Milwaukee Academy of Medicine
1356th Meeting
October 20, 2020

Dr. Jack Kleinman, President, opened the 1356th meeting of the Academy. He announced that Dr. Kaup Shetty will be the new Newsletter Editor, and that Humanitarian Award nominations are due by November 1. An appeal was made for more member involvement in the Academy, such as contributing to the newsletter or becoming a member of the Council. Contact Angie!

Dr. Leslie Martin, Program Committee Chair, introduced the speaker, Ryan Westergaard, MD, PhD, MPH, who was presenting via Zoom from Madison, Wisconsin. Dr. Westergaard has been the Chief Medical Officer and Epidemiologist, Wisconsin Department of Health Services, since 2019. He also is Associate Professor of Medicine, Division of Infectious Diseases, University of Wisconsin School of Medicine and Public Health.

"SARS-CoV-2 Transmission Dynamics in Wisconsin: Lessons Learned and Long Road Ahead", by Ryan Westergaard, MD, PhD, MPH . Highlights from this 20 October, 2020, Zoom presentation to the Milwaukee Academy of Medicine are summarized by K. Shetty and L. Martin.

Within months after accepting a new position as Wisconsin's Chief Medical Officer and Epidemiologist, Dr. Westergaard suddenly found himself facing SARS-CoV-2. His presentation gave us his Wisconsin perspective on the SARS-CoV-2 chronology, spread and response. SARS-CoV-2, also called COVID-19, is a novel beta coronavirus.

On December 20, 2019, an alert on The International Society for Infectious Diseases' (ISID) Program for Monitoring Emerging Diseases (ProMED) reported an unusual outbreak in Wuhan, China. Within weeks, the NEJM published the viral sequence of SARS-CoV-2. On February 5, 2020, a person who returned to Wisconsin from Wuhan was diagnosed with the illness, requiring a large control and treatment effort. The next major influx to Wisconsin was from 12 Nile River cruise travelers coming back to Fond du Lac. Soon there was community spread, and on March 25 Governor Evers announced a controversial "Safer At Home" order. Testing and tracing and identification of outbreaks are very important for public health control efforts. Identification of outbreaks in the meat packing industry in Milwaukee and Cudahy allowed effective targeted control efforts. In July, a surge started among 18-24 year-olds, followed by increases among other age groups. Another major wave started after Labor Day due to reopening of Colleges and Universities. There have been more than 3,000 cases on the UW campus. The pandemic is expected to get worse during this fall and winter.

There has been much political controversy over what our responses to the pandemic should be. Epidemiologic surveillance and analysis provide insights into what is effective. This is exemplified by "Reproductive Numbers" R_0 and R(t), and by dispersion factor K.

"Reproductive Numbers" help understand the pandemic.

Base Reproductive Number, (R_0), is the average number of people infected by one case in a population of susceptible individuals. R_0 for the flu is about 1.3. For the 1918 flu it was 2 or 3. For measles it is about 12.

The R_0 for SARS-CoV-2 in a virgin population like ours is about 5. But by changing behaviors or the environment it is possible to change R_0. This can be seen with the equation

$R_0 = \beta CD$, where

β is the probability of infection per contact. (This can be lowered by decreasing the intensity of exposures, or by increasing resistance to infection.)
C is the number of contacts. (This can be lowered by isolating infectious people by doing containment and mitigation.)
D is the duration of infectivity. (We do not yet have a way of doing this.)

β can be lowered by doing distancing and using face masks and eye protection. (see: Chu DK, Akl EA, Duda S, et al. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. The Lancet. 2020;395(10242):1973-1987. doi:10.1016/s0140-6736(20)31142-9)

Distancing: aOR 0.18 RR 0.30
FaceMask: aOR 0.15 RR 0.34 (although a bandana or loose knit wrap is ineffective)
Eye Protection: RR 0.34

C can be lowered with containment and mitigation. South Koreans found that prolonged contact, such as talking in close proximity, spreads the virus. (Risk of transmission in households was 14-20%, whereas risk associated with non-household close contact was about 3%.) South Korea very effectively contained spread by rigorously testing, Isolating cases, tracing all contacts, and quarantining all potentially infectious individuals. State-wide mitigation, by stay at home orders or limits on gatherings, also lowers C.

