng

- District 8 is flattening at a high level, with a tendency to increase again
- Flattening at a low level: Districts 4, 6, 9, 11, Binh Tan, Binh Thanh, Tan Phu
- Decreasing: Districts 1, 2, 3, 5, 7, 10, 12, Binh Chanh, Can Gio, Cu Chi, Go Vap, Hoc Mon, Nha Be, Phu Nhuan, Tan Binh, Thu Duc

Số ca tâm soát có triệu chứng (theo hàm log)



Charts of district-specific epidemic trends - District name, R0 value

Scenario of Directive 19 from Aug 31: Forecast of pressure on the healthcare system

- If implementing Directive 19 from Aug 31, the number of severe cases and cases needing ICU will continue to decrease until Sep 18.
- However, the number of severe and critical cases needing ICU will increase again very quickly and the system will be overloaded around Sep 24 and by early October will be 3 times the current data.



Some proposals

Roadmap to return to the new normal

Summary

- Data needs to be collected accurately, fully, and updated to serve statistics, forecasting, and decision making
 - Should improve data aggregation and analysis to better support decision making
- Criteria for gradually returning to normal state: Directive 16+ (Jul 26) → Directive 16 (Jul 9) → Directive 10-UB (Jun 19) → Directive 15 (May 31)
 - Refer to WHO recommendations
 - Refer to models from countries such as Australia, Singapore, Thailand
 - HCMC specifics → pilot model
 - Root of the problem: Distancing → Control the spread → R_0 number must be low, vaccination rate increases
 - How to trace quickly and effectively when new cases occur? → Current tools need improvement

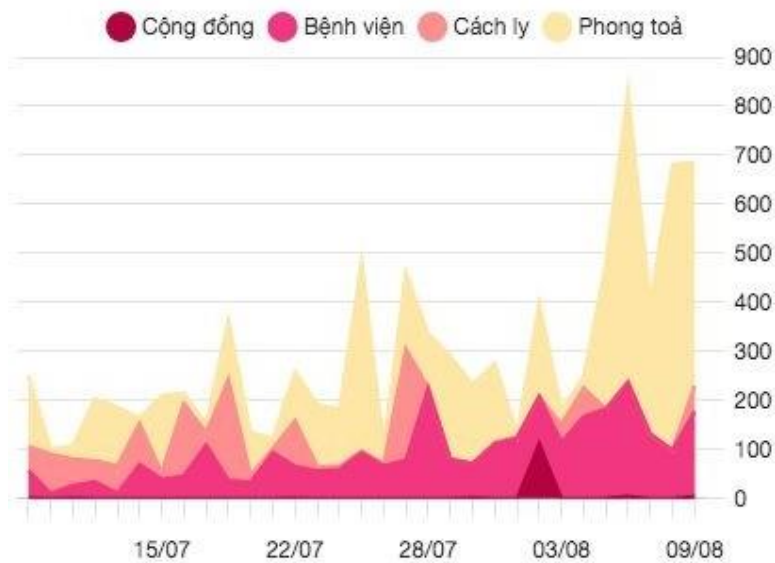
Response Scenarios → Forecast of High-risk Districts

- The forecast model shows that District 8 is currently a high-risk district (based on daily information on symptomatic F0 cases, based on the citywide epidemic situation)
- Need to verify through a summary dashboard → explain why?
 - F0 charts on spread situation, classifying infection cases → number of community infections increasing
 - Vaccination situation
- Actions
 - Check compliance with social distancing in lockdown areas ○ Increase community testing
- Technology support
 - Require declaration → HCMC Health Declaration App
 - Use surveillance cameras to warn and handle cases of distancing violations
 - Deploy home isolation app for F1
 - Advocacy and mobilization
 - Social security support → minimum living needs of food, medicine, sanitation

