

# A Short Note on Containment Scheme against Spreading of Novel Coronavirus COVID-19

Wan Ki Chow<sup>1</sup>, Cheuk Lun Chow<sup>2</sup>

<sup>1</sup>Department of Building Services Engineering, The Hong Kong Polytechnic University, Hong Kong, China

<sup>2</sup>Department of Architecture and Civil Engineering, City University of Hong Kong, Hong Kong, China

Email: wan-ki.chow@polyu.edu.hk

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## Abstract

A two-stage containment scheme is proposed to minimize spreading of the novel coronavirus. Two stages of quarantine each of 14 days will be involved.

## Keywords

Coronavirus, Containment Scheme, Safety Management, Quarantine Control

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## 1. Introduction

Spreading of the novel coronavirus (COVID-19) [1] among people is fast. As this is a novel coronavirus disease, some of its characteristics are unlike the previous coronaviruses, and still unknown. These novel characteristics make spreading control [2] [3] [4] scheme difficult. The physics behind was just proposed [5] recently. Two points are of particular importance in this respect. The first point is that the incubation period, which is commonly taken to be 14 days (based on SARS), may be longer than this and an incubation period of up to 24 days has been reported. The second point is asymptomatic subjects, that is, people still in the incubation period, are contagious. Based on these two points the present 14-day quarantine practice might not be adequate.

It appears that this epidemic will not come to an end in a short time [6], and might last till the end of the year 2020. A better way at this stage (March of 2020) is to block or minimize contact among people within a reasonable time, as proposed below, which is a compromise between effectiveness (requiring longer quarantine) and degree of freedom (less restriction on people quarantined).

Symptoms of COVID-19 can be observed only after the incubation period, commonly taken to be 14 days [1]. Therefore, a viable containment strategy of quarantine of suspected subjects to prevent further disease spreading is needed.

It is very difficult to realize complete isolation of suspected subjects if there are no serious consequences. Too many people might have been infected already if the quarantine requirement is too loose or the quarantine period is too short.

A safety management scheme arranging quarantine is therefore proposed in this short note based on the following containment scheme which is to be imposed on asymptomatic people identified to have been in close contact with confirmed subjects or have a travel history in certain areas (as specified by the government).

## 2. First Stage Quarantine

The containment scheme is as follows:

F1. Divide the containment area to be controlled into  $n$  blocks,  $N_1, N_2, \dots, N_i, \dots, N_n$ , where the  $i^{\text{th}}$  block  $N_i$  can be a city, a town, a village, a housing estate, a building or even a cruise ship [7] ... etc.

F2. Divide the  $i^{\text{th}}$  block  $N_i$  into  $m$  units,  $M_{i1}, M_{i2}, \dots, M_{ij}, \dots, M_{im}$ , where the  $j^{\text{th}}$  unit  $M_{ij}$  of the  $i^{\text{th}}$  block  $N_i$  can be a home, a level in a building, several buildings or even a residential area as in **Figure 1**.

F3. The smaller the size of the  $j^{\text{th}}$  unit  $M_{ij}$  of the  $i^{\text{th}}$  block, the more effective will be the control of spreading.

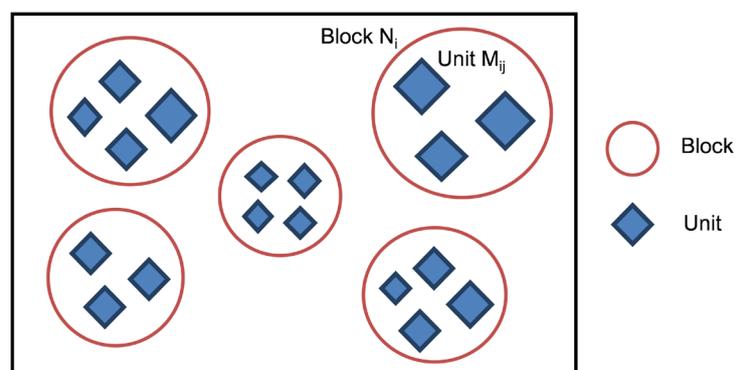
F4. Contact is only allowed within the unit  $M_{ij}$ , but prohibited among the other units of the block  $N_i$  in 14 days.

F5. Identify infected patients for medical treatment. If there is a confirmed case in unit  $M_{ij}$  during this stage, quarantine of the people in that unit will continue for 14 days starting from the date of confirmation of their unit-mate.

## 3. Second Stage Quarantine

People passing the first stage of quarantine will proceed to the second stage of quarantine, which is a relaxation of the first stage. This stage is designed based on compromise between safety and degree of freedom.

S1. Contact among different units  $M_{ij}$  inside the  $i^{\text{th}}$  containment block  $N_i$  is allowed in this stage, but not among different containment blocks in another 14 days.



**Figure 1.** Blocks and units.

S2. Identify the infected patients in each containment block for medical treatment. If there is a confirmed case in the  $i^{\text{th}}$  block  $N_i$  during this stage, quarantine of the people in that block will continue for 14 days starting from the date of confirmation of their block-mate.

#### 4. Releasing Stage

People passing these two stages of quarantine will be released if laboratory check for the novel coronavirus cannot be arranged due to resources limitation.

#### 5. Conclusions

The following can be concluded:

- The above recommended containment scheme requires 2 quarantine levels of 14 days each (totally 28 days) to minimize the spreading of COVID-19.
- The scheme is a compromise between effectiveness and degree of freedom.

#### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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### **Nomenclature**

M—the unit within a block

N—the block

### **Subscripts**

i—number of the block

j—number of the unit in a block