Backward contact tracing

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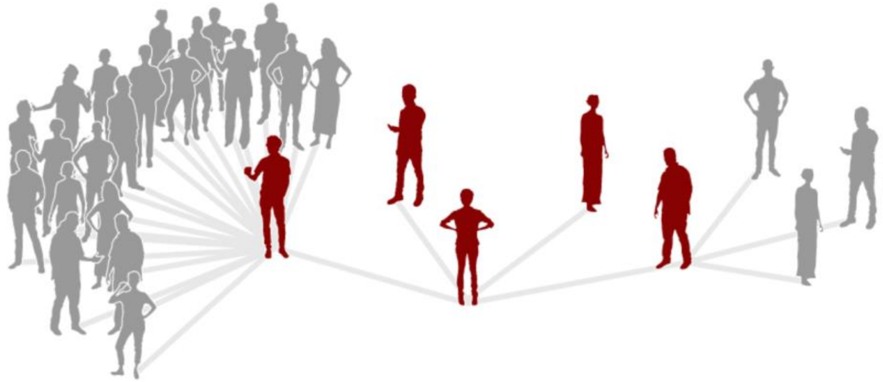
Claire Blackmore, WHO
Klaas Nelissen, Leuven University
Emilie Peron, WHO
Joren Raymenants, Leuven University

Examples of superspreading events and overdispersion

- February 2020, Daegu, South Korea: in a church mass gathering event, one case infected more than 5,000 known cases
- February 2020, Boston, United States: in a conference, one positive case led to at least 97 cases and eventually, the virus spread from the meeting across Massachusetts and to other states
- March 2020, Jordan: during a wedding, one infected attendee infected at least 76 cases of about 360 guests
- December 2020, Antwerp, Belgium: in a long-term care facility, one visitor infected 40 staff members and more than 100 residents. The visitor subsequently tested positive.

- Modelling studies
  - 19% of cases seeded 80% of all local transmission (Adam and al)
  - 10% of cases caused 80% of secondary transmissions (Endo and al; Sneppen and al)
  - 5% of infected individuals accounting for 80% of subsequent cases (Laxminarayan and al)



High individual-level variation in the number of secondary transmissions

-> overdispersion (*k* ~ 0.1)

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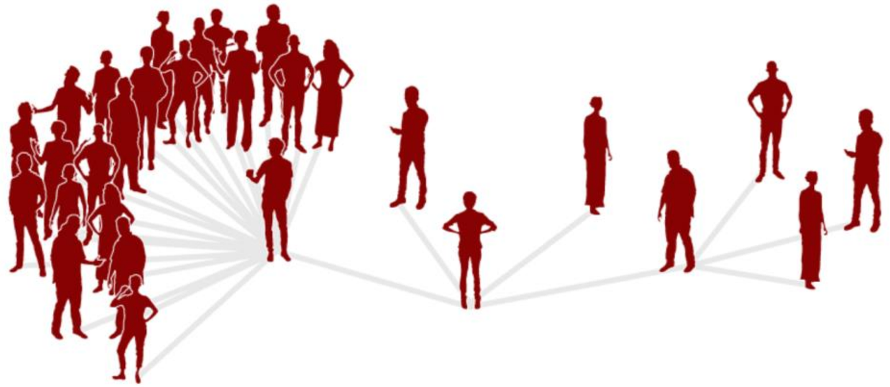

