Demo: Comparing vaccination strategies with finalsize

This is a fictional use case to demonstrate:

- The kind of new insights Epiverse tools are unlocking
- Why these tools need to be open-source and disseminated are widely as possible

Fictional situation

- Outbreak currently ongoing in Senegal
- 1,000,000 doses of vaccines (80% efficacy) available

How to distribute a limited doses supply?

Herd immunity

In a partially immunized population, unimmunized individuals get indirect protection from immunized individuals

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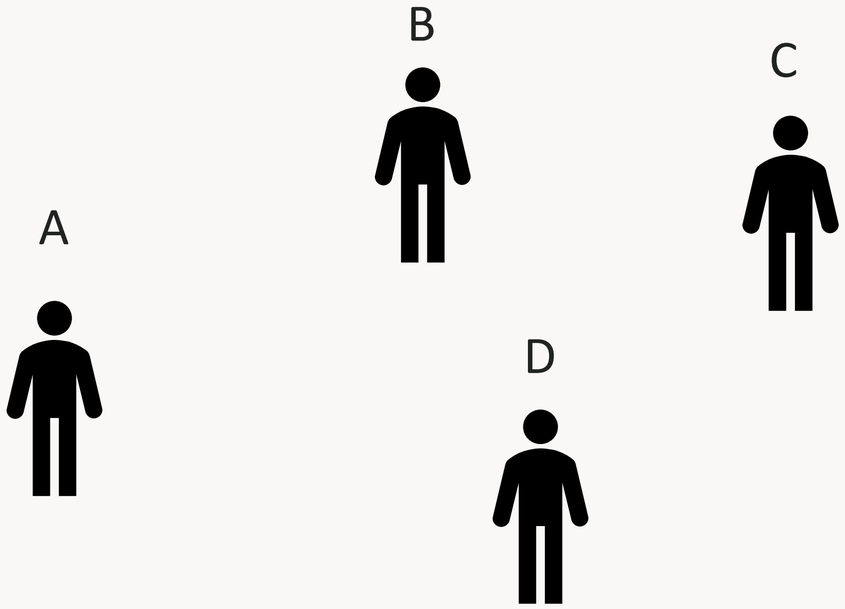

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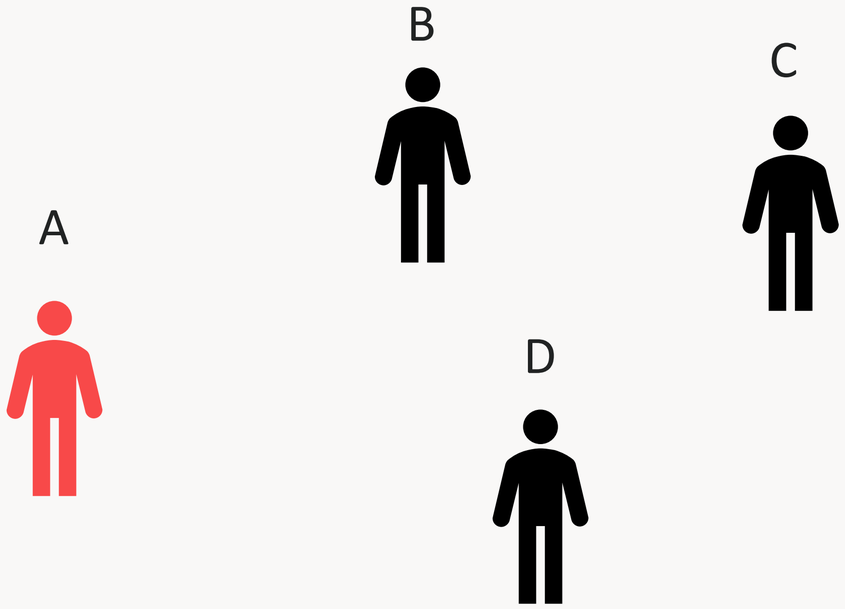