District 8 - Verifying the forecast

Số ca dương tính

phân theo ngày công bố của Bộ Y Tế

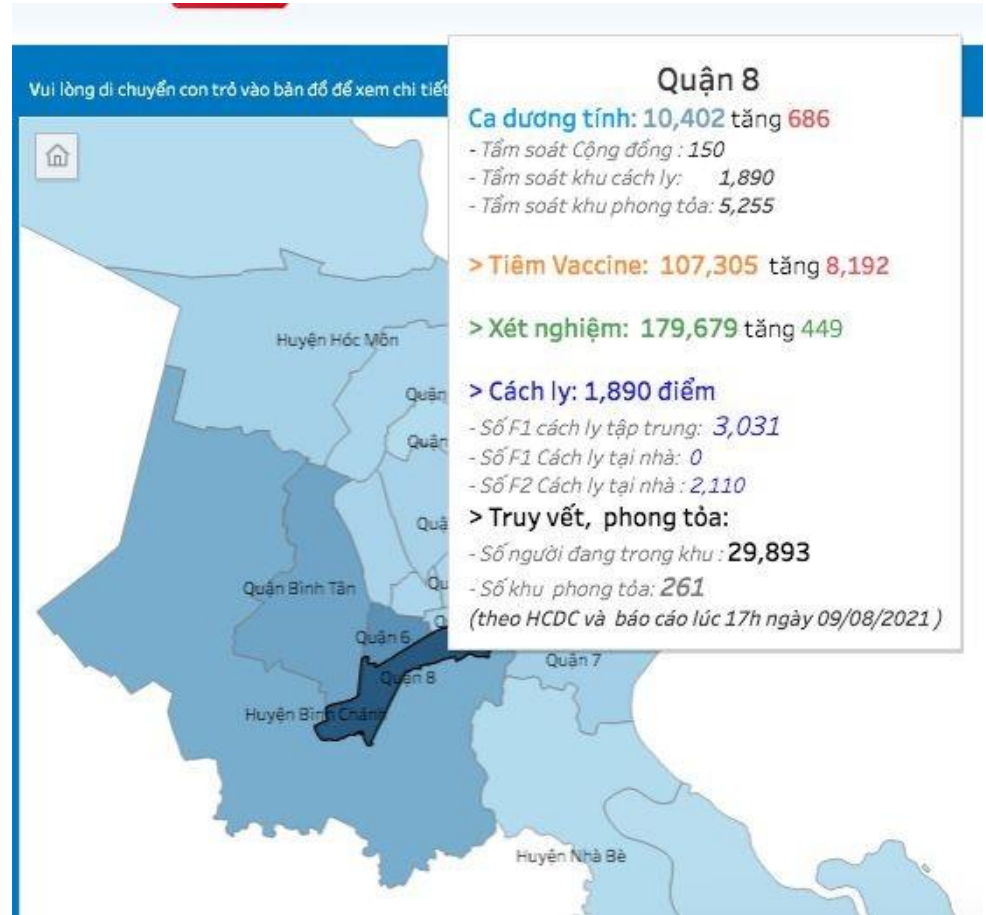


Số tiêm Vaccine so với tổng số dân

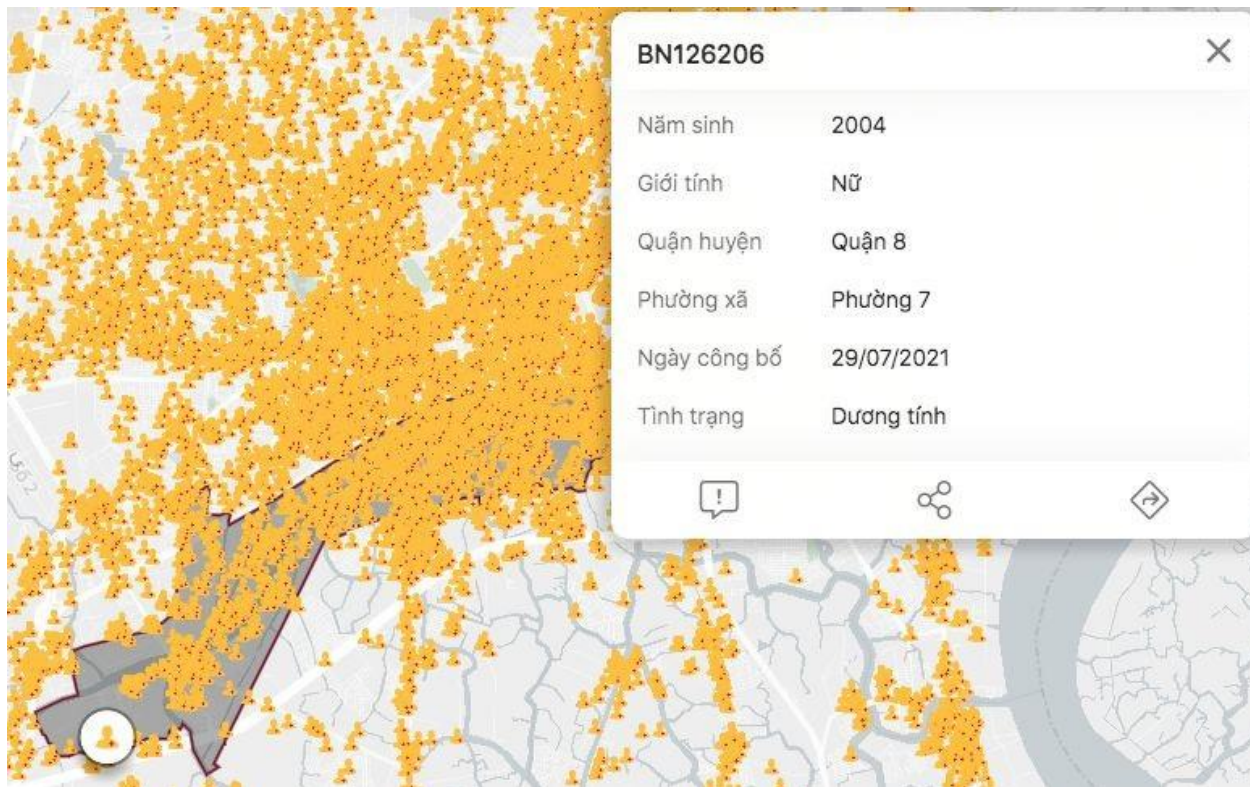
Huyện Hóc Môn	74,765 (đạt 13.79% dân số)
Huyện Nhà Bè	30,758 (đạt 14.87% dân số)
Quận Bình Tân	121,708 (đạt 15.52% dân số)
Quận Bình Thạnh	81,853 (đạt 16.40% dân số)
Quận Gò Vấp	126,432 (đạt 18.68% dân số)
Quận 12	127,523 (đạt 20.56% dân số)
Huyện Bình Chánh	154,393 (đạt 21.88% dân số)
Quận 8	107,305 (đạt 25.27% dân số)
Quận Tân Phú	124,312 (đạt 25.61% dân số)
Huyện Củ Chi	119,915 (đạt 25.95% dân số)
Quận 3	50,913 (đạt 26.74% dân số)
Quận 4	52,628 (đạt 30.02% dân số)
Quận 10	75,621 (đạt 32.20% dân số)
Quận Tân Bình	160,034 (đạt 33.71% dân số)
Thành phố Thủ Đức	383,345 (đạt 37.81% dân số)

District 8 - Verifying the forecast

- The information and tools available are quite sufficient for verification, but the accuracy and updating of data and the convenience of using tools still need further improvement
- Some necessary information is not yet collected



