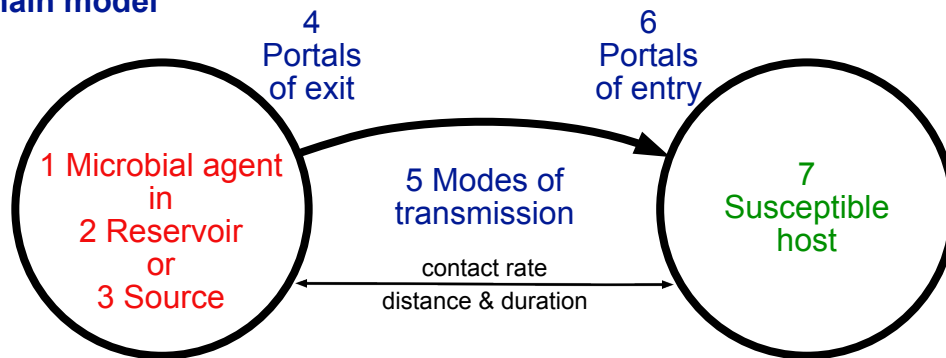


Preventing and Controlling Infectious Diseases, COVID-19 Edition

Population Health Division, San Francisco Department of Public Health

Chain model



Reservoir / Source

- 1 air
- 2 water
- 3 food
- 4 people
- 5 animals and vectors
- 6 vehicles
- 7 soil and debris

Modes of transmission

- 1 contact - direct
- 2 contact - indirect (fomites, fecal)
- 3 droplet
- 4 airborne
- 5 vehicle-borne
- 6 vector-borne
- 7 vertical (mother to child)

The 7 Habits of Uninfected People

- 1 physical distancing (especially if susceptible or most vulnerable)
- 2 frequent hand washing; avoid touching eyes, nose, and mouth
- 3 face covering or mask, respiratory hygiene, and cough etiquette
- 4 staying home when sick: don't go to school, work, social events
- 5 keeping vaccinations up-to-date (e.g., flu, hep A)
- 6 safe consuming of water, food, products (includes harm reduction)
- 7 understanding infection prevention/control (study this document)

Transmission containment strategies

- 1 reduce reservoir and / or source (mitigate hazard, disinfection)
- 2 reduce contact (decrease rate and duration, increase distance)
- 3 reduce fraction of population that is infectious
- 4 reduce biological infectiousness (e.g., ART in HIV)
- 5 reduce biological susceptibility (e.g., PrEP, vaccine)
- 6 interrupt transmission (infection control, N95s, face masks, etc.)
- 7 reduce fraction of population that is susceptible

Transmission equations

$$\text{EQ 1: } R(t) = R_0 x(t) \approx c p d [1 - h f - r(t)]$$

$$\text{EQ 2: } I(t) = c p P(t)$$

Special transmission drivers

- 1 asymptomatic infectiousness
- 2 pre-symptomatic infectiousness
- 2 short serial (generation) time
- 3 airborne transmission
- 4 fomite transmission
- 5 fecal-oral transmission

$R(t)$ = effective reproductive number
 R_0 = basic reproductive number
 x = fraction of population susceptible
 c = contact rate between infectious sources and susceptibles
 p = transmission probability
 d = duration of infectiousness
 h = vaccine effectiveness
 f = fraction of population vaccinated
 $r(t)$ = fraction removed (recovered immune)
 $I(t)$ = infection rate among susceptibles
 $P(t)$ = probability source is infectious
 (t) = at time t

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Details here: <https://escholarship.org/uc/item/7687z08g>

Also visit population health blog: <https://taragonmd.github.io/>

Infectious disease control measures / tools

- behavior change of reservoir/source and/or susceptibles
- testing (diagnostic, and targeted or mass screening)
- case definition (epidemiological, clinical, and laboratory criteria)
- case finding for isolation, treatment, surveillance
- isolation (separation of infectious person ["case"])
- case management (transport, house, feed, isolate, treat, clear)
- contact tracing for quarantine, PEP, surveillance
- quarantine (separation of exposed individuals)
- social distancing (for individuals or groups)
 - * keeping 6 or more feet from others
 - * school closures, cancellation of classes
 - * cancellation of mass gatherings
 - * travel restrictions
- shelter at home ("shelter in place") (avoiding potential exposures)
- vaccination (targeted and/or mass)
- pre- or post-exposure prophylaxis (PrEP, PEP, vaccine, IgG, drug)
- treatment (infectious cases or co-risk factor)
- infection prevention (aka infection control)
- environmental measures, including disinfection
- cordon sanitaire (preventing *exit* from affected region)
- protective sequestration (preventing *entry* into unaffected region)