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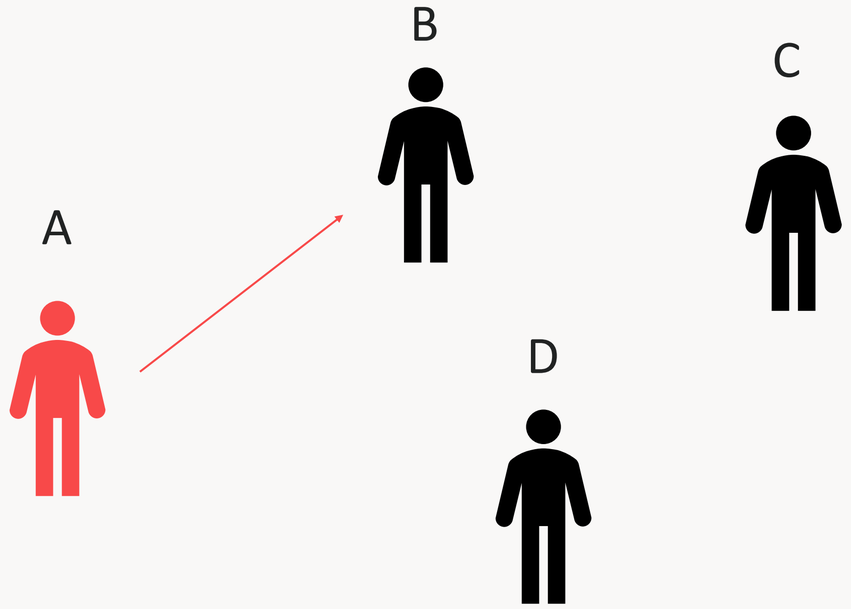

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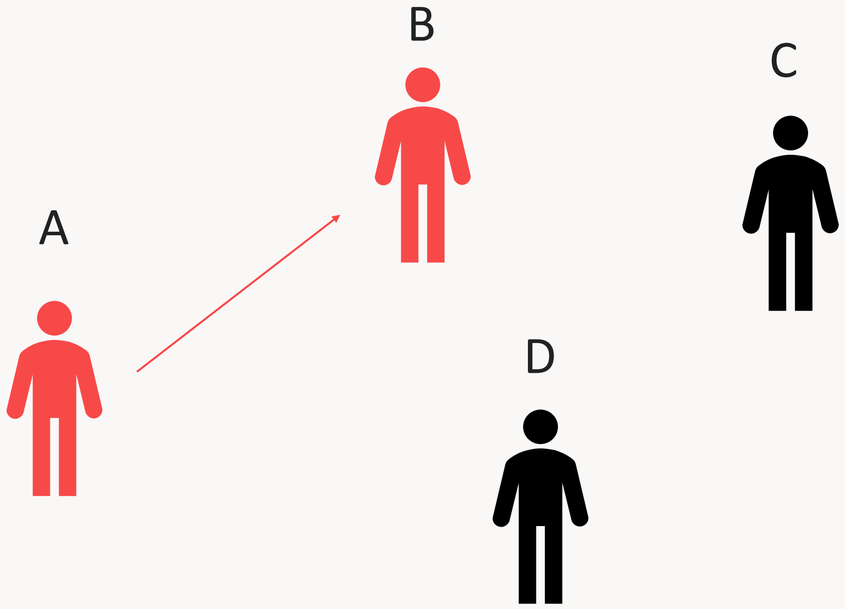

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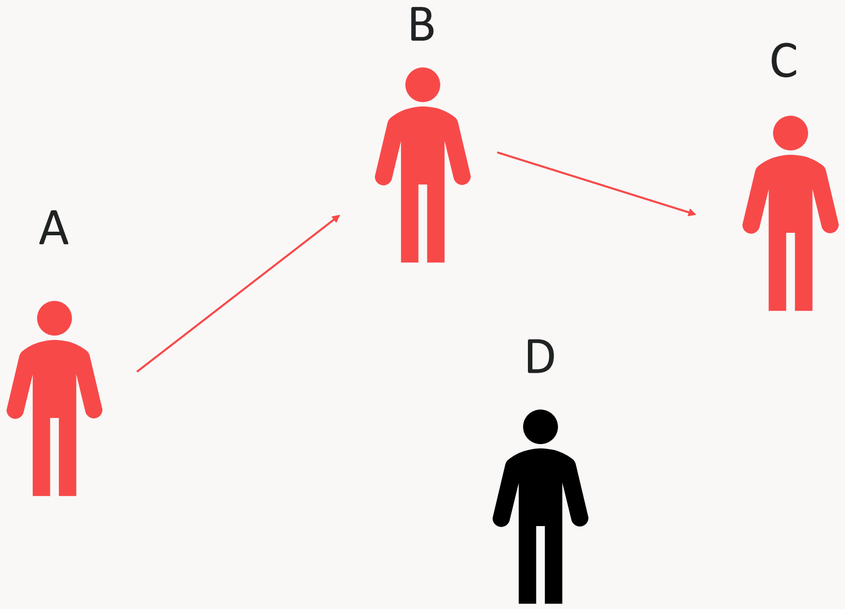

