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U.S. Senate Hearing on Enlisting Big Data
in the Fight Against Coronavirus
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Good morning Chairman Wicker and Ranking Member Cantwell and members of the Senate Committee on Commerce, Science, and Transportation. My name is Inder Singh. I am the founder and CEO of Kinsa, a San Francisco-based public health company. Thank you for giving me the opportunity to provide my insights and demonstrate Kinsa's work in combating COVID-19. We look forward to working with you, your colleagues, and public health professionals to fight this virus and ultimately secure the health and well-being of all Americans. All of us being acutely aware our country is in the midst of an unprecedented pandemic public health crisis, I will get right to the point.

We believe we have the only effective means of detecting COVID-19 spread in the community. It is 2 or more weeks earlier than any other system.

On March 18, we launched healthweather.us. Healthweather.us shows in real-time where there are *unusual* levels of fever – above and beyond what you'd expect from normal cold and flu. The clusters of unusual fever have been verified by top epidemic researchers to have an extremely strong correlation with COVID-19 outbreaks that are occurring approximately *two to three weeks after we detect them - in essence, healthweather.us has become the first accurate early warning signal of COVID-19.* Healthweather.us and its underlying illness signals have become a trusted source for identifying potential hotspots and COVID-19 trends by public health professionals around the nation.

This capability was far from a happy accident. Kinsa has spent the past eight years building a network of over one million smart thermometers across the United States for the sheer purpose of tracking and ultimately curbing the spread of infectious illness. As described in the New York Times, data from our thermometer network has allowed us to accurately predict the spread of flu weeks ahead of the CDC and down to the county level. Top academic researchers in flu forecasting have confirmed this, with one collaborator recently proclaiming - "we have broken the forecasting barrier."

In early March, Kinsa began analyzing our thermometer data differently - with fever as one of the few known common symptoms of COVID-19, my team believed that our forecasting capabilities could help. We subtracted cold and flu numbers from what we were seeing and began detecting unusual fever clusters - "hotspots" - indicating community spread of COVID-19.

This is an early warning system. Think of it as a flashlight going off, illuminating a geography and saying, "send the test kits in, because something unusual is happening." This real-time information on where and when illness is starting, and where community spread is occurring, is vital in appropriately allocating limited supplies and manpower to the areas most in need of early intervention. It **is** possible to stem the spread of an epidemic or pandemic such as COVID-19 with this kind of immediate intervention.

Our technology and network have tremendous potential and capability to act as an early warning system for both seasonal flu and pandemics such as COVID-19. I'd like to take this moment to remind us that in the 2017-2018 flu season, nearly 80,000 Americans died, and we were faced with tents outside of Emergency Rooms in cities like Atlanta. With worsening flu seasons and increasing threats of pandemics, I believe an early warning system like Kinsa's is essential infrastructure for our country to both detect outbreaks, and also enable real-time communication with those who are ill or those who are at risk of falling ill. It is the reason I started Kinsa in the first place.

We are living in uncertain and unsettling times. COVID-19 is spreading quickly throughout the United States, wreaking havoc on our health, our economy, and our way of life. The country still lacks adequate lab-based testing capacity, personal protective equipment and clinical staff to conduct the widespread testing seen in countries such as South Korea where the virus has been held in check. To contain the spread and efficiently deploy limited resources in the United States, we need real-time tools that will help us predict where cases are being missed and where hotspots are flaring up.

Data feeds from clinical locations such as emergency rooms are not adequate, as only a fraction of total cases show up in clinical care sites, and by then it's too late for containment. As we've learned from China, most cases are spreading in the community before people know that they are infected, if they know at all.

I believe four key steps are necessary to stem the growth of an epidemic:
    1)   An early warning system to understand where and when illness is
    spreading
    2)   Widespread testing capabilities
    3)   Treatment and isolation of those infected
    4)   Antibody testing to determine the immunity level of a population

In the absence of widespread testing, it is even more critical that we have an early warning system and the means to understand where outbreaks might be occurring. I understand that it is far easier to speak of our needs than it is to put them into practice. Often some elements are out of our control due to resource shortages, such as with test kits for COVID-19.

