SARS-CoV-2: state of the pandemic

C. Jessica E. Metcalf & B.T. Grenfell
cmetcalf@princeton.edu
Seven day rolling averages

https://ourworldindata.org/covid-vaccinations
Omicron - emerging characteristics

- Evades antibodies and thus can infect individuals with prior immunity (vaccinated, or infected) - although boosters do seem to reduce this potential

- More transmissible relative to previous variants, with possibly a shorter interval between exposure and symptoms, making it harder to slow spread by contact tracing.

- Appears to have reduced ability to infect cells of the lower respiratory tract - which might partly explain reduction in severity - but noting that severity in individuals with prior immunity is also expected to be reduced (T-Cells, etc).

!!Half as severe but twice as transmissible would yield the same pressure on the health system… and staffing issues are ubiquitous

Omicron - emerging characteristics

- Evades antibodies and thus **can infect individuals with prior immunity** (vaccinated, or infected) - although boosters do seem to reduce this potential.

- Is **more transmissible** relative to previous variants, with possibly a shorter interval between exposure and symptoms (/transmission?) making it harder to slow spread by contact tracing. Spreads incredibly fast.
Omicron - emerging characteristics

- Evades antibodies and thus can infect individuals with prior immunity (vaccinated, or infected) - although boosters do seem to reduce this potential.

- Is more transmissible relative to previous variants, with possibly a shorter interval between exposure and symptoms (/transmission?) making it harder to slow spread by contact tracing. Spreads incredibly fast.

- Appears to have reduced ability to infect cells of the lower respiratory tract - which might partly explain reduction in severity - but noting that severity in individuals with prior immunity is also expected to be reduced (T-Cells, etc).
Omicron - emerging characteristics

• Evades antibodies and thus **can infect individuals with prior immunity** (vaccinated, or infected) - although boosters do seem to reduce this potential.

• Is **more transmissible** relative to previous variants, with possibly a shorter interval between exposure and symptoms (/transmission?) making it harder to slow spread by contact tracing. Spreads incredibly fast.

• Appears to have reduced ability to infect cells of the lower respiratory tract - which might partly explain **reduction in severity** - but noting that severity in individuals with prior immunity is also **expected to be reduced** (T-Cells, etc).

  !!Half as severe but twice as transmissible would yield the same pressure on the health system… and staffing issues are ubiquitous
Omicron - emerging characteristics

- Evades antibodies and thus **can infect individuals with prior immunity** (vaccinated, or infected) - although boosters do seem to reduce this potential

- Is **more transmissible** relative to previous variants, with possibly a shorter interval between exposure and symptoms (/transmission?) making it harder to slow spread by contact tracing.

- Appears to have reduced ability to infect cells of the lower respiratory tract - which might partly explain **reduction in severity** - but noting that severity in individuals with prior immunity is also expected to be **reduced** (T-Cells, etc).

Vaccines will not be enough - we need to be able to manipulate transmission e.g., via rapid tests - for Omicron & future pandemic threats
Omicron - remaining questions

- Details of severity of omicron in unvaccinated; across doses; over age; etc; and other aspects of heterogeneity in severity (the key question is net severity = chance of hospitalization x number infected)
Omicron - remaining questions

- Details of severity of omicron in unvaccinated; across doses; over age; etc; and other aspects of **heterogeneity in severity** (the key question is **net severity** $= \text{chance of hospitalization} \times \text{number infected}$)

- Details of the relationship between omicron and **long COVID**, likewise
Omicron - remaining questions

• Details of severity of omicron in unvaccinated; across doses; over age; etc; and other aspects of heterogeneity in severity (the key question is net severity = chance of hospitalization x number infected)

• Details of the relationship between omicron and long COVID, likewise

• Health system effects of an ongoing pandemic (health worker fatigue, …)
Omicron - remaining questions

• Details of severity of omicron in unvaccinated; across doses; over age; etc; and other aspects of **heterogeneity in severity** (the key question is **net severity** = chance of hospitalization x number infected)

• Details of the relationship between omicron and **long COVID**, likewise

• **Health system effects** of an ongoing pandemic (health worker fatigue, …)

Necessary for planning interventions and vaccination (boosters, updates)
Possible futures

- **Optimistic** - this is the start of a bumpy path to **endemicity**. There are still questions around the unvaccinated (children, etc). However, T-cell immunity, which will reduce severity, is constantly building up in the population and could drive severe outcomes further and further down, even if the virus drifts to evade immune protection from **infection**.
Possible futures

• **Optimistic** - this is the start of a bumpy path to **endemicity**. There are still questions around the unvaccinated (children, etc). However, T-cell immunity, which will reduce severity, is constantly building up in the population and could drive severe outcomes further and further down, even if the virus drifts to evade immune protection from **infection**.

• **Pessimistic** - a new variant could emerge that once again evades immunity against infection, **and** is also more severe and will could move rapidly through populations resulting in large numbers of severe cases, overwhelming health systems.
Possible futures

• **Optimistic** - this is the start of a bumpy path to endemicity. There are still questions around the unvaccinated (children, etc). However, T-cell immunity, which will reduce severity, is constantly building up in the population and could drive severe outcomes further and further down, even if the virus drifts to evade immune protection from *infection*.

• **Pessimistic** - a new variant could emerge that once again evades immunity against infection, and is also more severe and will could move rapidly through populations resulting in large numbers of severe cases, overwhelming health systems.

  The virus will be doing all the experiments, unless we can reduce transmission - international vaccination, including of immunosuppressed individuals is likely key.
Thank you