

关于2019新冠病毒（COVID-19）的公开信

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Goal 目标

This letter aims at convincing the US Government to **immediately adopt aggressive [social distancing](#) policies** to contain the spreading of COVID-19.

这封公开信旨在说服美国政府立即采取积极的社区隔离政策以遏制2019新冠病毒。

Facts. 现状

Once community spread takes hold in a country or region, the number of cases increases exponentially, doubling every 3 days or so, unless aggressive social distancing policies are enforced. 一旦一个国家或地区发生社区性传播，确诊数字会呈指数型上升，每三天左右就会翻倍，直到采取有效地社区隔离政策。

See, e.g., number of cases [outside China](#), and in [France](#), [Germany](#), [Spain](#), [Switzerland](#), [UK](#), [Netherlands](#), [Sweden](#), [Belgium](#), [Norway](#).

具体见中国，法国，德国，西班牙，瑞士，英国，荷兰，瑞典，比利时，挪威的数据。

The US case number has been growing exponentially for over a week. On [Saturday Feb 29](#), the total number of US cases is 69, including 47 cases originated from the Diamond Princess cruise ship or Wuhan evaluation, and **22 local cases**. By [Saturday Mar 7](#), the number of local cases rose to **388**. **Within 7 days, the number of**

local cases increased more than 16 folds, doubling more than 4 times.

美国的确诊人数已经在上一周呈现指数型的增长。在当地时间二月二十九日，全美确诊人数是69例，包括47例来自钻石公主号邮轮和武汉撤侨班机。其中本地确诊数为22例。在当地时间三月七日，本地确诊人数已经达到388例。在过去的七天里，本地确诊人数增长超过十六倍，相当于翻了超过四番。

When the number of cases reaches thousands, the sheer volume of patients will overwhelm the health care system.

Hundreds or more people (mostly older citizens) die, and medical workers will suffer greatly. See reports on this in [S. Korea](#), [Italy on Mar 2](#), [Italy on Mar 7](#), [Europe](#).

当确诊人数超过一千人时，庞大的患者数量将使得医疗系统崩溃。上百人（尤其是老年人）会因此死去，医疗人员会更加面临巨大压力。可以参考韩国，意大利，欧洲的具体数据。

A March 6 [Testimony of a Surgeon working in Bergamo, Italy](#) uses first-hand experience to explain the stress on hospitals and that COVID-19 is not flu.

一位来自Bergamo的意大利外科医生的三月六日一手证词阐述了现在医院的压力，以及新冠病毒不是流感的事实。

COVID-19 has a significantly higher fatality rate than Flu. Flu is estimated to have fatality of 0.1%. Estimation of the fatality rate of COVID-19 varies, some numbers are [2.3%](#), [3.4%](#). Also see an [age-based breakdown](#).

相比较流感病毒，2019新冠病毒有着明显更高的致死率。流感病毒的平均致死率为0.1%。2019新冠病毒的致死率与地区有关，目前的统计数据有2.3%，3.4%。致死率与年龄也有关系。

According to [worldometer](#), among 66,106 closed cases, there are 3828 deaths, translating to a 5.8% fatality rate. This could be too high, as the number of mild cases in China may be self-quarantined and not discovered.

根据 worldmeter, 在66106个确诊病例中, 有3828例死亡, 这个死亡率达到5.8%。而实际死亡率可能略低, 因为在中国有染病后自我隔离并未被统计的案例。

On the other hand, the numbers from the [other countries with more than 5000 cases](#) are worrisome. As of March 5, S. Korea [tested 140,000 cases](#), with 6000 positive cases, and 33 deaths. However, using $33/6000$ [to claim 0.6% fatality rate](#) is utterly wrong, since the vast majority of the 6000 cases are still active, and many patients will die. As of March 8, S. Korea has [51 deaths, 166 recovered cases, and 7382 cases being treated](#). S. Korea's thorough testing means that even patients with mild symptoms are included, yet the fatality rate is alarmingly high.

另一方面, 在其他超过5000例确诊的国家, 情况更加危急。在三月五日, 韩国为140000人做了病毒检测, 其中6000人显示阳性, 包括33例死亡。但是由此得出 $33/6000=0.6\%$ 的致死率是完全错误的。因为6000人中有可能会有新增死亡案例。在三月八日, 韩国测试7382例, 51例死亡, 166例康复。韩国的全面测试意味着轻微症状患者也会被纳入, 但死亡率确显著增加。

Similarly, [Italy](#) has 366 deaths, and only 622 recovered cases. Iran has 194 deaths for 2134 recovered cases. These are the most critical numbers to be watched in the next few days. Some scientists claim that [there are two strains](#), with one deadlier, but there is no consensus.

类似地, 意大利显示366例死亡, 只有622例康复。伊朗194例死亡, 2134例康复。这些才是接下来几天需要关注的最重要数据。一些科学家称病毒有两种亚型, 其中一种有致死性, 但并未得到证实。

Even for a very conservative estimation of fatality rate of 1%, it would mean 5% to 10% of patients need hospital care, which cannot be provided when it is a pandemic. Without adequate medical care, the fatality rate will be higher.

