

The impact of the COVID-19 pandemic on rabies reemergence in Latin America: The case of Arequipa, Peru

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INTRODUCTION

- In Arequipa, Peru, normal canine rabies control activities¹ include:
 - Yearly mass **dog vaccination** campaigns
 - Surveillance** and subsequent **focus control**
- Efforts to reduce the spread of COVID-19 have disrupted these vital control efforts

RESEARCH QUESTION

How have **COVID-19 control measures** affected **canine rabies elimination programs** in Latin America?

METHODS

- Examine disruptions through the lens of a **mathematical model**

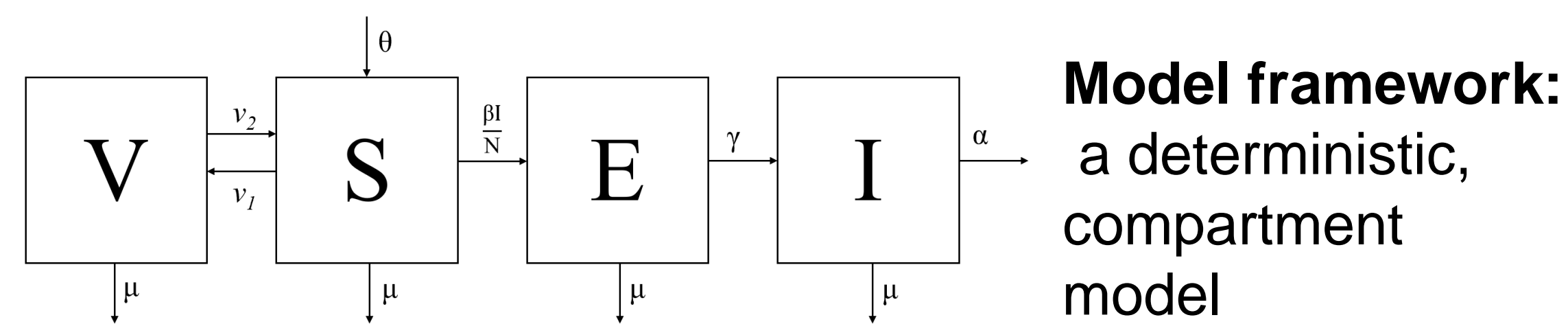


Table: Parameter estimates

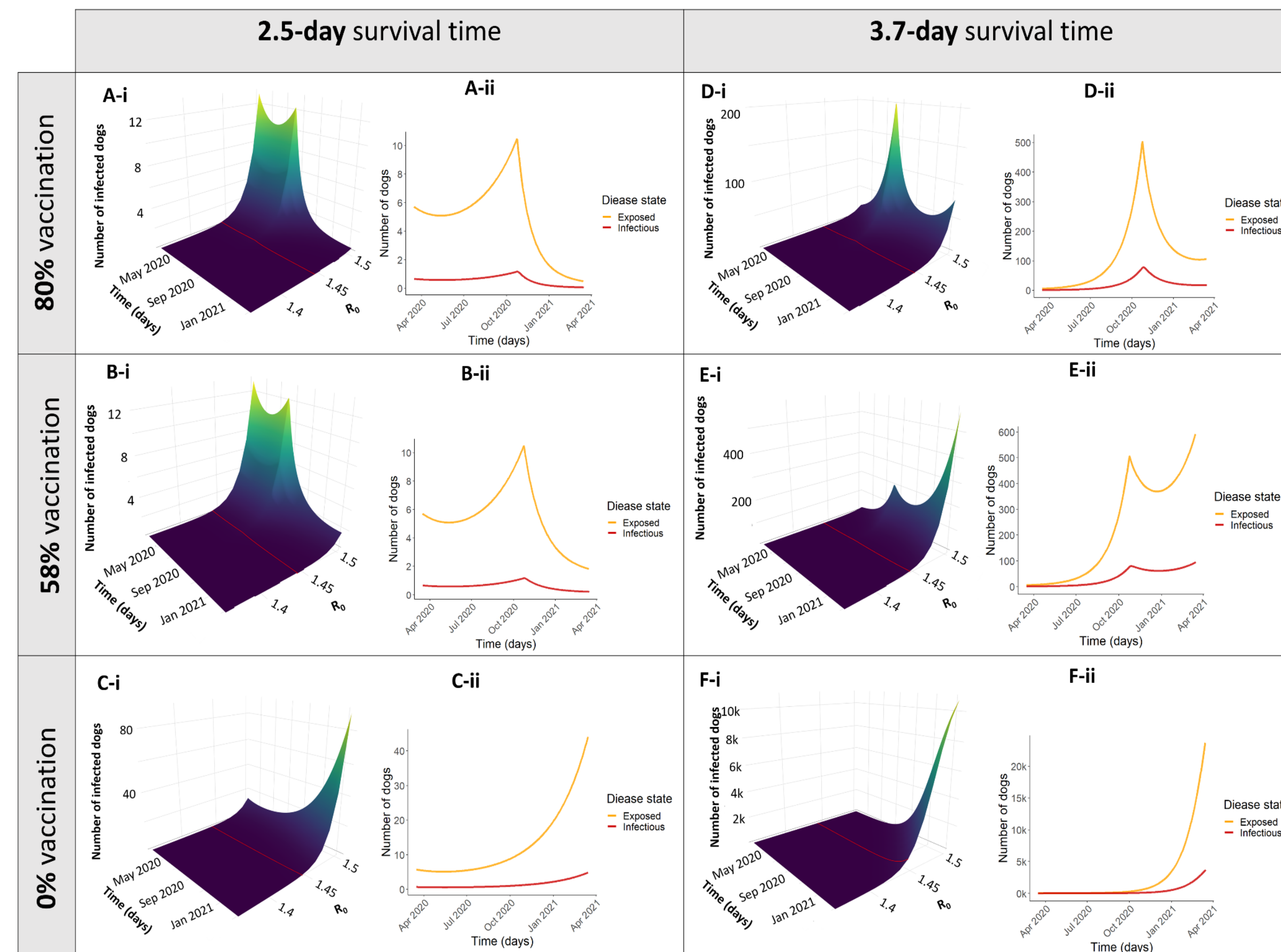
Parm	Definition	Estimate
N	Total population	203183
θ	Birth rate	$\theta = \mu N + \alpha$
μ	Normal death rate	1/1099.20
γ	1/Latency	1/22.3
α	Rabies death rate	1/2.53 ²
v_1	Vaccination rates	Changes yearly
v_2	Rate of immunity loss	1/365
β	Transmission coefficient	$R_0(\gamma + \mu)(\mu + \alpha)/\gamma$
R_0	Basic reproductive number	1.44

