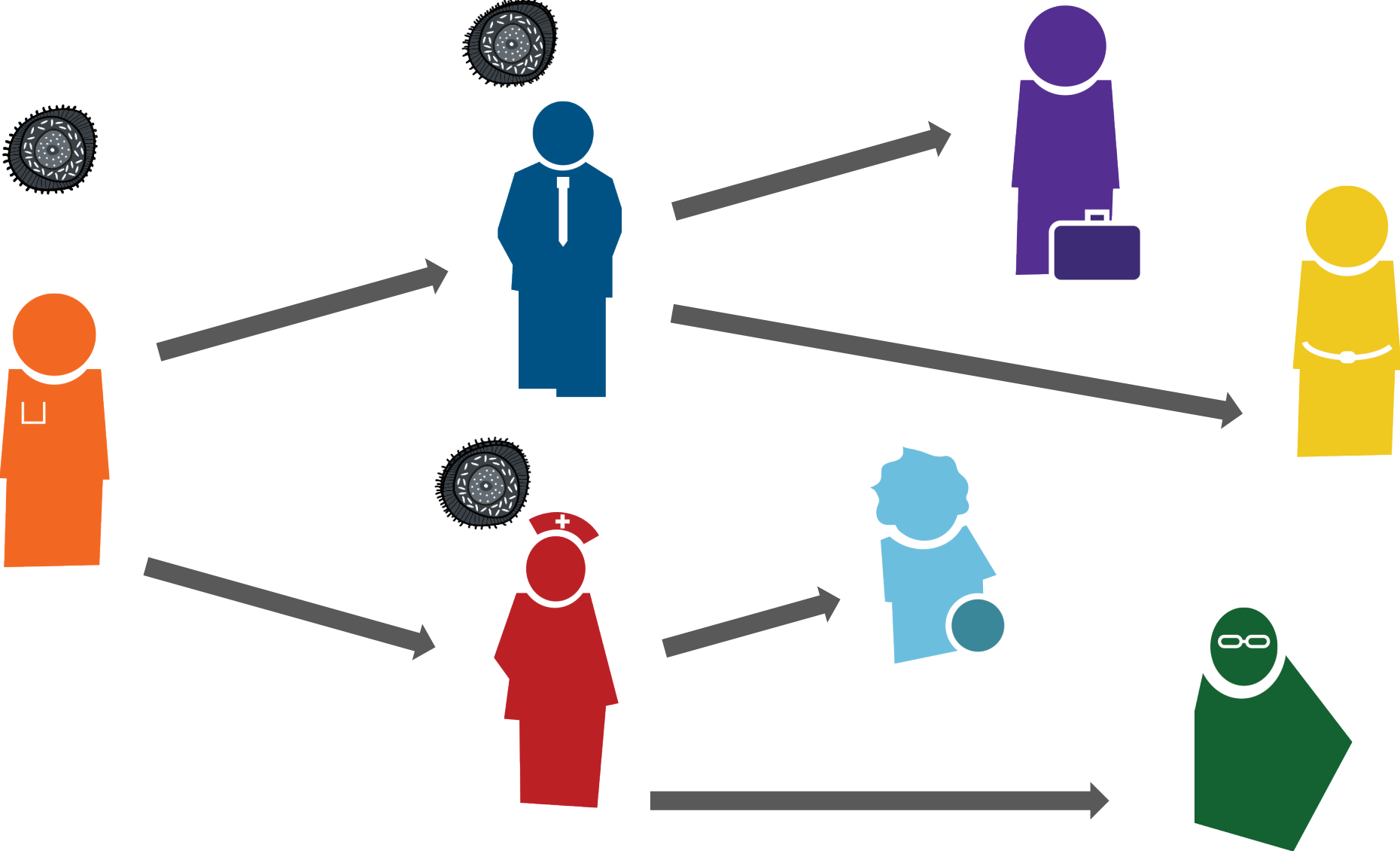


# How infectious is COVID-19?



# Basic case reproduction number $R_0$

Average number of secondary cases per case (number of successful transmissions per case) in a totally susceptible population.