即使采取非常保守的方式估计死亡率为1%左右, 这也意味着5%到10%的患者需要就医。当病毒大流行时, 医疗资源无法满足, 死亡率会更高。

Strong [social distancing measures](#), taken by [S. Korea](#) and China, have **effectively slowed down, and are on path to stop** the spreading of the virus in [China](#) and [S. Korea](#).

韩国和中国采取的强有力的社区隔离政策，有效地减缓并且阻止了病毒的传播。

Italy was forced to [close all schools starting Mar 4](#), and [quarantine 16 million people starting Mar 8](#).

意大利在三月四日被迫关闭学校，在三月八日开始隔离1600万人。

The number of cases in the US is about the same as [Italy's](#) numbers 10 days ago. What Italy is doing now, the US is likely to have to follow in 10 days.

美国的确诊人数和意大利十天前非常相似。意大利采取的措施，美国很可能在十天后也被迫跟进。

The risk to each individual at this time remains low. Even if one million people within US are infected, the chance that one person gets it is 1 out of several hundreds. Also, the fatality rates for young people are known to be low. However, **the risk to the society is very high.**

病毒对于个人的影响较低。即使在美国有一百万人感染，每个人感染的概率也只有几百分之一。而且对于青少年来说致死率会更低。可是社区感染的可能性很高。

Prediction and Justifications.预测和理论支撑

Without new decisive containment efforts, the number of confirmed cases in US will increase at least 10 folds in 10 days, to 4000 or more (and possibly as high as 10,000) by Mar 17.

在没有决定性收容措施的情况下，美国的确诊案例在10天内会增加10倍。在三月十七日会达到4000人确诊（有可能达到10000人或更高。

Every region with cases reaching 400 has been on exponential growth until reaching 4000. To go from around 400 to 4000, it took China 6 days, S. Korea 8 days, Italy 9 days, Iran 7 days.

每个地区确诊人数达到400后，就会呈现指数式增长达到4000。从400确诊到4000确诊，中国用了6天，韩国用了8天，意大利是9天，伊朗是7天。

In 3 days (from Mar 5 to Mar 8), France case number grows from 423 to 1126, more than doubling, and Germany grows from 349 to 1067, more than tripling.

在3月5日到3月8日的三天内，法国的确诊数从423到1126，德国从349到1067，增长速度分别超过了两倍和三倍。

So far, the number of total tests in the US is small. According to [the Atlantic](#), less than 2000 persons were tested as of Mar 6, with 10% positive rate. On the Grand Princess cruise ship, out of 46 tested, 21 were positive. These indicate that many people with the virus have not been tested.

目前，美国的总体检测数量还很少。根据Atlantic报道，截止3月6日，不到2000人接受了检测，大约10%成阳性。而至尊公主号邮轮上检测的46例中有21例成阳性。这意味着有很多人已经携带病毒但没有被检测。

The virus is highly contagious. In New York, one patient leads to dozens of cases. Out of 3700 passengers and crew members quarantined on Diamond Princess, the number of confirmed cases grew from 10 on Feb 4 to 542 on Feb 18.

这次的病毒具有高传染性。在纽约，一位病人传染了十几例。在钻石公主号邮轮的例子中，3700名乘客和船员例，2月4日自由10例确诊，到2月18日已经达到542例。

The situation will be dire by the end of March, before warm weather arrives in the northern part of the country. And experts say the expectation that COVID-19 will disappear in summer like flu is [false hope](#).

“疫情在三月底之前会非常严峻，但温暖的天气的到来会改变这一切”。可是专家称对于新冠病毒会在夏天消失的是错误的希望。

The Paths Ahead. 未来的路。

Path A. The US government takes decisive and proactive actions today and leads the Western world to enforce aggressive social distancing measures to contain the spread. Looking at situations in China, this should be able to contain the virus in 4 to 6 weeks. **Life should be able to return to normal by June or July.** Total number of cases in the US may be in the tens of thousands, with

hundreds of deaths. There will be economic and other kinds of pains and suffering, but these are **unavoidable**.

第一条路。美国政府立即采取有效的有预见性的行动并且领导西方世界采取积极的社区隔离措施以阻止病毒的传播。目前中国的疫情可能持续4到6周，人们的生活有望在六月到七月间恢复正常。美国的确诊总人数可能达到数万人，可能包括数百例死亡。经济和其他方面的萧条一定会出现，但这些是不可避免的。

Path B. Continue the current course of action. **In no more than two weeks (by Mar 22), the number of confirmed cases will top 10 thousands.** Health care systems in states starting with Washington, California, New York will be strained like Northern Italy today. **US government may have to adopt drastic social distancing measures similar to locking down entire cities.**

第二条路。保持原状。在两周内（3月22日之前）确诊人数会达到一万人。从华盛顿州，加州，纽约州开始，医疗系统在各个地区会逐渐像意大利北部一样。美国政府会不得不采取大范围社区隔离和城市封锁。

The best case scenario is that the spreading can still be contained by these measures to be about 10 to 50 times the size as under Path A, i.e., with hundreds of thousands or a few millions of people infected, and thousands or more deaths. It will take longer for the lockdown effort to be effective because of the scale of spreading. It may be August or September before life can return to normal. And the economic damage will be a lot higher than Path A.

