The Overview of Shanghai on Combating Covid-19 Epidemic of April 6, 2022[1]

by George Yuan on April 7, 2022

The Background

Based on the data available from the Shanghai Government Health Committee on combating the COVID-19 epidemic from March 1, 2022 to April 6, 2022 with the so-called "Term Structure for the Turning Period" (see [2]) to support the management of the emerging risk associated with the battle of the COVID-19 epidemic in Wuhan (see reference [1-10]) more than two years ago, we conducted an analysis based on the framework of ISEIR model (see [2-3]) to obtain the following basic conclusion and expectations for the Overview of Shanghai Action on Combating COVID-19 Epidemic of April 6, 2022 from now to the next few weeks.

I: The Introduction of Method Used for Analysis for Shanghai on Combating COVID-19 Epidemic

Starting on March 1, 2022, one leading city, Shanghai, faced another wave of COVID-19 infections with two typical behaviors (see Appendix 1 below):

1) The number of deaths from the category of "Confirmed Patients" (确诊病人)(in short, CP) is almost zero, and the CP number is not as high as two years ago in Wuhan; and
2) The only high number is from the category "Asymptomatic Patients"(无症状感染者) (in short, AP). Thus by following our dynamic management in terms of the "Term Structure for the Turning Period" (see Yuan et al. [2]), by emphasizing the Turning period to have the "significant change" for the daily change of AP with a number of days through the two key risk factors: 1) the AP & CP Delta; and 2) the AP & CP Gamma. The meaning of both factors is explained as follows in brief:

   Here, the **AP (reps., CP) Delta** is defined as the daily change of AP (resp., CP) number, which measures the daily change of the current situation for the entire Shanghai city on combating the COVID-19 Epidemic from March 1, 2022 to April 6, 2022.

   The second risk factor is called "**AP (resp., CP) Gamma**", which is the change of AP's (resp., CP's) daily change, which measures the potential force for the entire city how fast to produce new AP (resp., CP) people.

Once we have these two risk factors with four indices, they then allow us to establish a general dynamic standard to help us to make the necessary control and risk management to make sure the daily change of both CP and AP is below 10%, and both CP and AP are below 0.

II: Our Overview for Shanghai Action on Combating COVID-19 Epidemic

Based on the data and the basic standard listed above, we have the following conclusion and overview for the Shanghai Action on Combating COVID-19 from March 1, 2022 to today (April 6, 2022)：

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Conclusion 1:

The Peak time of the COVID-19 Epidemic starts on April 5, 2022 and would enter "Turning Period" from around the time phase of April 5, 2022 to April 8, 2022.

As of April 5, 2022, the current status on combating the COVID-19 epidemic in Shanghai is that it was approaching the beginning of the "Period of inflection Turing Point" starting on April 5, 2022, and by looking forward to tomorrow (April 7, 2022) and the day after tomorrow (April 8, 2002); in another word, the Turning Period for Shanghai this time is from April 5 to April 8, 2022. Starting on April 9, 2022 or April 10, 2002, the **Combating COVID-19 Epidemic in Shanghai is entering the second half.**

Conclusion 2:

The Under Control of Shanghai on the COVID-19 Epidemic Starting On Around April 10, 2022

At present (April 7, 2022), the increasing number of "**(asymptomatic) infected persons**" (AP) in Shanghai is still more than 10% (see the red number at the bottom of the last two lines from the table in Appendix A below), actually both Gamma CP and AP are now under zero since April 5, 2022, CP gamma and AP gamma are -143%, -78%, and -46%, -39%, which indicate the "increase in the number of Confirmed Patient (CP) and the symptomatic (asymptomatic) infected people (AP)" has little potential. This is a true return by the implementation of the comprehensive program for the "Isolated Home Control Policy" for epidemic prevention, as the one used successfully in Wuhan (China) starting in January 2020.

Conclusion 3:

The Overview of Shanghai for Epidemic Prevention on COVID-19 After April 10,2022

Based on the study and above conclusion, it is reasonably expected that:

(A): The "inflection point period" of epidemic prevention in Shanghai (please note that we do not the keyword "inflection point", please see Yuan et al. [1-2] for the reason) should start from April 5. We look forward to completing the transformation from April 5 to April 8.

(B): It is also expected to enter a controllable stage after April 9 and April 10 by the standard that "the daily change of increasing number of patients and the daily increase of (asymptomatic) infected persons are less than 10%".