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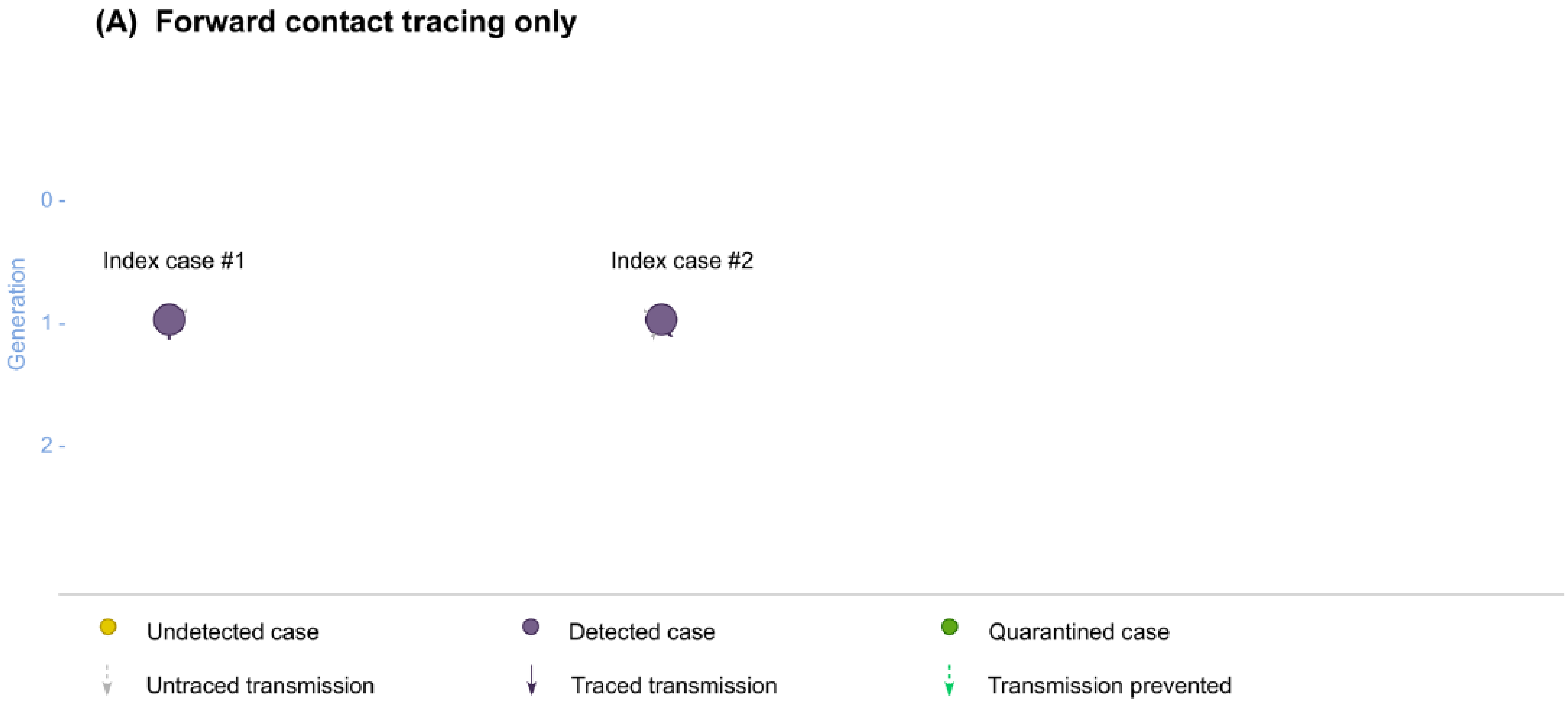
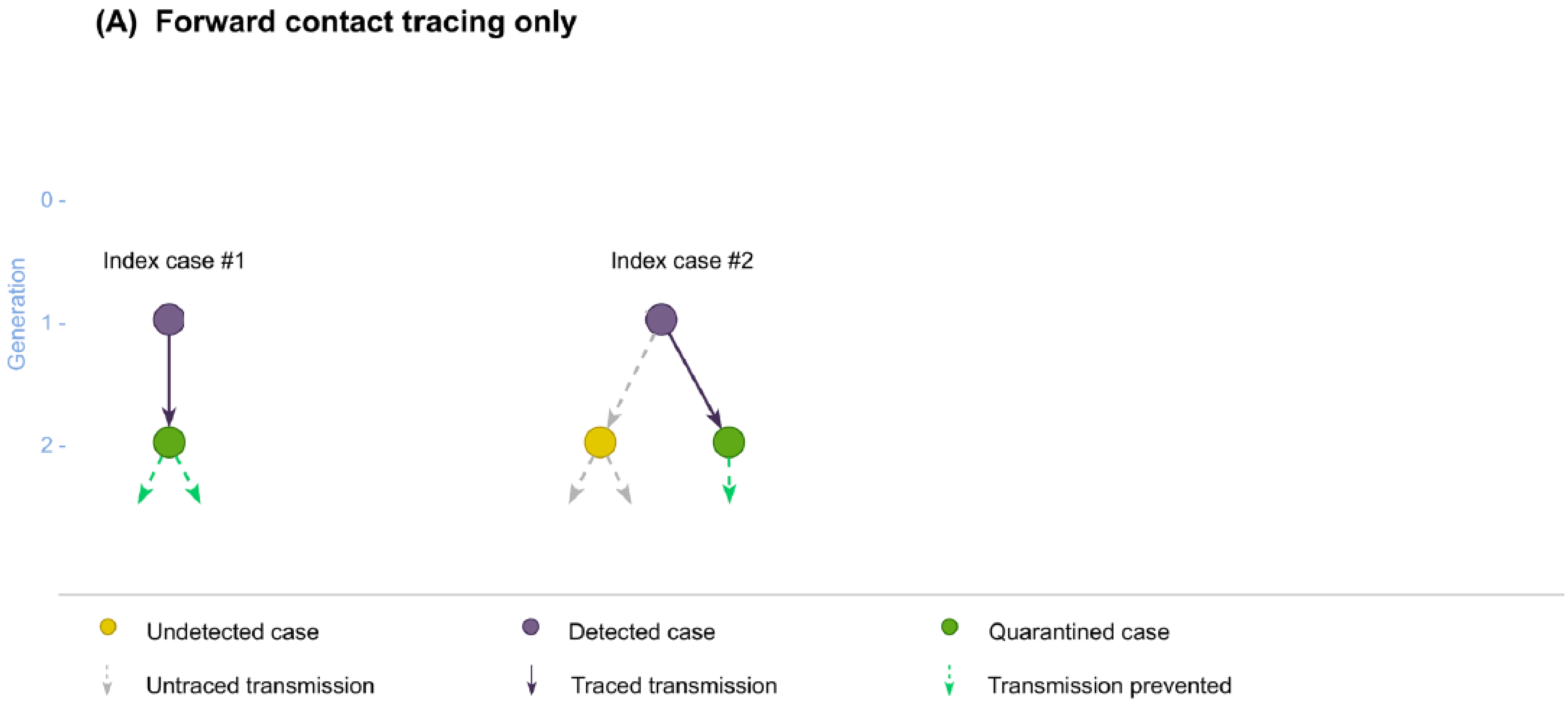
Likelihood of infection <u>from</u> a superspreading event > likelihood of <u>further</u> infection