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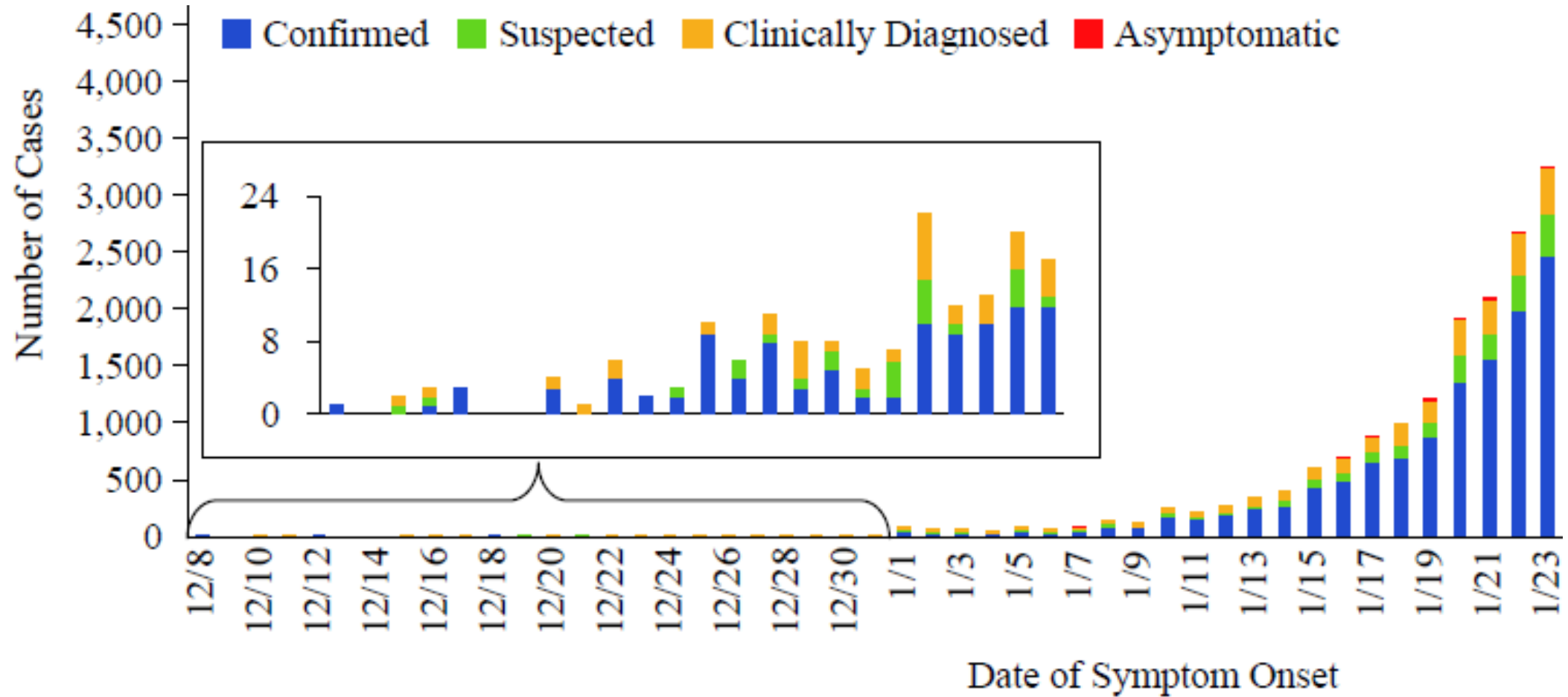
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# Epidemic curve



China CDC weekly Feb 17 2020

# R0 for COVID-19

**Estimates** between 1.5 and 4.5, most 2-3

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What does this mean?