Appendix A:

Daily Report from Shanghai municipal government health and Health Committee on COVID-19

Samples	Date	Confirmed Patient (in short, CP)	Asymptomatic Patient(In short, AP)	CP Delta	CP Gamma	AP Delta	AP Gamma
数据量	日期	确诊病人	无症状感染者	确诊病人的 Delta 指标	确诊病人的 Gamma 指标	无症状感染者 Delta 指标	无症状感染者 Gamma 的指标
1	2022/3/1	1	1				
2	2022/3/2	3	5	200%		400%	
3	2022/3/3	2	14	-33%	-117%	180%	-55%
4	2022/3/4	3	16	50%	-250%	14%	-92%
5	2022/3/5	1	28	-67%	-233%	75%	425%
6	2022/3/6	3	45	200%	-400%	61%	-19%
7	2022/3/7	4	51	33%	-83%	13%	-78%
8	2022/3/8	3	62	-25%	-175%	22%	62%
9	2022/3/9	4	76	33%	-233%	23%	5%
10	2022/3/10	11	64	175%	425%	-16%	-170%
11	2022/3/11	5	78	-55%	-131%	22%	-239%
12	2022/3/12	1	64	-80%	47%	-18%	-182%
13	2022/3/13	41	128	4000%	-5100%	100%	-657%
14	2022/3/14	9	130	-78%	-102%	2%	-98%
15	2022/3/15	5	197	-44%	-43%	52%	3198%
16	2022/3/16	8	150	60%	-235%	-24%	-146%
17	2022/3/17	57	203	613%	921%	35%	-248%
18	2022/3/18	8	366	-86%	-114%	80%	127%
19	2022/3/19	17	492	113%	-231%	34%	-57%
20	2022/3/20	24	734	41%	-63%	49%	43%
21	2022/3/21	31	865	29%	-29%	18%	-64%
22	2022/3/22	4	977	-87%	-399%	13%	-27%
23	2022/3/23	5	979	25%	-129%	0%	-98%
24	2022/3/24	29	1580	480%	1820%	61%	29889%
25	2022/3/25	38	2231	31%	-94%	41%	-33%
26	2022/3/26	45	2631	18%	-41%	18%	-56%
27	2022/3/27	50	3450	11%	-40%	31%	74%
28	2022/3/28	96	4381	92%	728%	27%	-13%
29	2022/3/29	326	5656	240%	160%	29%	8%
30	2022/3/30	355	5298	9%	-96%	-6%	-122%
31	2022/3/31	358	4144	1%	-91%	-22%	244%
32	2022/4/1	260	6051	-27%	-3339%	46%	-311%
33	2022/4/2	438	7788	68%	-350%	29%	-38%
34	2022/4/3	425	8581	-3%	-104%	10%	-65%
35	2022/4/4	268	13086	-37%	1145%	52%	416%
36	2022/4/5	311	16766	16%	-143%	28%	-46%
37	2022/4/6	322	19660	4%	-78%	17%	-39%

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Appendix B: The following are old story from April /2020.

Dr. George Yuan, Distinguished or Guest Professor at Chengdu University, Sun Yat-Sen University (Guangzhou, China), and East China University of Science and Technology (Shanghai, China), correctly predicts COVID-19 peaking in China since mid-February/2020 using a mathematical model called iSEIR.[1]

As the COVID-19 situation in China tails off, much attention has fallen onto a particular professor from Soochow University who predicted on 7 February 2020 – earlier than anyone – that the epidemic would peak around mid to late February in China.[2-5]

"If the isolation control program currently implemented continues with full force and the disclosed statistics are true, then considering the current situation and combining it with the simulation analysis of our internal iSEIR model[1], we believe 1 February 2020 is the start of the turning point of the COVID-19 epidemic situation in China, and a peak should be reached around the middle to end of February," wrote Dr. George Yuan Xianzhi, distinguished professor of Centre for Financial Engineering in Soochow University, in a WeChat post that has since gone viral.[2-4]

Professor Yuan said that the iSEIR model is an extension of the SEIR model used to describe the spread behaviour of infectious diseases, where "S" refers to those who are susceptible to disease but have not been infected yet; "E" refers to the exposed group who are infected but are not infectious yet; "I" refers to those infected who also become infectious; and "R" refers to those who have recovered from the infection, who may or may no longer be infectious.[1]

According to Prof. Yuan, the SEIR model does not consider the fact that every individual has a subject-specific probability to become a spreader. "With the iSEIR model, where 'i' stands for 'individual', we are able to study the distribution of individual behaviors by studying each node in the corresponding multiplex network," he explained.

In this scenario, the model focused on two critical parameters Prof. Yuan dubbed as "Delta" and "Gamma", terminologies borrowed from financial risk management. "Delta" refers to the change in percentage of infected people in China each day, while "Gamma" refers to the speed of change in percentage of infected people in China each day, a concept also known as second derivative in calculus.