Consequences for contact tracing: Likelihood of infection from a superspreading event > likelihood of further infection



Endo and all, Implication of backward contact tracing in the presence of overdispersed transmission in COVID-19 outbreaks
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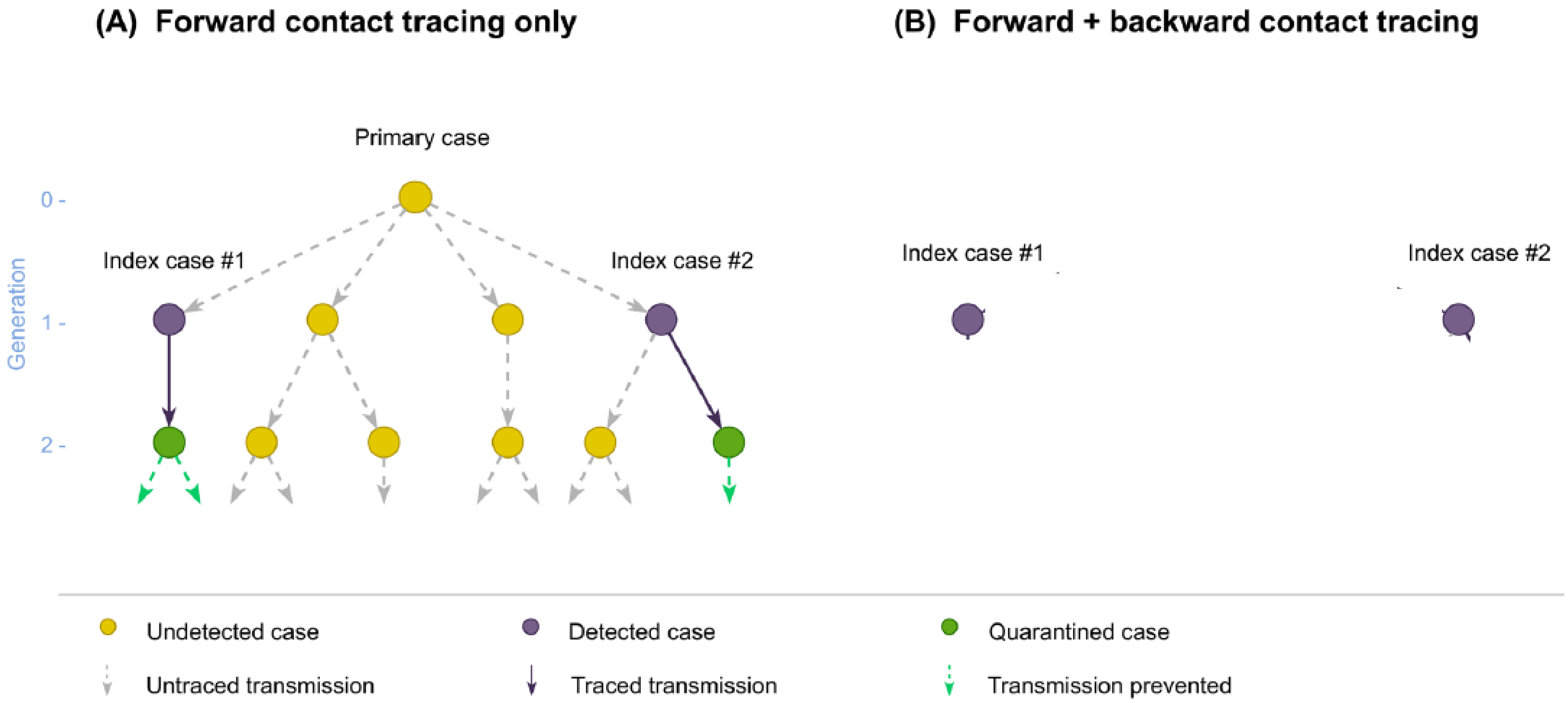