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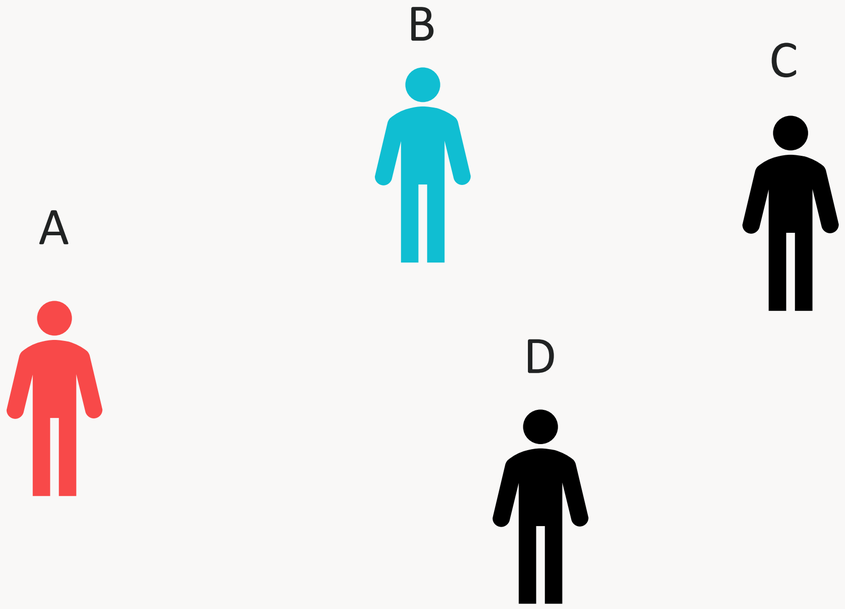

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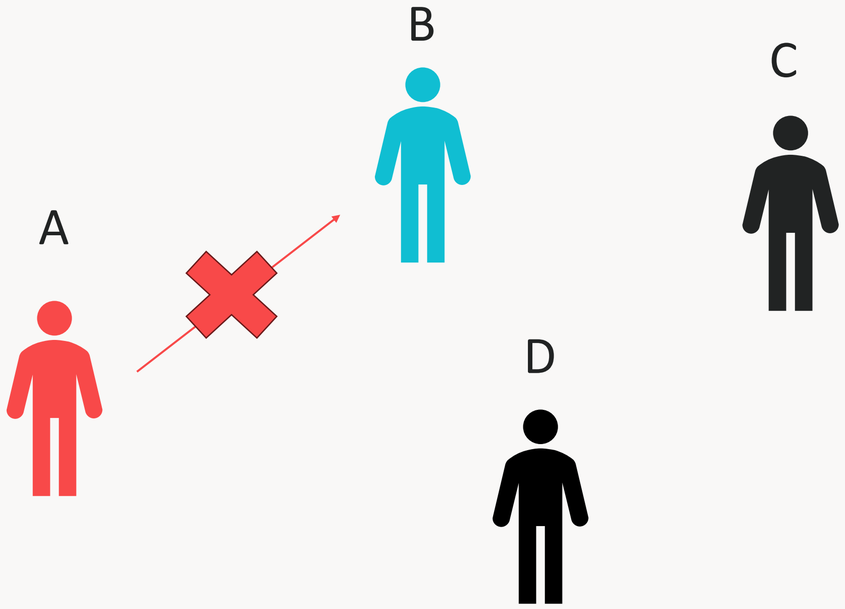


3 scenarios to compare

How to distribute the 1,000,000 doses to maximize their impact in the entire population via herd immunity?