District 8 - Verifying the forecast



Data issues

- Which positive case number is correct? 3959 (HCMC) or Ministry of Health (3991)
- Mainly just cumulative numbers, no daily numbers (time series data)
- To assess the transmission risk of shippers → no information

18:25 09/08/2021

THÔNG BÁO VỀ 4.185 CA MẮC MỚI

Trong đó 02 ca nhập cảnh và 4.183 ca ghi nhận trong nước tại TP. Hồ Chí Minh (1.642), Bình Dương (1.162), Đồng Nai (355), Tiền Giang (251), Tây Ninh (133), Hà Nội (74), Cần Thơ (71), Bà Rịa - Vũng Tàu (65), Đà Nẵng (60), Đồng Tháp (59), Phú Yên (53), Bình Định (45), Bình Thuận (34), Khánh Hòa (33), Lâm Đồng (30), Quảng Ngãi (18), Trà Vinh (15), Hà Tĩnh (15), Nghệ An (12), Quảng Nam (11), Ninh Bình (10), Thừa Thiên Huế (10), Hải Dương (7), Bình Phước (5), Quảng Bình (3), Đắk Lắk (3), Hậu Giang (3), Thái Bình (2), Kiên Giang (1), Bắc Giang (1) trong đó có 770 ca trong cộng đồng.

- Trong ngày 09/8 ghi nhận 9.340 ca nhiễm mới, trong đó 17 ca nhập cảnh và 9.323 ca ghi nhận trong nước tại TP. Hồ Chí Minh (3.991), Bình Dương (2.887), Đồng Nai (538), Tây Ninh (290), Long An (287), Tiền Giang (251), Bà Rịa - Vũng Tàu (242), Cần Thơ (98), Phú Yên (84), Hà Nội (78), Đồng



Forecasting issues - decision support

- The information on <https://covid19.hochiminhcity.gov.vn/> is simply displaying and aggregating data, no forecasting yet
 - Currently taking forecasts from antoancovid site → haven't seen verification of whether the forecasts are correct
- Information is still scattered, needs to be concentrated on a dashboard to support decision making
 - Typically, results from many different models are needed to be able to cross-validate

Some proposals - 1

- To achieve a "new normal" state with the epidemic controlled
 - Most likely cannot immediately return to normal at the same time but will gradually return and by "green zones"
 - Protect each "green zone"
 - Ensure the 5K's, especially the distancing factor
 - Effectively use technology to quickly trace and potentially quickly remove "infected elements" from "green zones"
- Need to develop a set of measurement criteria to determine "green zones"
- HCMC's current situation: Need to reduce pressure on hospitals → goal to reduce deaths
 - Need close coordination between the F0 triage system in the early stage, home-based F0 care (Local health, Community health/Companion doctors...) with hospitals at different levels
- Find sources and speed up vaccinations to ensure herd immunity

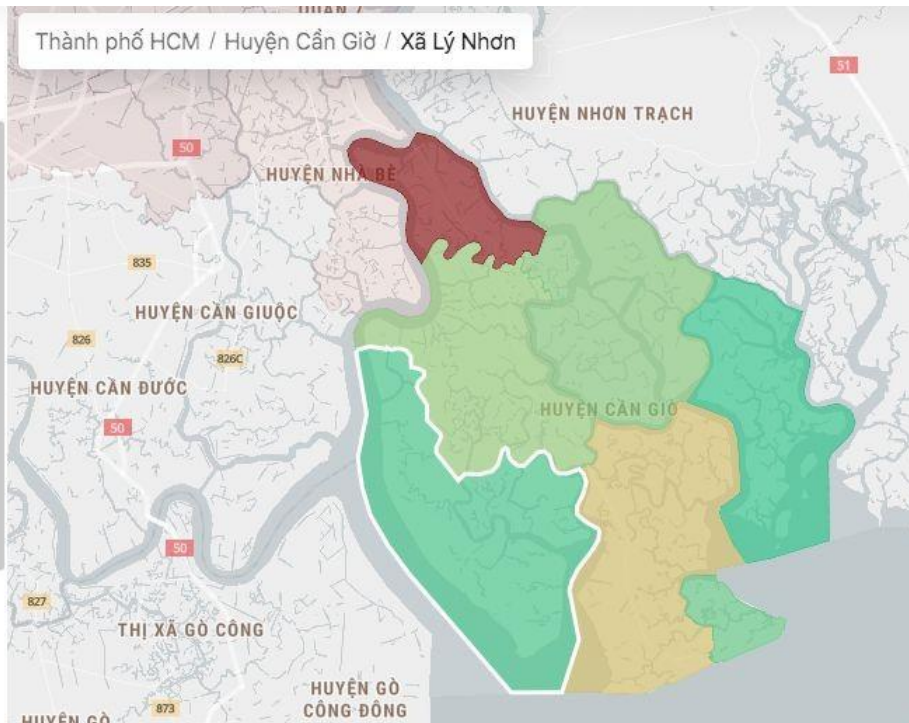
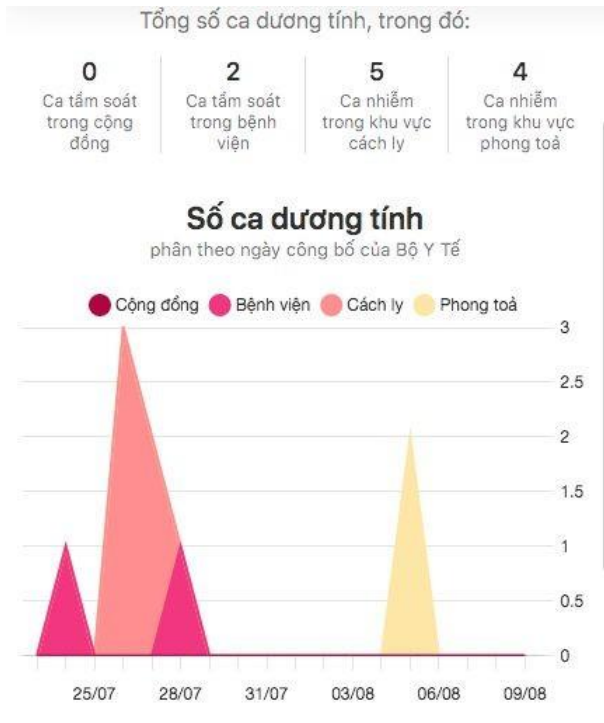
Some proposals - 2

