Written Evidence Submitted by
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1. *What the UK can learn from the social distancing measures employed in China and other countries.*

   Background:

   We analyzed data from 32,000 lab-confirmed COVID-19 patients in Wuhan until March 9 to study public health (non-pharmaceutical) intervention effects and the epidemiological characteristics of these patients. The paper was published in Journal of the American Medical Association (JAMA) on April 10.

   General principles and key take home messages

   1. The general principle for controlling an epidemic is simple: To stop an outbreak, need to reduce the number of new infections. How? Detect the source of infection, i.e., infected patients. Isolate infected patients to block the transmission chain so they won't infect others, and have infected patients be treated early to reduce the risk of deaths.
   2. The effective reproducible number R value is the average number of people infected by a case. To fully control the epidemic, need to bring the R value way below 1 and make it close to 0 as much as possible.
   3. To achieve this, multi-faceted measures are needed, which include six pillars: mask wearing, social distancing, widespread testing, contact tracing, isolating infected patients and quarantining symptomatic subjects and close contacts, and treating infected patients.
   4. Both social distancing AND centralized isolation and quarantine are needed to fully control the outbreak. Social distancing, testing, and contact tracing greatly help but are not enough. Centralized isolation and quarantine helped crunch the curve in a timely fashion, protect loved ones, and save lives of loved ones, and stop the outbreak.
   5. Analyze real data and facilitate decision making based on real data analysis results, in addition to simulated data.
   6. Every country is different, detailed implementation of the general principles needs to adapt to each country's own situation and culture, by learning from other cities and countries, such as Wuhan, South Korea, Singapore as well as Italy and Germany. It should not be copy and paste. It is not just about modelling, but also about effective implementation of the six pillars: public health implementation, health care implementation and society implementation.
   7. Effective public education and communication is critically important, both to share gained scientific knowledge and inform the public to make good decisions for themselves, loved ones and communities.
   8. Wuhan experience discussed in our JAMA paper and other country's experience let us not to start 0. We can control the outbreak in a timely fashion if we as a community work together and do it right. We don't need to wait for one year.
   - A single take home message: Unite the community and everyone is a team member, contributes and works together to combat COVID-19. It requires a multi-

stakeholder approach that engages our government, international organizations, academia, business, community & citizens.

Social distancing:
- Analyze data and let data and evidence speak
- Summarize JAMA paper findings: Using the Wuhan data of 32,000 cases until March 8, the R value was estimated to be > 3 before intervention, and reduced to a little above 1 after lockdown+traffic ban+home isolation. It showed social distancing greatly helped but was not enough to bend the curve. After implementing centralized isolation and quarantine, R dropped to 0.1 on March 8
- Social distancing intervention was launched on Jan 23   and centralized quarantine was added on Feb 1. All the 16 field hospitals were closed on March 10 as all the patients were discharged. It took 1.5 months.
- Zero confirmed case was reported in late March, in less than two months since the intervention started.
- Wuhan reopened the city on April 8 after two weeks of no confirmed cases was observed.
- Social distancing is the primary measure in many countries. What works and what does not work using social distancing?
- Social distraining helps break transmission between households but does not help to break transmission within households. Household here is broadly defined: people live together, including family members and significant others, and those living in closed space, such as nursing homes for elderly, and prisoners.
- Social distancing flattens the curve, while centralized isolation and quarantine furthers bends the curve.
- Social distancing greatly helps but is not good enough to stop the outbreak, as shown in multiple countries: China, Italy, Germany, Spain and many states in US. It reduce R from >3 to a little above 1 or around 1. This finding was replicated in many countries, such as Italy, Germany, and Spain. The R curves has lingered around 1 for a month in Italy and Germany.
- Family transmission is more common. Social distancing does not properly control within-house transmission, especially for low income families and under-served minorities who have poor housing conditions. Need to carefully develop isolation and quarantine plans to prevent within-household transmission and reduce death rates.

Smart/Centralized isolation and quarantine:
- To isolate infected and reduce within-house transmission and community transmission, Wuhan did centralized isolation and quarantine, by isolating infected subjects, including mild/moderate case, in field hospitals, and quarantining symptomatic subjects and close contacts of infected in hotels/dorms.
- Important to hospitalize not only severe cases, but also mild/moderate cases. The current practice in many countries is to hospitalize only severe cases. This might cause several issues, e.g., limiting ability to prevent infecting family members and to reduce deaths
- Three isolation and quarantine groups in Wuhan:
  - Group 1: confirmed cases (symptoms + positive tests): admit mild and moderate cases in field hospitals, treat and monitor them
  - Benefit: prevent household members from being infected, treat mild cases early, close monitor them for progressing to become severe, if so, transfer

them to regular hospitals/ICU; reduce death, reduce the burden on ICUs, PPE, ventilators, and HCWs

- o Group 2: suspected cases (those with symptoms but might not have been tested yet), quarantine them in hotels. If test positive, transfer to field hospitals. If negative tests in 14 days, release them to go back home.
- Group 3: quarantine family members + close contacts in hotels+dorms. if test positive, transfer to field hospitals. If negative test in 14 days, release them to go back home.
- Groups 2 and 3 both have medical staff on site to monitor them, private room+private bathroom, and no central air-conditioning
- Groups 2 and 3: small children stay in the same room as parents, older children have own rooms.

Testing priorities:
- o Give test priorities to high risk groups
  - HCWs
  - Elderly
  - Residents and workers in nursing homes
  - Family members and close contacts
  - Low income families and URMs

2. *Strategies taken by other countries (e.g. Austria) to lifting coronavirus restrictions and how they are informed by science: How lifting restrictions may affect the spread of COVID-19. What should an 'exit strategy' contain (for example economic considerations)? What can the UK learn from other countries?*

Guidin Principle:
- One has to be highly confident that the public is not put at a significant risk of infection and death, and the public is safe after lifting
- Balance public health safety and minimization of economic damage
- Proceed with great caution on preventing a second surge

Strategies:
- Analyze the real UK data to evaluate whether the outbreak has been contained successfully using the current measures
- The current R value in UK seems to linger around 1.
- How to crunch the curve to make R as low as 0.
- UK has excellent epidemiologists and statisticians and engage them in the analysis of the UK real data.
- Carefully develop indicators to guide UK's decision on lifting the restriction order while preventing a second surge, and ensuring public is safe and the social and health care capacity is available for what is needed.
- California developed 6 indicators for lifting staying at home order (See this article and the slides)
  - o Evaluate the ability for monitoring and protecting community: testing, contact tracing, isolation and quarantine (support positive tests and exposed)
  - o Prevent infections of high risk
  - o Hospital ability to handle new surges
  - o Treatment ability

- - Physical distancing in schools, business and child care
  - Plans to when to reissue the second stay at home order
- China strategy:
  - Reopened the country after at least two weeks of no   confirmed cases
  - Continue some degree of social distancing
- Detect and isolate asymptomatic cases
  - We estimated 60-80% of daily new cases are asymptomatic.
  - The NY pregnant women study (n=215): Among those with positive tests, 85% of them were asymptomatic
  - The Boston homeless shelter study: All subjects with positive tests were asymptomatic
- Conduct serological epidemiological studies
  - A PRC test tells the current infection status, while an antibody test tells the past infection status but does not tell the current infection status. See this.
  - Having antibody means a person has been exposed but does not mean a person is immune, as pointed out by WHO in this article.
  - Antibody tests can have a very low sensitivity if infection is within 7 days of symptoms or diagnosis, and a much better sensitivity after 12 days.
- Protection of low income families + HCWs+ Elderly in nursing homes

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