Estimated Reproductive Number, (R(t)), is another "Reproductive Number". R(t) is R_0, times the proportion of the population that is susceptible at a given time. Thus, if a small enough proportion is susceptible, (due to vaccination, for example), R(t) becomes less than 1, and the number of people being infected will progressively decrease. About 5% of the Wisconsin population has SARS-CoV-2 antibodies, but with the expected R_0, it requires around 60% to acquire this "herd immunity".

Dispersion factor "K" also is useful. A low K indicates that there are "super-spreaders". SARS-CoV-2 has a K of about 0.1. This means that about 10% of infected people spread about 80% of new infections. Super-spreading is associated with super-spreader events. Therefore, a Wisconsin order was issued to prevent hazardous gatherings, such as in crowded poorly ventilated bars. (see: Endo A, Abbott S, Kucharski A, Funk S. : Estimating the overdispersion in COVID-19 transmission using outbreak sizes outside China. **https://wellcomeopenresearch.org/articles/5-67)**

Wuhan stopped transmission via strict lockdown. South Korea contained the virus with a "Box It In" containment strategy. Our efforts to decrease R_0 have been much less successful. R(t) has stayed above 1, (about 1.07 in early October), which is a little too high to prevent new infections from progressively increasing. Reasons include having too few public health workers, insufficient testing resources, lack of unified adoption of a strategy, poor cooperation from the public, and super-spreader events.

Dr Westergaard has had to spend much of his time defensively crafting and legally defending public health policies. Politicians and the public hopefully are learning about epidemiology and public health, and about what we can do to control R_0 and R(t), and will overcome high-level discord. Trusted messengers are needed.

The presentation was followed by a lively Q&A session.

1. Is the virus spread via contaminated surfaces?

RW: Data are incomplete. Avoiding spread via contaminated surfaces makes sense, but spread via air droplets seems much more important.

2. What can be done to reduce super-spreading?

RW: Superspreading may relate to host factors that make the case more infectious, however, it seems more useful to consider environmental factors, such as prolonged exposure in a tightly crowded and poorly ventilated bar, that give rise to super-spreading events.
3. “Beyond the “anti-science” arguments, which you obviously can’t engage rationally, how do you respond to those who want to prioritize the economy over hundreds of thousands of deaths from SARS-CoV-2 infection, but rather than making that fairly unpersuasive argument legislatively, instead couch opposition to public health measures as claims to the Wisconsin courts of constitutional invalidity of such measures?” (Dr Derse)
RW: Our chosen responses to the pandemic always incorporate compromises. There are trade-offs to be made. But there is little political tolerance for grey areas! In this discussion, I am an advocate for solutions that improve the health of the population.
4. How effective would UV light be at controlling spread in classrooms?
RW: UV does denature viruses, however, UV is not used when eyes and skin are exposed to it.
5. Why did Dr. Fauci not recommend masks early in the pandemic?
RW: Information on mechanism of transmission was very sketchy. Masks were scarce and had to be prioritized for high risk situations. Supply now is adequate.
6. Which modeling is currently preferred for prediction of cases and deaths?
RW: We had been using models to estimate which governmental orders would make the best sense. Now there is better observational data, and we are doing less modeling. Now we have a good idea what works, but it is hard to make it happen.
7. Why is the case fatality rate (CFR) decreasing?
RW: The case fatality rate decreases when there is increased detection of mild illnesses, protection of vulnerable individuals, decreased vulnerability, improved treatment, and decrease in virulence of the virus.
8. What personal protective equipment is needed for routine patient care?
RW: For a positive or symptomatic patient, full PPE (N-95, eye protection, gloves, gown…) For routine visits, wear at least a surgical mask and eye protection.
9. Should we do testing of representative samples of the population, and should we do pooled testing of classrooms of students?
RW: Testing of representative samples is helpful, but more difficult than one might suspect. People do not comply. Public health staff are already swamped. Seropositivity is not durable. Sensitivity and specificity of acceptable tests may not be excellent. Frequent, pooled, rapid turn-around screening of classrooms, followed by individual testing if the result is positive, may make testing more affordable.