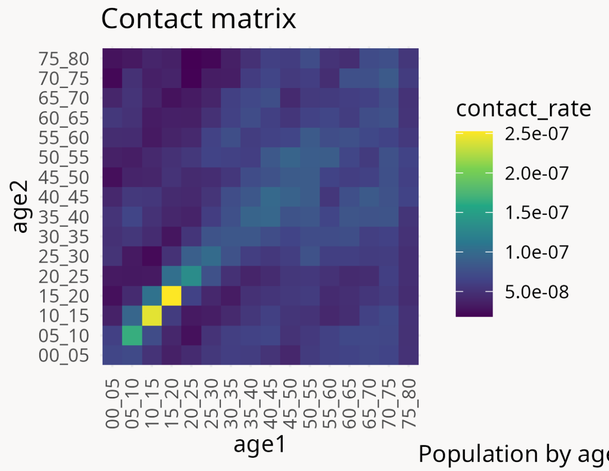
- **Scenario A**: Give 1,000,000 doses to the youngest age group
- **Scenario B**: Give 1,000,000 doses to the oldest age group
- **Scenario C**: Give 1,000,000 doses uniformly across the whole population

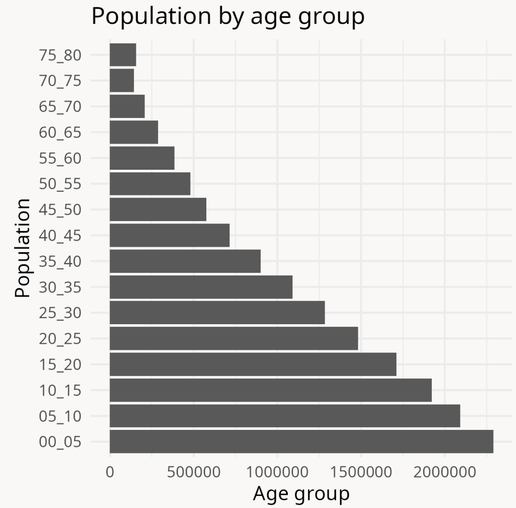
Using finalsize

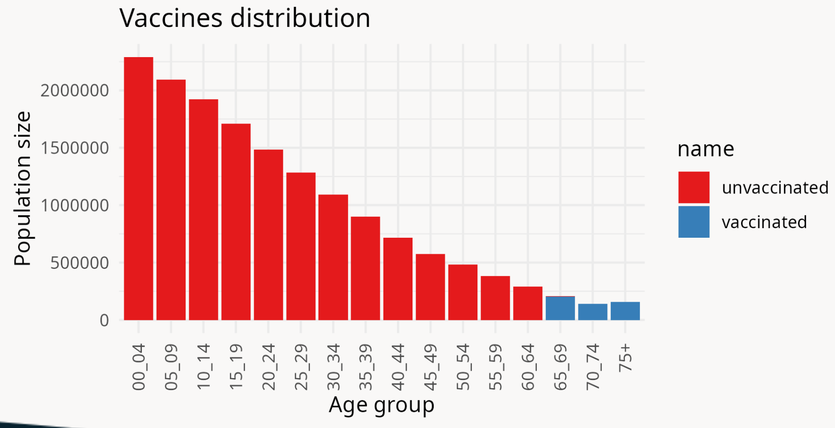
```
library(finalsize)

final_size(
  r0 = r0,
  contact_matrix,
  demography_vector,
  susceptibility,
  p_susceptibility
)
```

Reproduction number

Vaccine efficacy







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demo_grp	susc_grp	susceptibility	p_infected
00_05	susc_grp_1	0.70	0.0431598
05_10	susc_grp_1	0.70	0.0707364
10_15	susc_grp_1	0.70	0.0835088
15_20	susc_grp_1	0.70	0.0723355
20_25	susc_grp_1	0.70	0.0495588
25_30	susc_grp_1	0.70	0.0526637
30_35	susc_grp_1	0.70	0.0541672
35_40	susc_grp_1	0.70	0.0581954
40_45	susc_grp_1	0.70	0.0603913
45_50	susc_grp_1	0.70	0.0557931
50_55	susc_grp_1	0.70	0.0603806
55_60	susc_grp_1	0.70	0.0540232
60_65	susc_grp_1	0.70	0.0569088
65_70	susc_grp_1	0.70	0.0597207
70_75	susc_grp_1	0.70	0.0632707
75_80	susc_grp_1	0.70	0.0483331
00_05	susc_grp_2	0.14	0.0087850
05_10	susc_grp_2	0.14	0.0145655
10_15	susc_grp_2	0.14	0.0172894
15_20	susc_grp_2	0.14	0.0149048