- The issue of data collection needs to be improved
- Criteria for updating distancing policies + technology support
 - Control transmission → collect information with traceability → check-in QR app of Dept of Information & Communications & Dept of Health
 - Control implementation of distancing → camera monitoring app
 - Community-based health capacity to care for mild F0 → remote F0 care app on technology platform by volunteer doctors from Companion Doctors, Community Health Teams. Help me, 1022 → reduce burden.
 - Health capacity of the whole system → sufficient capacity to prevent when outbreaks occur
 - Forecast of F0, management of transmission chains
- Evaluate criteria based on data → summary dashboard
 - Already have sites like covid19-tphcm, antoancovid ○ But need to do better

Some proposals - 3

- Pilot testing for export processing zones, industrial zones - temporarily not testing for residential areas. Reasons:
 - Easier to control entry and exit of Export Processing Zones, Industrial Zones
 - Awareness of workers' compliance with distancing is easier to control
 - High vaccination rate
 - Number of workers is not too large
 - Limit the travel distance of workers within a 5km radius
- Data to Industrial Zones, Export Processing Zones has not been fully collected

Can Gio District - Ly Nhon Commune



Thank you very much!

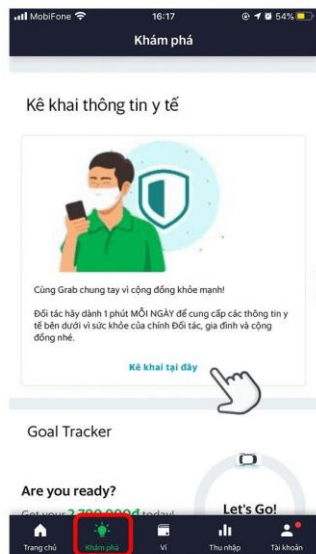
**Reference: Grab's application of IT
in epidemic prevention**

Grab

- Grab stores information about trips including shipper and recipient (address, phone number) and contact time. Whenever a shipper is known to be positive, related people will be notified.
- Whenever a trip starts, the passenger must make a health declaration and the QR-code must be saved on the system. Grab will fine the shipper if the trip does not have a QR-code or the QR-code is invalid.

Grab

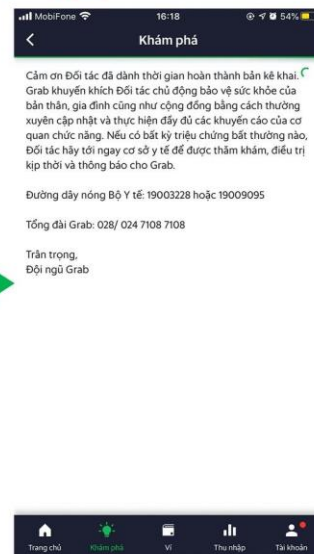
Hướng dẫn Kê khai thông tin y tế **BẮT BUỘC** mỗi ngày



Nhấn **Khám phá**
> **Kê khai thông tin y tế**
> **Kê khai tại đây**

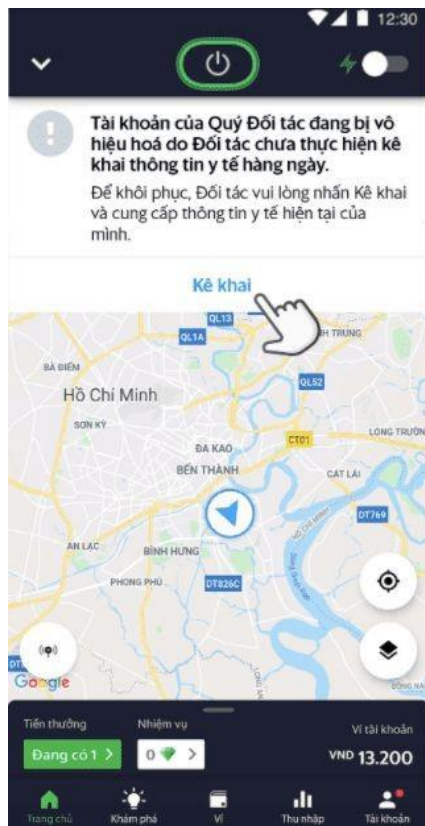


Đọc và xác nhận
tất cả các hạng mục sau đó nhấn **Gửi**



Hoàn tất! Đổi tác vui lòng lặp lại quy trình xác nhận này **mỗi ngày** để duy trì hoạt động tài khoản.

Grab



Trường hợp không kê khai thông tin y tế trong vòng **24 GIỜ kể từ lần kê khai gần nhất**, tài khoản của Đối tác sẽ bị **tạm khoá**.

VD: Đối tác khai báo y tế lần gần nhất vào lúc 08:00 sáng ngày 09/06 sẽ bị tạm khoá tài khoản từ 08:00 ngày 10/06 nếu không tiếp tục thực hiện việc khai báo.