- Compare model results to **prospective surveillance data**

RESULTS

- Model simulations-** 6 different scenarios were tested:

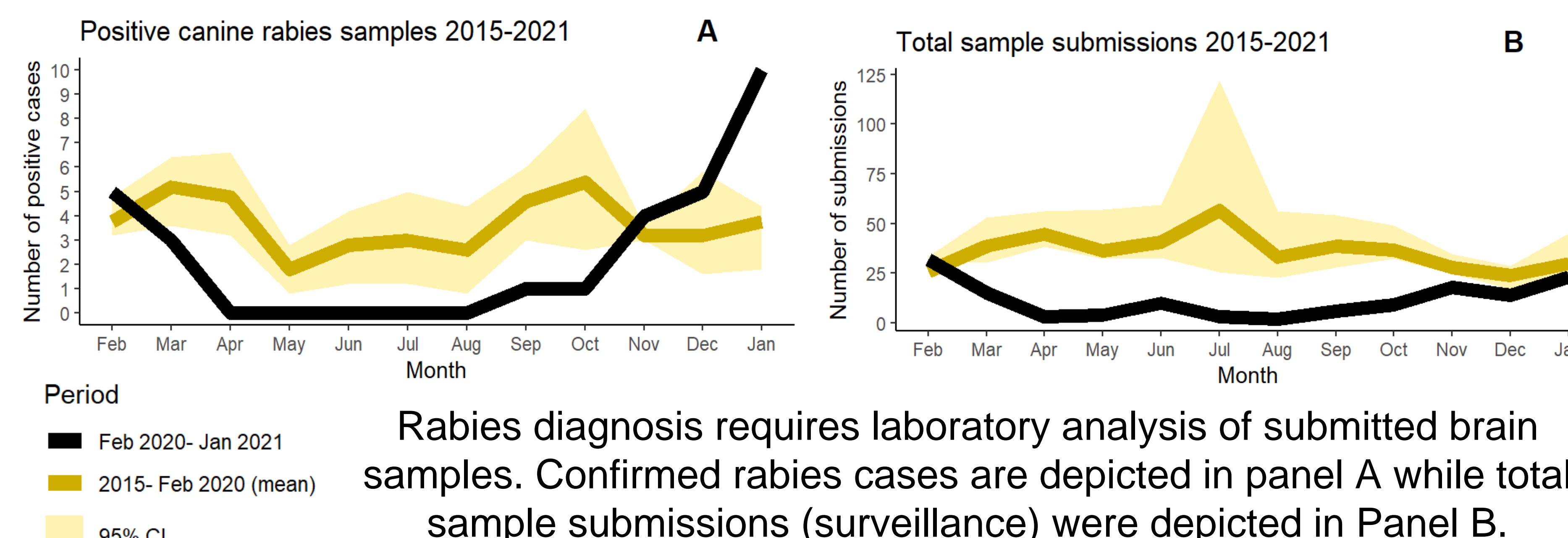
- Vaccination coverage: ideal (A,D), suboptimal (B,E) and none (C,F)
- Surveillance: normal (A-C) and decreased (D-F)



Simulations were run for all plausible ranges of R_0 (i-figures) and for results for $R_0 = 1.44$ (ii-figures) were displayed individually for ease of visualization.

- Surveillance data-** unfortunately, we are already seeing rising trends:

- January 2021 had the **highest number of confirmed cases** since rabies was reintroduced in 2015 **despite below-average surveillance**



Rabies diagnosis requires laboratory analysis of submitted brain samples. Confirmed rabies cases are depicted in panel A while total sample submissions (surveillance) were depicted in Panel B.

CONCLUSION

- In Arequipa and across Latin America, rabies control activities were dramatically reduced in 2020
- Models predicted **exponentially rising trends** of canine rabies cases
- Early 2021 surveillance data **confirms increase in cases** despite lower-than-average surveillance

Rabies elimination programs across Latin America are in danger

FUTURE DIRECTIONS

- COVID-19 will **continue to challenge public health systems** in Latin America in the intermediate-term future
- Innovative methods to **conduct rabies control efforts safely** are needed

REFERENCES

- Castillo-Neyra et al. (2019). Socio-spatial heterogeneity in participation in mass dog rabies vaccination campaigns, Arequipa, Peru. PLoS NTD
- Hampson et al. (2009). Transmission Dynamics and Prospects for the Elimination of Canine Rabies. PLoS Biol.

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