Outcome

demo_grp	susc_grp	susceptibility	p_infected
00_05	susc_grp_1	0.70	0.0431598
05_10	susc_grp_1	0.70	0.0707364
10_15	susc_grp_1	0.70	0.0835088
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25_30	susc_grp_1	0.70	0.0526637
30_35	susc_grp_1	0.70	0.0541672
35_40	susc_grp_1	0.70	0.0581954
40_45	susc_grp_1	0.70	0.0603913
45_50	susc_grp_1	0.70	0.0557931
50_55	susc_grp_1	0.70	0.0603806
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65_70	susc_grp_1	0.70	0.0597207
70_75	susc_grp_1	0.70	0.0632707
75_80	susc_grp_1	0.70	0.0483331
00_05	susc_grp_2	0.14	0.0087850
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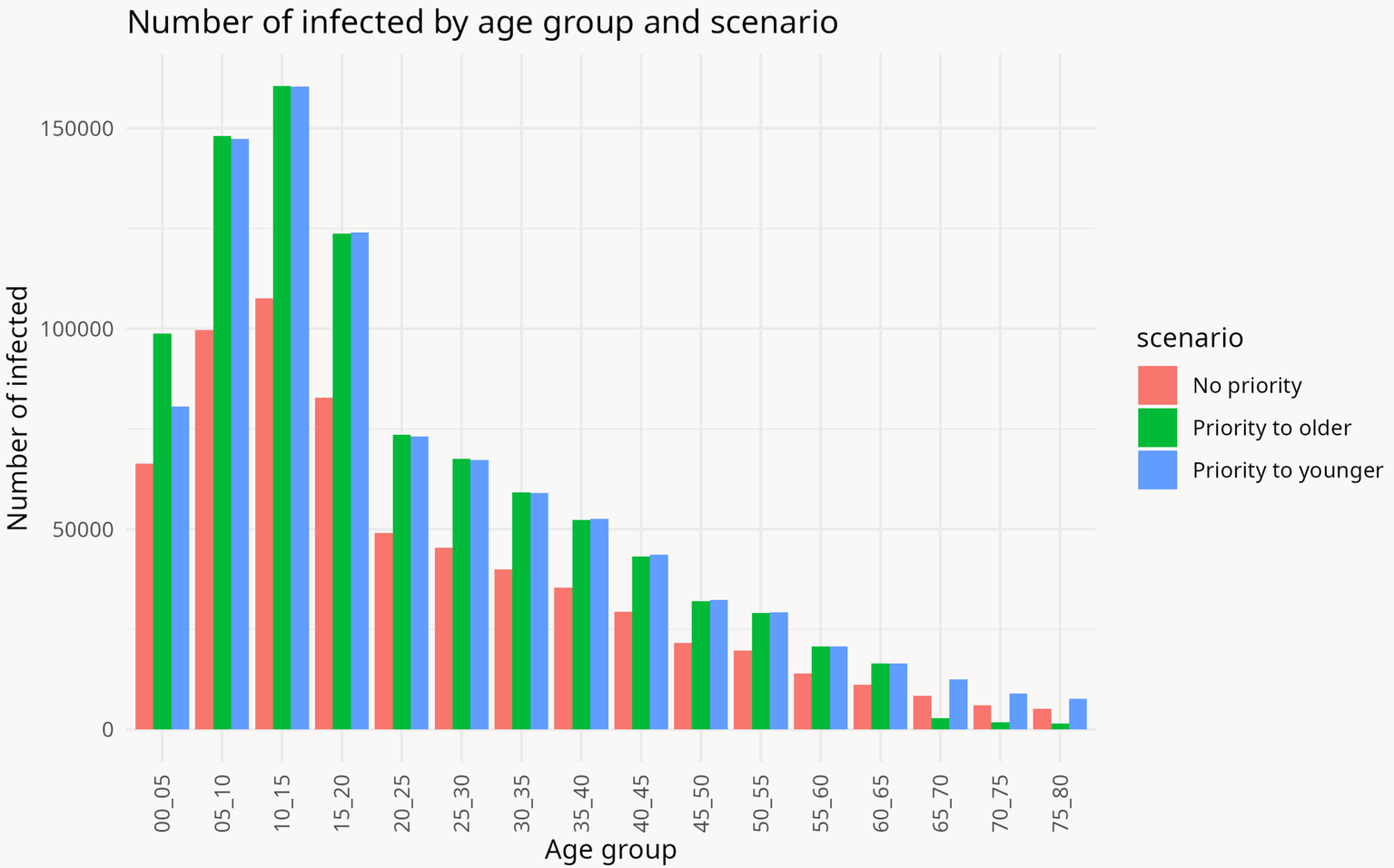
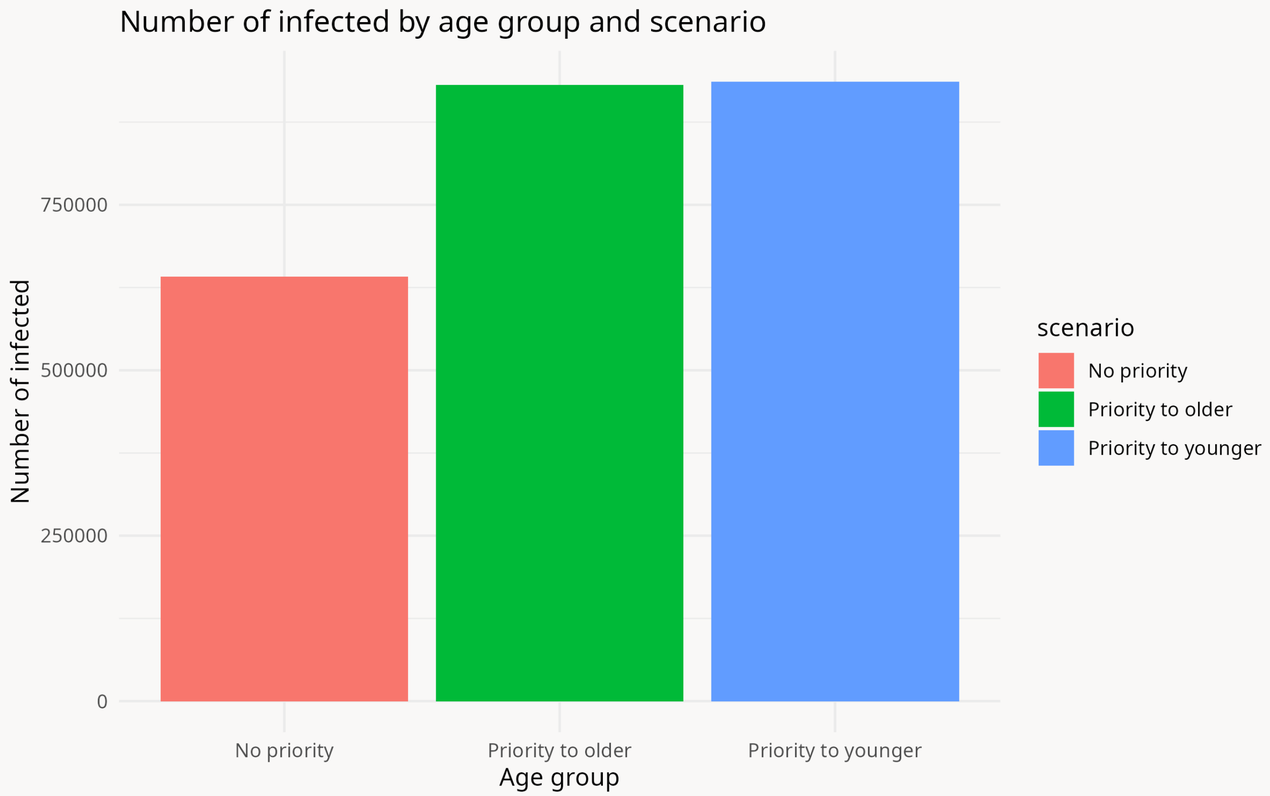