Đối tác có thể **tự khôi phục hoạt động tài khoản** bằng cách nhấn **Kê khai** tại thông báo tạm khoá ở màn hình chính (như trong hình minh hoạ) hoặc truy cập mục **Khám phá** và thực hiện việc khai báo y tế.

Tài khoản của Đối tác sẽ được khôi phục **ngay sau khi khai báo thành công!**

Grab

Chụp hình

Xác thực khuôn trang



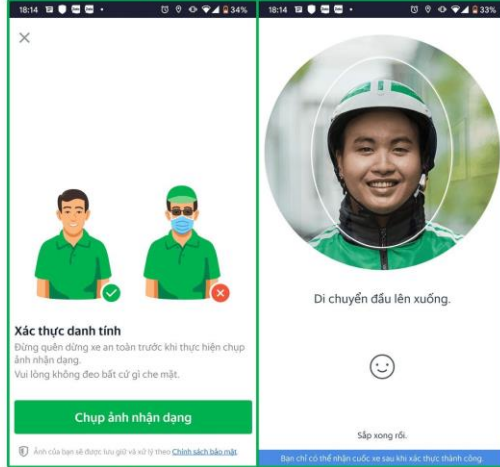
Hiển thị trong mục
**Kê khai thông tin y tế
bắt buộc hàng ngày**

Đối tác **bắt buộc**
đeo khẩu trang khi chụp hình

Chỉ cần thực hiện
01 lần duy nhất mỗi ngày

Chụp hình

Xác thực danh tính bằng khuôn mặt



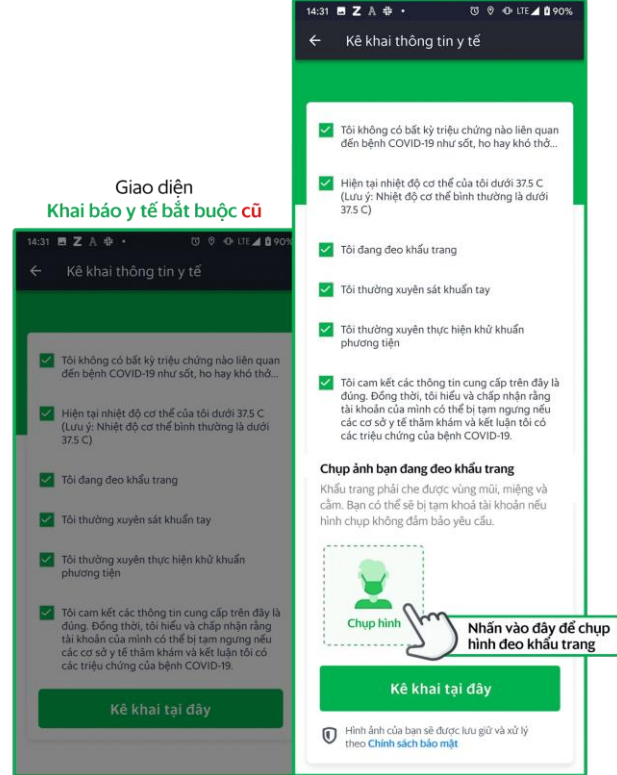
Tự động hiển thị khi
Đối tác mở ứng dụng/sẵn sàng nhận cuộc