最好的情况是最终确诊人数会达到第一条路的10到50倍：百万人感染，数千人死亡。又有大范围的传播，会导致着更长时间的封锁。人们的生活回到八月到九月才能恢复正常。经济打击会远远超过第一条路。

Worst-case scenario is that spreading cannot be contained, and we are looking at situations predicted by some experts, with up to [70% of the population infected](#). Local communities will still try any conceivable containment method. Economic and social activities will be greatly disrupted. 20% of the population over the age of 70, as

well as significant fractions of other age groups, will die while waiting for medical care, with family members desperately looking on. The situation looks to be at least as bad as the Spanish flu. We may be looking at the worst humanity and economic disaster since World War 2. The remaining hope after the devastation is that either virus mutates to a milder form, or effective vaccines can be developed before the next wave hits.

最坏的情况是疫情得不到阻隔。像一些人事的预测，可能会有70%的人被感染。各个地区还是会尝试隔离，经济和社会活动会被重创，20%左右的老年人（70岁以上）会在等待医疗保障的过程中去世。他们在人口比例依然占有较大的比重，但他们的家人只能绝望地目睹这一切的发生。这会至少和西班牙流感一样惨烈。我们可能会经历二战以来最惨烈的经济人文灾难。而我们只能祈祷病毒会变异成温和的形态或者疫苗能在下一波袭击之前研究成功。

The Choice. 抉择

It appears that US officials have admitted [failure in containment](#) and moved to mitigation; however, it is unclear what is the mitigation strategy. **The only rational choice is Path A.** While this brings the disruption to the broader society earlier, the magnitude of the disruption will be less and it will pass quicker. **Without decisive and aggressive actions now, the government will have to take these or even more drastic measures later,** when the virus is much more widespread, which leads to thousands of preventable deaths, health care systems straining to the point of breaking, longer disruption of social and economic activities, and bigger scale of damage to the society and the economy.

事实上，美国政府已经承认阻隔措施已经失败，并且已经采取了缓解措施，但具体是什么还不清楚。而为一有效的选择就是路线一。尽管这会更早地冲击社会，但影响的广度和深度都会更小并且灾难会更快过去。如果现在不采取有效的积极的措施，政府将在病毒广泛传播后不得不采取更加严格的措施，并且会导致成千上万的无辜死亡，社会和经济长活动期的崩溃，以及更大规模的冲击。

Every day of delaying means more people die in the end.

每一天的等待都会让更多的人死去。

Who is the Author and Why is He Writing This? 作者是谁以及作者为什么要写这封公开信

I am a Professor of Computer Science at Purdue University. My research area is Security and Privacy. I am no medical expert, but I am familiar with the literature on the spreading of computer virus (which is similar to the spreading of biological virus), and I have worked with numbers a lot.

我是来自普渡大学计算机系的教授。我的研究领域是安全和隐私。我不是专业的医生，但是我熟悉计算机病毒的传播（这和生物病毒的传播和相似），并且我已经为此做了很多工作。

I started looking at COVID-19 numbers on Feb 27 because my son signed up for his school's Spring break (Mar 14 to 21) trip to Orlando, FL, and I needed to decide whether I would allow him to go. While the numbers were low then, I was worried about the exponential growth of COVID-19 case numbers. Over the last week, my worst-case predictions on the case numbers have been met, and I have seen exponential growths in more and more countries. I have also been discussing these trends with others, and found that few people saw the same things as I did. I have resigned to simply sit back and watch the situation develop. However, after reading [Testimony of a Surgeon working in Bergamo](#), I was deeply saddened by the suffering described there. I shared my frustration with my friends: "I am watching a train wreck going to happen, yet can do nothing to help." Then I realized maybe there is something I could do. If this open letter achieves its goal, thousands of people do not have to die. Thus, even if the chance of having any impact is very low, I have to try.

我从2月27日开始关注2019新冠病毒因为我的儿子报名了学校的去佛罗里达奥兰多的春假旅行。我现在要决定是否允许他前往。尽管现在感染人数还很低，我担心这

会在接下来成指数型增长。上一周，美国的感染数据和我的最坏模型预期吻合，并且在其他国家这一数据也呈现出了指数型的增长。我也和其他人讨论过此事，他们也有观察到了相同的增长趋势。我只能单纯的看着事态的发展。但在阅读了贝加莫工作的外科医生的证词后，我对他的描述深感难过。我把我的无助分享给了朋友：“当我看着火车在车毁人亡的道路上奔驰，而我却无能为力”。然后我意识到或许我可以做些什么。如果这封公开信实现了目标，那么数千人不必为此死去。可是，即使这封信的力量相当渺小，也值得一试。

I thank several colleagues for their valuable suggestions and advice. (Names will be added after I obtain approval.)

我感谢给我提供宝贵建议和意见的同僚们。（我会附上他们的姓名如果我得到允许）

2am March 9, 2020

2020年3月9日凌晨两点