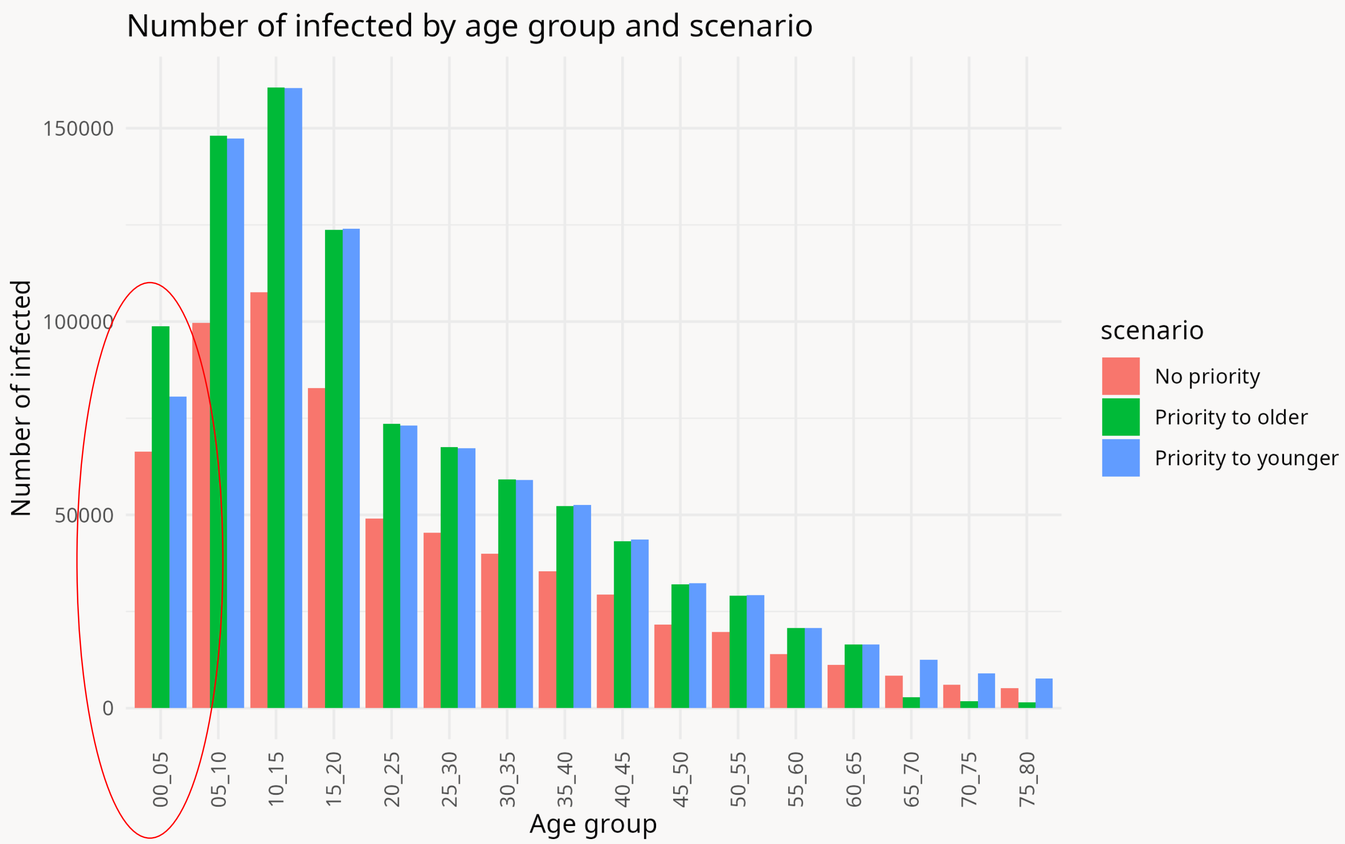
Outcome

- Vaccinating across all age groups reduces most the overall number of infections



Outcome

- Vaccinating across all age groups reduces most the overall number of infections
- Vaccinating across all age groups protects more the youngest age group than targeted campaigns



Potential improvements

Flexibility is baked into the tool and virtually any improvement is possible:

- Take into account age-specific fatality rate
- Take into account different contact rates across different regions
- Multiple doses vaccine schema
- etc.

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For the Senegal case and this specific outbreak!

Localism

Insights from Africa may not fit Latin America or Europe since results depends on the population pyramid and contact patterns.

It is important the everyone has access to these tools & capacity to run analyses and simulations in their own context.