

**To the Mayor and Members of the City Council****June 23, 2020**

Page 1 of 2

SUBJECT: PANDEMIC METRICS**Issue:**

On June 16, 2020, City Council requested additional information on pandemic research and modeling.

Pandemic Research

It's challenging to state conclusively how world events have shaped respiratory virus pandemics or pandemics, in general. Rather, it is easier to conclude how world pandemics have shaped the world – given their tragic impact to human health worldwide. During the most severe pandemic in recent history, the 1918 Influenza Pandemic, it was estimated that 500 million individuals were infected and 50 million deaths occurred despite its relatively short duration (1918-1920). Further, duration of respiratory virus pandemic events have varied throughout history given the intrinsic nature of respiratory viruses (virulence); the host (population); technological advances; the availability of treatment and prophylaxis (vaccines); the community's level of preparedness; and the hospital infrastructure.

Modern researchers use data from previous pandemics to predict future pandemics, to develop strategies to reduce their occurrence, to address emerging health risks and to model the course of a current event. This includes micro, macro, environmental, industrial and public health variables. While the world changes quickly, a respiratory virus pandemic spreads most easily through social contact and much of the research looks at how cultures interact on a daily basis, how compliant they are with the orders of authorities, type/openness of economies, age/generation types, etc., along with the medical/scientific analysis.

Reproduction Number (R Naught)

A Reproduction Number (R_n) is used to estimate the number of new cases that will stem from a single case. While there is a relationship between R_n and case doubling, case doubling measures the actual infections as they are reported through lab tests.

If the R_n is 2, then we would expect one positive person to infect two additional people and those two would infect 4 (i.e., 2 each) with an estimated transmission period of 4-5 days (i.e., time it takes for one person to infect others). At R_2 , a single positive person, not practicing social distancing, wearing a mask, staying home, etc. could cause 31 people to be infected over a 14-day period. At R_1 , it would be 4 additional people over the same period.

An R_n below 1 would suggest less spread and we would then expect to see a larger doubling number. An R_n above 1 would suggest a greater spread and we would expect the doubling time to be lower. As an example, in the middle of May we had an R value of .7 and over the next several weeks the case doubling went from 14 to 50 days. We predicted less transmission and saw less transmission.

**To the Mayor and Members of the City Council****June 23, 2020**

Page 2 of 2

SUBJECT: PANDEMIC METRICS

The City has a partnership with UNT Health Science Center and UT Southwestern who both create Reproduction Number Models for the City. These institutions bring a variety of specialists together to build the models. This includes Epidemiologists, Infectious Disease Doctors, Public Health Professionals, Researchers, Behaviorists, and others. They analyze hard science/medical metrics, introduce forensic analysis, etc. and create complex mathematical models the combine known research, predictable viral process and educated presumptions.

The RN changes daily, but, generally, it does not swing greatly from one day to the next (i.e., incrementally will increase or decrease). It tends to ebb and flow just this phase of a pandemic and is impacted by time of year, how well the population uses social distancing, the amount of viral activity already in the community, etc.

Case Doubling

Where the RN is a prediction of new numbers, case doubling (CD) is the number of days it takes for positive results, hospitalizations, or deaths to double. When we talk about flattening the curve, we are actually suggesting that we increase the number of days for these things to double. The faster they double, the more active cases we have in the community and the more medical resources that are required at one time to treat patients. CD for positive test results can include both antibody blood test and antigen swab test.

Positive Case Reporting

There are two broad categories of testing: antibody and antigen. Antigen testing, sometimes referred to as diagnostic testing, includes a swab in the nasal passage test and is used primarily to test for a current infection of COVID-19. Its accuracy is 90% and higher. Antibody is a blood test and it is primarily used for past infection. A current infection might produce a negative finding (no antibodies yet), and that is why it should not be used for this type of screening. Various studies have found antibody tests currently available are only about 50% accurate. When accuracy is improved, the antibody test will help us determine the true community exposure rate.

Tarrant County Public Health does not use antibody results in reporting new cases or case doubling; however, the State of Texas and other regional/national agencies will use these results. While the use of antibody results could throw off the current infection rate, reproduction number models do not rely on these numbers alone. True viral spread will also show up as an increase in EMS calls, visits to the hospital, ICU/hospital bed occupancy, etc.

Additional information can be obtained from Code Compliance Director Brandon Bennett at 817.392.6322.

David Cooke
City Manager