Yêu cầu Đối tác
KHÔNG đeo khẩu trang khi chụp hình

Đối tác có thể được yêu cầu
thực hiện **nhiều hơn 01 lần/ngày**

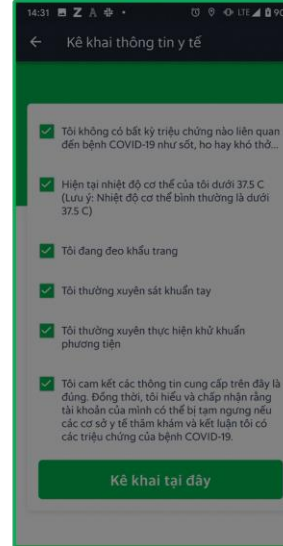
Giao diện

Khai báo y tế bắt buộc từ 23/07/2020



Giao diện

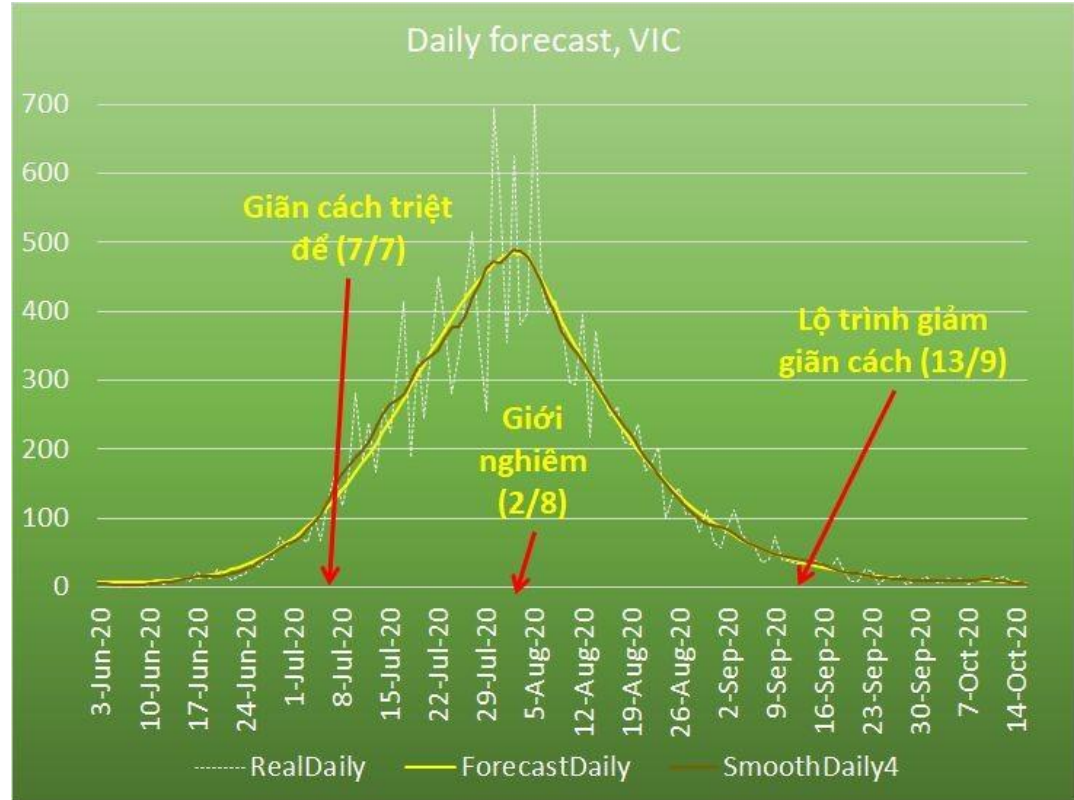
Khai báo y tế bắt buộc cũ



Reference: Social distancing policy of Victoria,
Australia during the July 2020 outbreak 112 days
of distancing

Reference model from Victoria, Australia

- Went through 112 days of distancing from June 2020 to October 2020
- Peak of 700 cases/day - reached on Aug 5, 2021 after nearly 60 days of distancing
- In 2020 it was not the Delta variant



Epidemic situation in Victoria, Australia

- On Jul 7, 2020, Victoria state (population 6.7 million) implemented social distancing according to the Prime Minister's Directive No. 15 for 15 days, when the number of daily recorded cases reached a peak compared to before - 165 new cases
- By Oct 28, 2020 (only 4 new cases, 1 death), started easing travel restrictions, at this time Victoria had over 20,300 COVID-19 cases and 817 deaths.
- After Sep 28, 2020, if the average number of daily cases decreased to about 30-50 cases for 14 consecutive days, the city would apply stage 3 restrictions, whereby outdoor gatherings could be allowed to increase from 2 to 5 people. In addition, schools or childcare facilities, some industries would also be allowed to operate again.
- Also according to Mr. Andrews, after Oct 26, 2020, if the daily infection rate fell below 5 cases for 2 weeks, the restrictions would be lifted.

Epidemic situation in Victoria, Australia

- The spread of COVID-19 in Australia began to slow down when on Aug 11, 2020 the country recorded just over 350 new cases, a decrease of more than 50% compared to Aug 5, 2020.
- The 2nd COVID-19 outbreak in Victoria was thought to have passed the peak after the state recorded a record number of infections in one day of 725 cases on Aug 5, 2020. The epidemic situation then gradually turned positive and on Aug 11, 2020, Victoria recorded only 331 new cases (a 50% decrease).
- Although the number of infections decreased, the number of deaths was at a very high level. The state had 19 more deaths, equal to the number of deaths recorded on Aug 10, 2020. Thus, in just the past 10 days, Australia had 200 deaths due to the COVID-19 epidemic.
- During the peak period, the state reported more than 700 new nCoV cases per day, but strict social distancing and lockdown measures helped control the epidemic.

Current Statistics

Distancing Milestones

- Directive 15: 37 days from May 31 - Jul 8
- Directive 16: from Jul 9 - Jul 23 - Aug 1 - Aug 15
- May 31 - Jun 14: HCMC implemented social distancing according to the Prime Minister's Directive No. 15 for 15 days, only Go Vap District and Thanh Loc Ward, District 12 distanced according to Directive 16.
- Jun 15 - Jun 29: Chairman of HCMC People's Committee Nguyen Thanh Phong continued to direct social distancing across HCMC according to Directive 15 for another 2 weeks.
- Jun 19: HCMC People's Committee issued Directive No. 10 on tightening and strengthening measures to prevent and control the COVID-19 epidemic in HCMC; temporarily suspending spontaneous markets, stopping public passenger transport... until now.
- Jul 9 - Jul 23: HCMC implemented social distancing according to Directive 16 across the city, applied for 15 days.
- Jul 22: Directive 12 of the City Party Committee on strengthening some measures to implement Directive No. 16
- Jul 24 - Aug 1: Additional 8 days of Directive 16
- Jul 26: People not allowed to go out from 6PM
- Aug 2 - Aug 15: HCMC government decided to continue implementing social distancing according to the Prime Minister's Directive 16 for another 14 days