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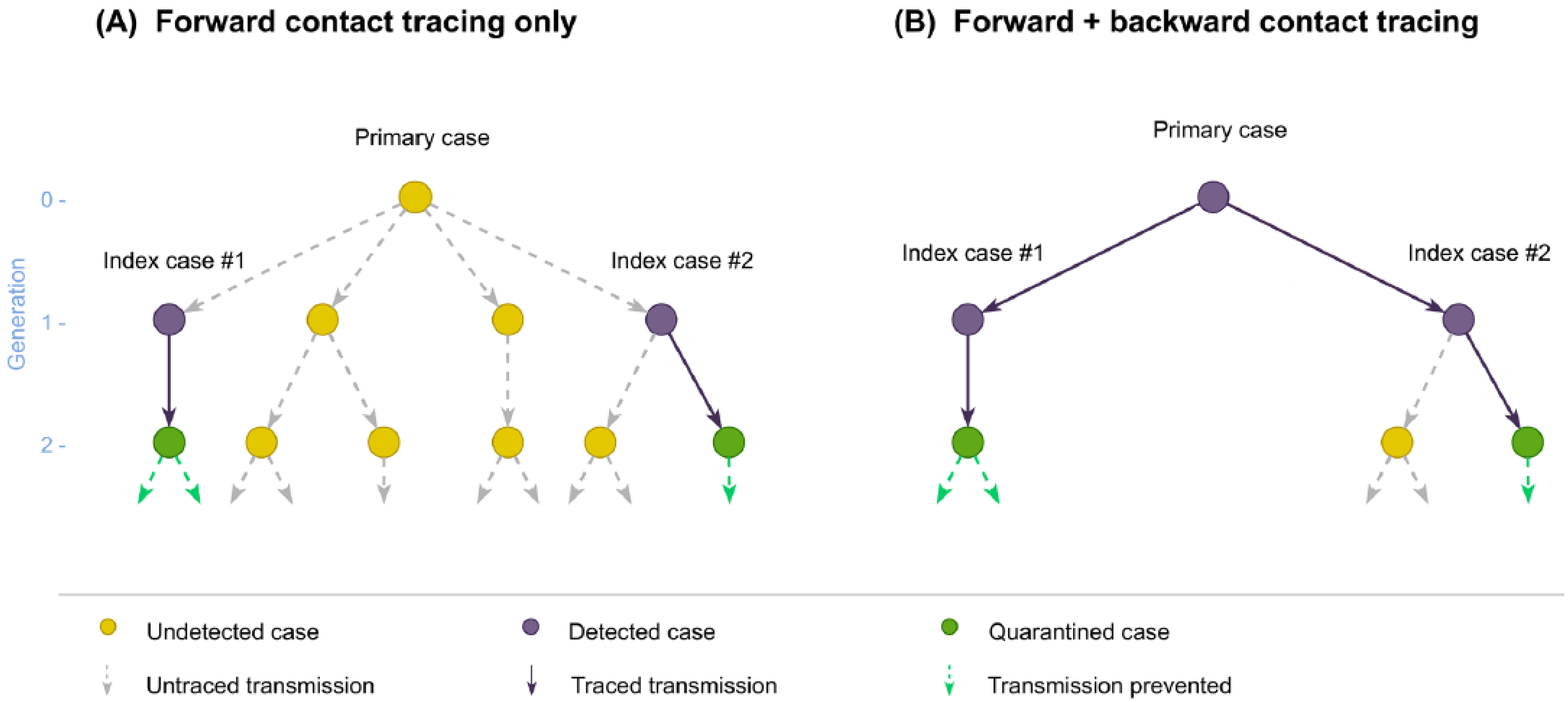