But it is possible for the United States to leverage an early warning system to stem the next wave of COVID-19 spread - likely to happen after we relax social distancing policies, and perhaps again in the winter during the traditional cold and flu season - and deploy resources accordingly. Indeed, Kinsa is standing up this system.

I do not envy our elected public servants like you during this unprecedented time. They are being forced to make decisions that pit life vs. livelihood. They are working with public health experts, and are making the choices they *believe* are best, but without the necessary data to confirm whether their tough decisions are having a positive impact. But at Kinsa, we can see that while these social distancing mandates are no doubt devastating businesses and workers alike, they are indeed breaking the chain of infection. We have countless data points that tell the same story across the country: three to seven days after a stay-at-home or shelter-in-place order is enacted, fevers in these respective communities begin to drop, signaling a reduction in community spread of the virus.

We know that when aggressive social distancing regulations are lifted, there will be a second and potentially a third wave of COVID-19 before a vaccine is readily available. COVID-19 will hide out and remain asymptomatic in large families and small communities until the "hammer" is lifted and the "dance" begins.

To combat these future waves, we are already working with private funders, and some local public health entities to deploy our thermometers at cost so they may protect their communities. They are contributing to this COVID-19 early warning system so they know in real-time where to send test kits and deploy other key resources necessary to save lives. But we need a more holistic, national approach rather than these valiant but scattershot efforts.

It would take but 4.4 million additional smart thermometers – at a cost of less than $100 million - to effectively detect COVID-19 spread on a county-by-county basis. I believe this system is essential infrastructure today and will continue to be essential as our country faces worsening flu seasons and the possibilities of additional epidemics and pandemics. By knowing where and when outbreaks are occurring in real time, we can help our communities, the health care system and public health agencies direct resources effectively. Such an investment would most importantly save lives, while creating a significant return on investment, both in reopening the domestic and global economies and mitigating the impact of future outbreaks.

I started Kinsa with a mission to curb the spread of infectious illness through early detection and response. My nearly decade-long career in public health prior to starting Kinsa left me with the very stark realization that without an early warning system to track illness, we will always be racing against the clock to contain it, and in the process, lives will be lost. For the last 8 years, it has been my mission to use my knowledge of both technology and public health to build the system I so desperately wanted to use as a public health practitioner. To build an accurate and effective early detection system, I knew we needed to collect the "missing ingredient" data sets: accurate and geographically precise data on (1) where and when symptoms are starting, (2) how fast they are spreading and (3) how severe they are.

Knowing that the first, and likely only, action a person can take in their home to confirm an illness is to reach for a thermometer, we built the first-ever, FDA-cleared "smart thermometer." But calling it a thermometer is like describing a smartphone to someone who has only ever used a rotary phone, because Kinsa thermometers don't simply tell you your body temperature - they answer the questions you care about when taking a temperature: What do I do? What do I have? What is "going around?"

If I may, please allow me to walk you through the experience of using a Kinsa smart thermometer:

Imagine it is the middle of the night and you are fast asleep when your 5 year old child bursts into your room, coughing and complaining of not feeling well. The first thing you do is reach for your Kinsa thermometer to take her temperature. You open the Kinsa app, which displays a delightful animation of a friendly elephant blowing bubbles - a welcome distraction that keeps your child engaged long enough for you to get an accurate temperature reading.

Your daughter has a fever of 101.1. Rather than having to guess on what to do next, Kinsa walks you through a series of short questions to determine whether this illness is serious. Is your child displaying any alarming behavior changes, such as extreme confusion or listlessness? Thankfully, you say no. The app then asks whether any other symptoms accompany your child's fever. You select "cough." The app asks a few basic questions to determine the severity of the symptoms. Your child's cough is not accompanied by severe chest pain or difficulty breathing, for example, so you press "none of the above."

Kinsa's guidance lands on Home Care. Your child's symptoms aren't severe enough to require a visit to the hospital in the middle of night; the cough and fever can be handled well at home, and perhaps a dose of ibuprofen or acetaminophen will help reduce the discomfort. You can set a medication reminder for the next dose, and keep a log of the entire illness episode in the Kinsa app to share with a doctor if you choose to go in the morning. Before you head back to bed, you quickly check the health of your child's school to make sure there's nothing going around in her Kindergarten class.

