COVID and the Indoor Environment:

SEASONALLY-DRIVEN RISK FACTORS

Gillian Mittelstaedt, DrPHc, MPA
Director, Tribal Healthy Homes Network
www.thhnw.org
www.tribalindoorairfunding.org
Proportion of time indoors

Use of woodstoves & fireplaces

Natural or "mechanical" ventilation

Multi-generational interaction indoors

COVID prevalence

Seasonally-Driven Risk Factors
Factor 1:

↑ Proportion of Time Spent Indoors

Increase in *duration* of exposure to others in immediate household

Increase in gatherings outside our immediate “bubble”
**Factor 2: Multi-Generational Occupancy and Activity**

<table>
<thead>
<tr>
<th>Children – distance-learning</th>
<th>Essential and front-line workers</th>
<th>Young adults – work and social exposures</th>
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<tbody>
<tr>
<td>Adults – working remotely</td>
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<td>Elders – fewer outside activities</td>
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### Factor 3:

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<th>Use of Woodstoves and Fireplaces</th>
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<td>Potential increase in indoor concentrations of fine particulate matter</td>
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Factor 4:

Use of Natural/Mechanical Ventilation

- Potential increase of indoor concentrations of Carbon Dioxide (CO2)
- Potential increase of indoor levels of relative humidity (RH)
**Factor 5:**

| Increase in *total number of* infected individuals | Increase in percentage of positive tests among those tested |

↑ COVID prevalence and positivity rates
Proportion of Time Spent Indoors

- Increase in duration of exposure to others in immediate household
- More likely to gather in homes outside our immediate “bubble”

Potential for greater duration and frequency of exposure to COVID

Use of Woodstoves and Fireplaces

- May increase ambient and indoor concentrations of fine particulate matter
- May increase ambient indoor concentrations of volatile organic compounds (VOCs), Carbon Monoxide

Potential for exposure to immune suppressants

Multi-Generational Occupancy and Activity

- Children – distance-learning
- Adults – working remotely
- Elders – fewer group activities
- Essential and front-line workers
- Young adults – work and social exposures

Potential for greater transmission among household members

Use of Natural/Mechanical Ventilation

- May increase indoor concentrations of Carbon Dioxide (CO2)
- May increase indoor levels of relative humidity (RH)

Potential for higher concentration of aerosolized virus due to reduced air exchange
Total cases per 100k in high % AI/AN counties: 6,605

Total cases per 100k in low % AI/AN counties: 3,580

In counties with higher concentration of AI/AN population, the number of COVID cases per 100,000 is nearly double – 6,505 as compared to 3,580... why?
Counties with higher proportion of AI/AN population may have reservations and/or villages with...

- HUD-constructed homes without whole-house ventilation (less ventilation and filtration) (40% considered “sub-standard per NCAI)
- A housing wait list due to insufficient federal funding (more overcrowding/exposure) (30% per NCAI)
- Limited access to natural gas or affordable green energy, having to rely on older woodstoves for home heating (more fine particle air pollution)
- Limited indoor plumbing (challenge for hand-washing/disease transmission) (16% per NCAI)

A future question for researchers, tribal leaders, federal decision-makers and all who support tribes: Does substandard housing lead to indoor air quality risk factors that result in higher disease rates of infectious diseases such as COVID?
Factors within our control...

Mechanical Ventilation
Filtration (portable air cleaners or HVAC)
Social Distancing
Use of Masks and PPE
Hand-washing
Frequency and Number of Visitors
Regular, Safe Disinfecting of Surfaces