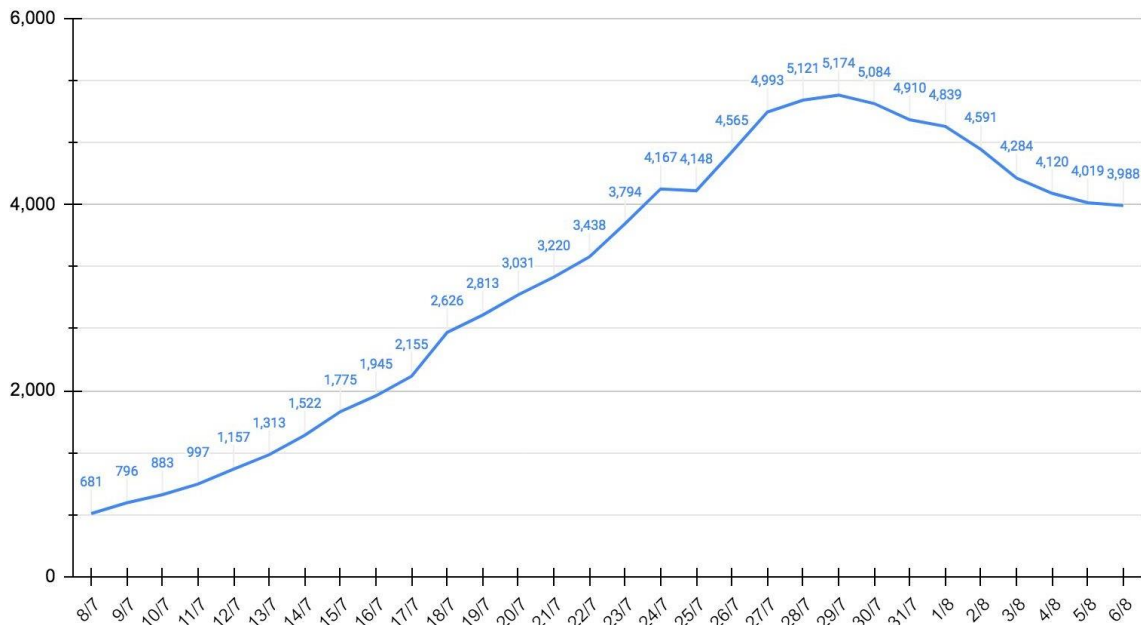
Epidemic situation as of Aug 6, 2021

- ● On Jul 9, 2021, HCMC began implementing distancing under Directive 16. At that time, the average number of cases was below 1K cases/day, and the total number of cases was 10K. Organizing treatment according to the 3-level model as guided by the Ministry of Health.
- As of Jul 25, 2021, before tightening distancing with Directive 12-TU and not allowing going out after 6PM (on Jul 26, 2021), the total cumulative number of cases was 60.4K, an increase of 50.4K after 16 days, an average of more than 3.1K/day.
- As of Aug 6, 2021, the cumulative number of cases was 114K, an increase of 54K after 12 days, an average of 4.5K cases/day. Organizing treatment according to the 5-level model. Number of patients treated 33K cases (from level 2 to level 5), of which levels 3-4-5 have almost reached maximum treatment capacity.

Epidemic situation as of Aug 6, 2021

- The peak was reached on Jul 29 (Jul 27 was the day with the largest absolute number)
- The time from applying Directive 16 to the epidemic tending to decrease was 21 days

Số ca mỗi ngày (trung bình 7 ngày) từ 09/07/2021 đến 06/08/2021



Epidemic situation in Southeast Asian countries

Epidemic situation in Southeast Asian countries

- Countries are increasing the number of daily cases but the number of daily deaths is lower than Vietnam
- Thailand on Aug 7 recorded an additional 21,838 cases and 212 deaths from COVID-19 in 24 hours, both the highest daily increases since the beginning of the epidemic, bringing the total number of cases nationwide to 736,522, of which 6,066 died.
- The Philippines, on Aug 6 recorded an additional 10,623 cases in 24 hours, the highest daily increase in nearly 4 months, bringing the total number of cases nationwide to over 1.6 million. The Philippines also recorded an additional 247 deaths, bringing the total number of deaths from COVID-19 to 28,673.
- Malaysia, on Aug 6 recorded an additional 20,889 cases in 24 hours, setting a record for the number of new daily cases for the third consecutive day, bringing the total number of cases nationwide to over 1.2 million. On the same day, Malaysia also recorded an additional 160 deaths from COVID-19. The whole country has nearly 10,200 deaths.

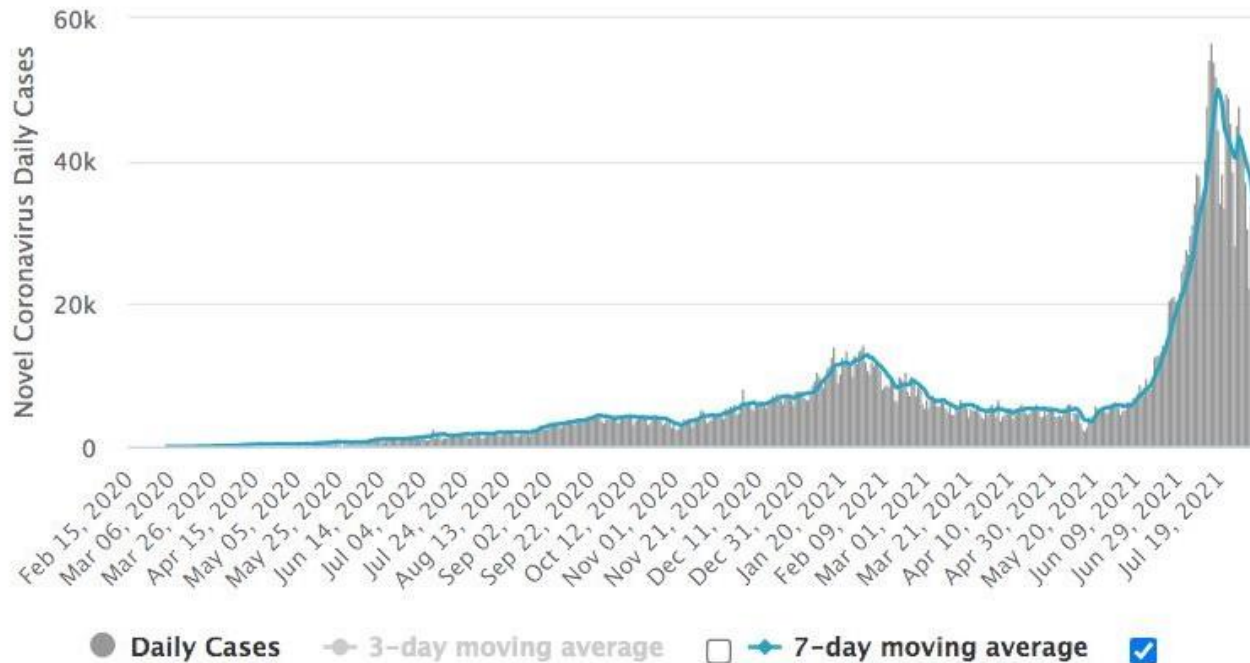
Epidemic situation in Southeast Asian countries