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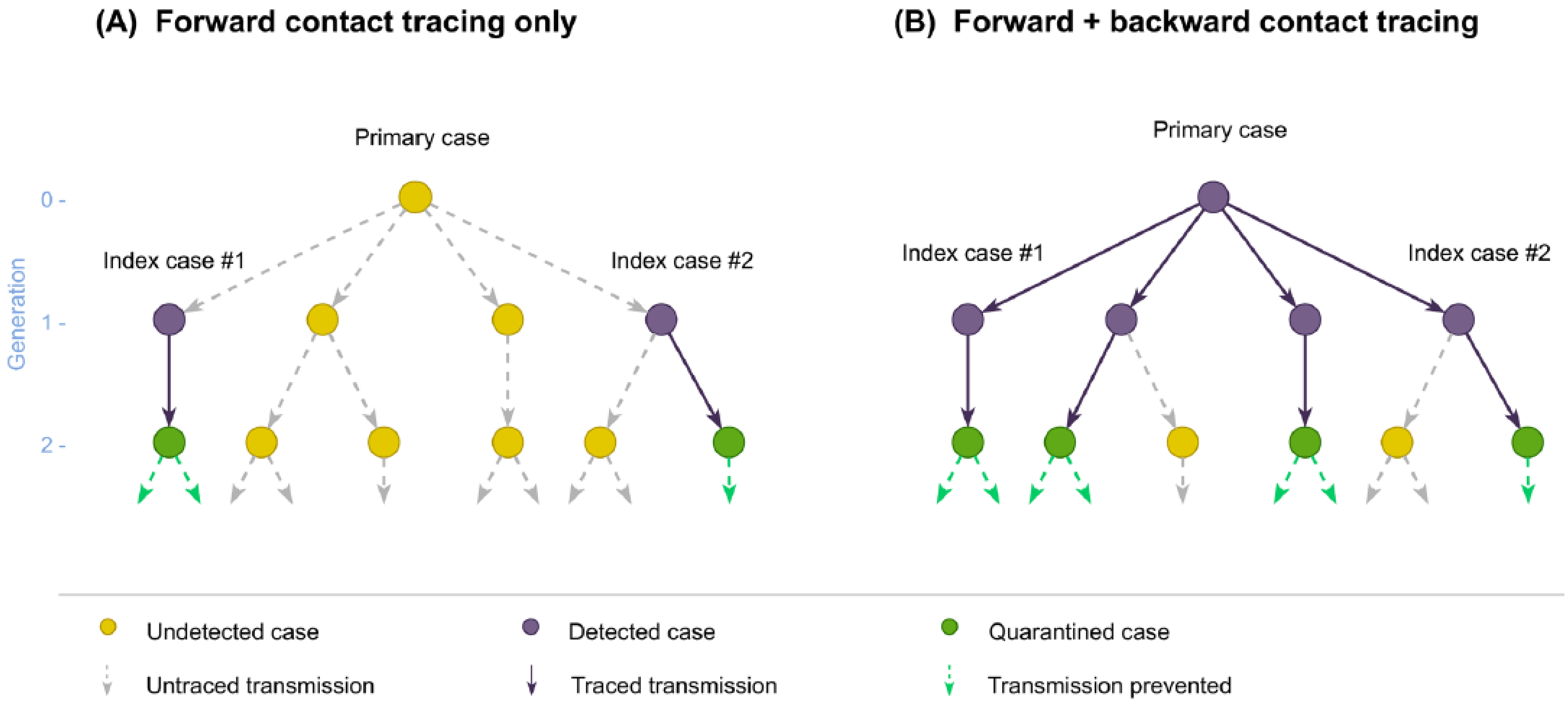

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Pending questions and limitations

Effectiveness of the backward contact tracing activities depends on:

- Timeliness of the processes
- The local capacities (contact tracers and testing)

-> When to turn it on and off?

-> How to prioritize?

-> Can we be assisted by digital tools to identify the geolocation of infections?

Over dispersion and superspreading events depend on:

- Environment: closed, crowded, closed contact, PHMS in place and adherence, activities practiced, types of contact (close, reg ular, random)
- People (age, immunity)??
- Virus (variants)??
- Time??

Bibliography and useful links

- https://www.theatlantic.com/health/archive/2020/09/k-overlooked-variable-driving-pandemic/616548/
- https://www.nature.com/articles/d41586-021-00460-x
- https://vis.sciencemag.org/covid-clusters/
- Lemieux and al, Phylogenetic analysis of SARS-CoV-2 in the Boston area highlights the role of recurrent importation and superspreading events. MedRix, August 2020. https://www.medrxiv.org/content/10.1101/2020.08.23.20178236v1
- Yousef and al, Large Outbreak of Coronavirus Disease among Wedding Attendees, Jordan. Emerging infectious diseases, September 2020. https://wwwnc.cdc.gov/eid/article/26/9/20-1469_article
- Adam and al, Clustering and superspreading potential of SARS-CoV-2 infections in Hong Kong. Nature Medecine, September 2020. https://www.nature.com/articles/s41591-020-1092-0
- Majra and al, SARS-CoV-2 (COVID-19) superspreader events, Journal of infection, November 2020. https://www.journalofinfection.com/article/S0163-4453(20)30717-9/fulltext
- Endo and al, Estimating the overdispersion in COVID-19 transmission using outbreak sizes outside China. Wellcome Open Research, July 2020. https://wellcomeopenresearch.org/articles/5-67
- Sneppen and al, Overdispersion in COVID-19 increases the effectiveness of limiting nonrepetitive contacts for transmission control. PNAS, March 2021. https://www.pnas.org/content/118/14/e2016623118
- Laxminarayan and al, Epidemiology and transmission dynamics of COVID-19 in two Indian states, Science, November 2020. https://science.sciencemag.org/content/370/6517/691