Your school is one of the 1,500 participants nationwide in Kinsa's free FLUency school health program. Parents and teachers have joined a group for the school to see anonymous, aggregated illness trends throughout the school and within classrooms. Your school nurse uses her Kinsa nurse portal to send preventative health messages and reminders to all families. You see that some children in Kindergarten have been diagnosed with the common cold - slight fever, cough, runny nose. Aha! Perhaps that is what your daughter has. Knowing what's going around her school gives you the information you need to make the right decision for your child and your family.

As this scenario illustrates, we turned a thermometer into a communication system, allowing us to speak with a person within hours of symptom onset, helping them get the guidance they need early and throughout the course of their illness. By connecting our

thermometer to the internet, we can guide the ill to the appropriate care in the moment, while simultaneously aggregating fevers and symptoms to inform where illness may be starting or spreading.

We have a product families turn to in a moment of vulnerability - when they or a loved one is unwell. As such, we must comfort, reassure and most importantly, do right by our users. User trust always has been, and always will be, paramount. I strongly believe that there is a way to protect an individual user's privacy while also aggregating data for the greater good. I am exceedingly proud of the way we have done this at Kinsa. We completely protect an individual's privacy while democratizing access to *population level insights* for communities and healthcare systems to know where outbreaks are occurring. We believe this population level insight - with its ability to pinpoint the areas most in need of intervention - is critical to save lives.

What we map on healthweather.us is a population level insight: the percent of people in a county or city that are ill. To be crystal clear, this is **not** personal data, **not** deidentified data, **not** even metadata. It **is** an insight about the population. There is absolutely **no** way to reverse out the percentage of people with fever in a county to identify an individual person. It simply is not possible to do it.

Additionally, as it relates to privacy: whether on iPhone or Android, our app specifically asks users to opt-in to share their locations. If a user chooses to deny this request, their location data is not shared with us. Users can also opt-out at any time.

In the scenario I described earlier, I alluded to the school health program, FLUency, that we have run for the past 5 years. I am proud that we have given out nearly 200,000 free thermometers to underserved communities through corporate sponsorships that support this program. But more importantly, we have seen that communities genuinely want access to aggregate insights on the health situation around them. And that access to these insights changes their behavior. Parents want to be informed of what is going around their child's school so that they may react quickly and appropriately; teachers want to know when illness is high in classrooms so they may disinfect more thoroughly; school nurses want to know what trends to look out for so they may proactively alert families to take precautions. Though smaller in scale than what we have built at healthweather.us, FLUency exemplifies the power of an early warning system. As a participating school nurse, Alisha P., from North Carolina put it:

*"I work in a Title 1 school district. Many of my kids come from homes with no beds, cars, or parents with no employment. Many also do not have insurance and though they qualify for Medicaid, they have no transportation to the Medicaid office to apply. Because of this, many are sent in on school buses for me to assess as their first line of defense. Before I began this program, I was seeing nearly 50 children a day at my school. After participating, my numbers dramatically dropped to around 20 students a day. Now parents can be certain their children are sick and keep them home. The app does a great job of telling them when to hydrate, when to medicate and when to notify the doctor. **It's truly an empowering app."***

As I conclude, while it would be tempting to rehash our winding, eight-year journey and the skepticism expressed by federal agencies about the efficacy of our technology, our current goal is to ensure that Kinsa's technology can be a part of the COVID-19 response and the preparation for future outbreaks. Kinsa's early detection system is too important to be ignored. We've taken the simplest health tool in anyone's home - a tool that all Americans feel comfortable using when they feel ill - and have built an early detection system designed to stop infectious illnesses before they become pandemics. Our next hurdle is even more widespread deployment and use of our technology, preparing our country for the inevitable challenges ahead when COVID-19 rears its head again later this summer or in the fall.

Again, thank you for the opportunity to share my insights. We are all adjusting to a new normal. My hope is that by helping provide our country with the tools needed to act early, effectively and decisively, we will be part of the solution that returns the United States to health and prosperity.