- On Aug 2, the Indonesian Minister of Health declared that the new wave of COVID-19, which is turning this country into the epicenter of the prolonged outbreak in Asia in recent weeks, had peaked.
- The spread of the Delta variant, first identified in India, has exploded in Indonesia. On Jul 15, 2021, the country recorded up to 56,757 new COVID-19 cases, the highest number in Indonesia to date. The number of COVID-19 deaths also reached a record high on Jul 27, 2021 with 2,069 cases.
- According to the Indonesian Minister of Health, the number of new daily COVID-19 cases has decreased, with an average of 33,800 cases per day last week, but the positivity rate for SARS-CoV-2 remains high.
- Indonesia has recorded more than 3.4 million COVID-19 cases and 95,000 deaths, although public health experts say the actual number could be many times higher.

Daily New Cases in Indonesia

Daily New Cases

Cases per Day
Data as of 0:00 GMT+0



**On the issue of mortality and the
response of the healthcare system**

Thailand from Jul 9

- Total cumulative F0 cases increased from 317,506 to 714,684 → 397K
- Total active F0 cases increased from 74,895 to 212,926 → 138K
- Number of deaths increased from 2,534 to 5,854 → 3.5K cases
- Number of daily deaths is increasing → 197 cases/day (peak)
- Mortality rate/active F0 cases: 2.5%

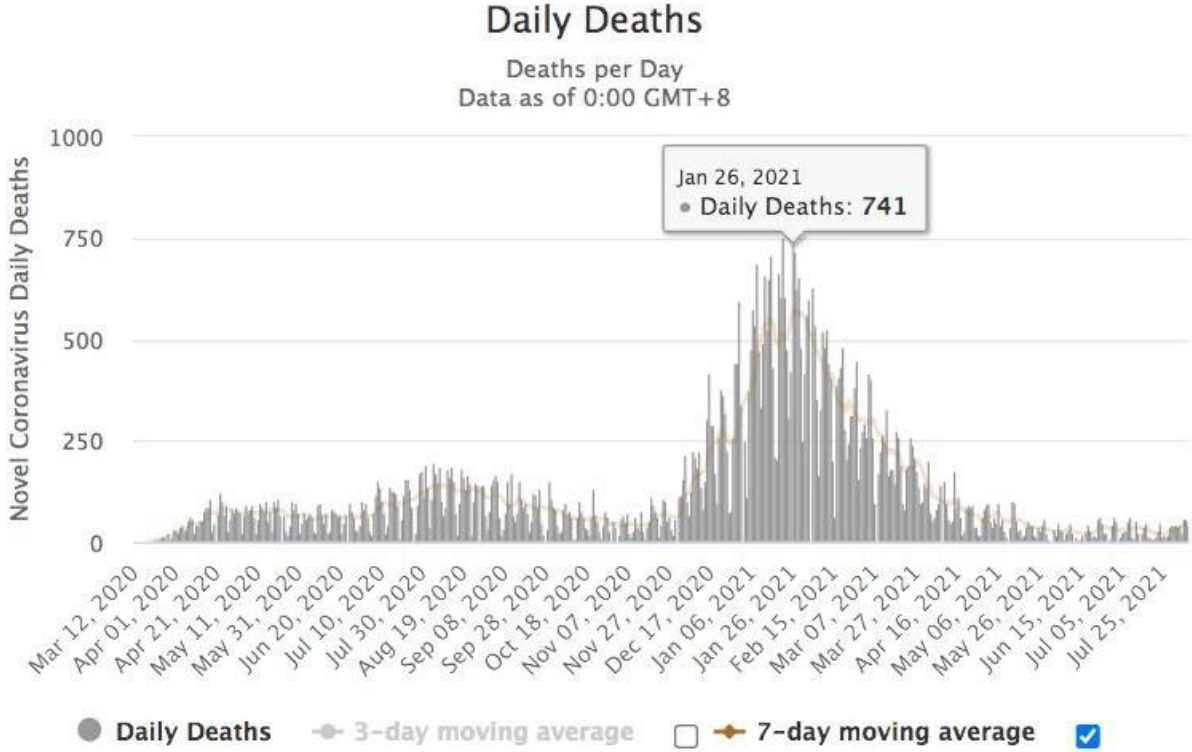
HCMC from Jul 9

- Total cumulative F0 cases increased from 10,295 to 113,976 → 104K
- Total active F0 cases → 50K
- Number of deaths: 2.3K cases,
- Number of daily deaths is increasing - 219 cases/day (peak)
- Mortality rate/active F0 cases: 4.6%
- → The mortality situation in HCMC is in an alarming state

Daily New Deaths in Italy



Daily New Deaths in California



Notes

- Analysis results are based on data provided by HCMC Dept of Information & Communications from Jun 21, 2021 to present (with data confidentiality terms)
- The forecasting analysis models are based on outbreak data from countries such as the USA, India, and data from previous days of the outbreak in HCMC and other provinces/cities of Vietnam to frequently fine-tune model parameters, ensuring updates with the developments and specifics of outbreaks
- Forecasting results are for reference only and need to be reviewed by medical and epidemiological experts
- This report focuses on the developments of the number of F0 cases, number of deaths, and the treatment response of the HCMC healthcare system