... in the early stage of the epidemic

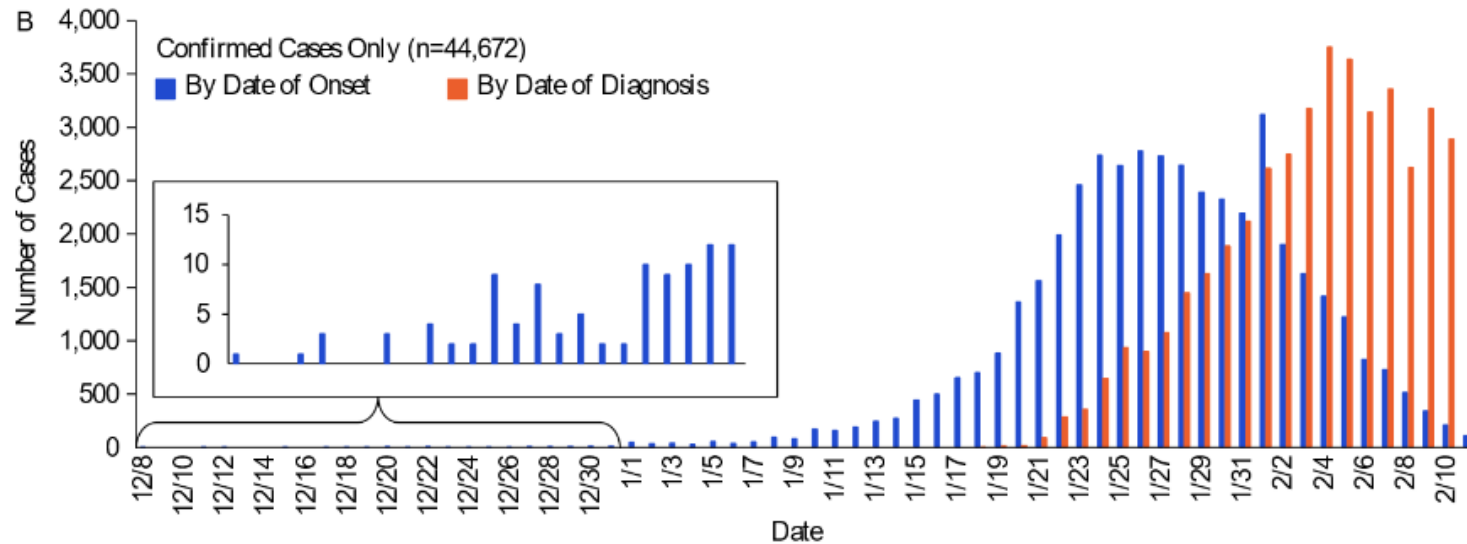
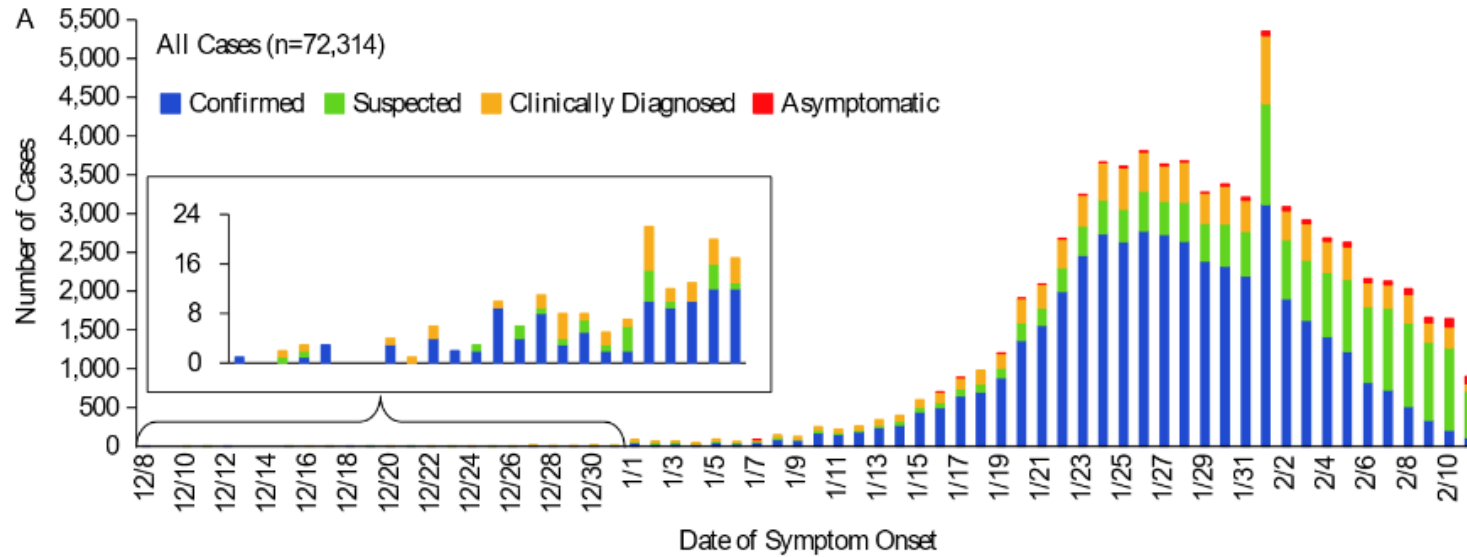
... using available data

... in Wuhan

... on average



# Difficulty in estimating R0



# R0 depends on 3 factors

- **duration of infectiousness**
- **probability of infection being transmitted during contact** between a susceptible and infected individual
- **average rate of contact** between susceptible and infected individuals

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*Infectious organism (& host)*

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Population

R0

**R0 for COVID-19  $\approx$  1.5-4.5**

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R0 for Measles  $\approx$  15

R0 for Chickenpox  $\approx$  10

R0 for SARS  $\approx$  3

R0 for Ebola  $\approx$  2

R0 for 'flu  $\approx$  1.5-3

# Secondary attack rate

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= *the proportion of those exposed to the primary case that develop disease as a result of the exposure*



# Secondary attack rate of SARS

## Singapore

Number of household members exposed to cases = 417

No. of new cases arising = 26

Secondary attack rate =  $26/417 = 6.2\%$

# NB: Secondary attack rate is context specific

**Depends on:**

**Closeness of contact**

SARS in Beijing 2° AR higher in those caring for patient (31%) than living in same residence (4.6%)

**Stage of illness**

SARS:

2° AR higher in hospital than at home – due to stage of illness?

# R0 and 2° AR

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$$\begin{aligned} \mathbf{R0} = & \text{2° AR [household]} \times \text{no. of contacts [household]} \\ & + \\ & \text{2° AR [other family]} \times \text{no. of contacts [other family]} \\ & + \\ & \text{2° AR [community]} \times \text{no. of contacts [community]} \\ & + \\ & \text{etc} \end{aligned}$$