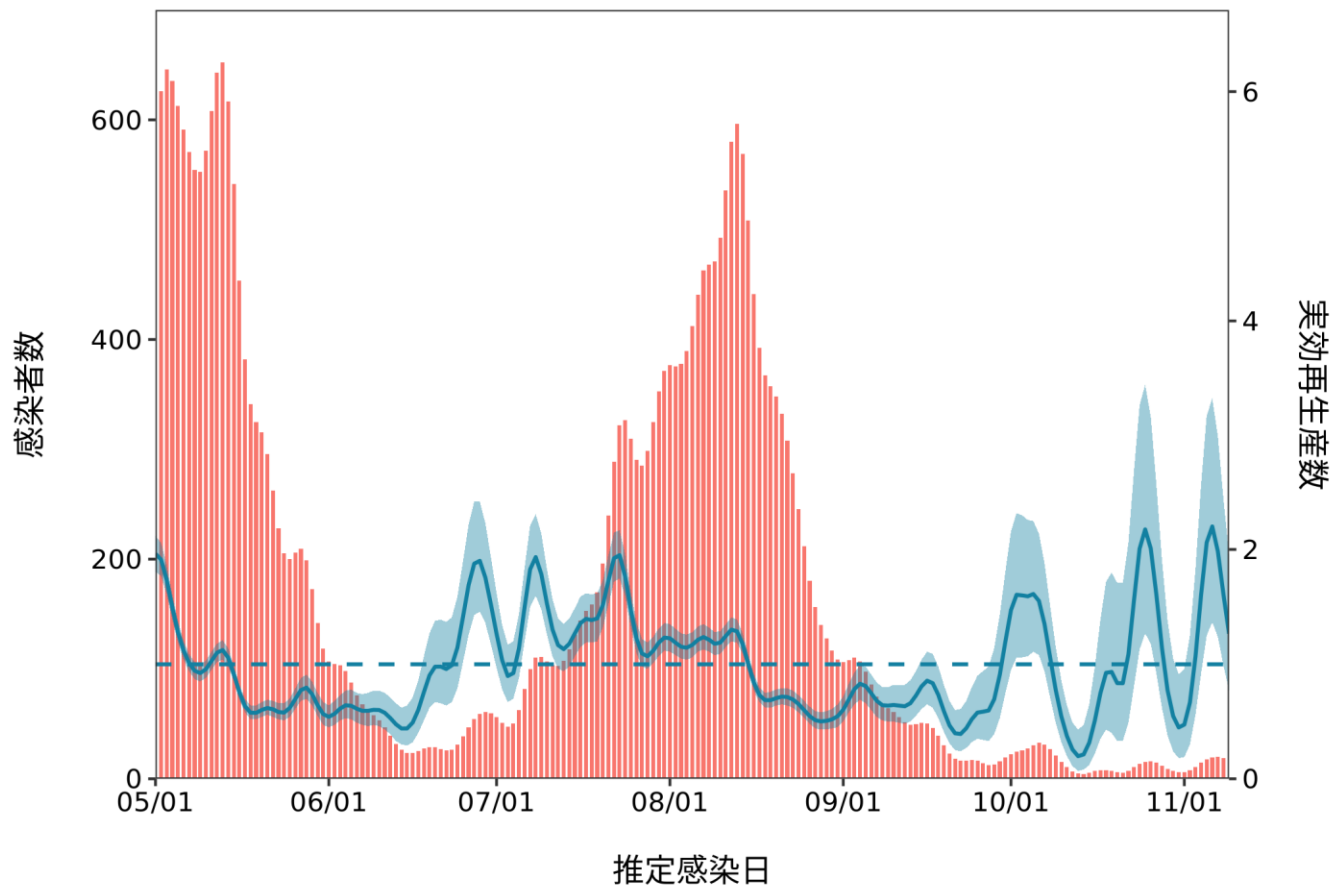


推定日 11月24日

最新推定感染日付 11月9日

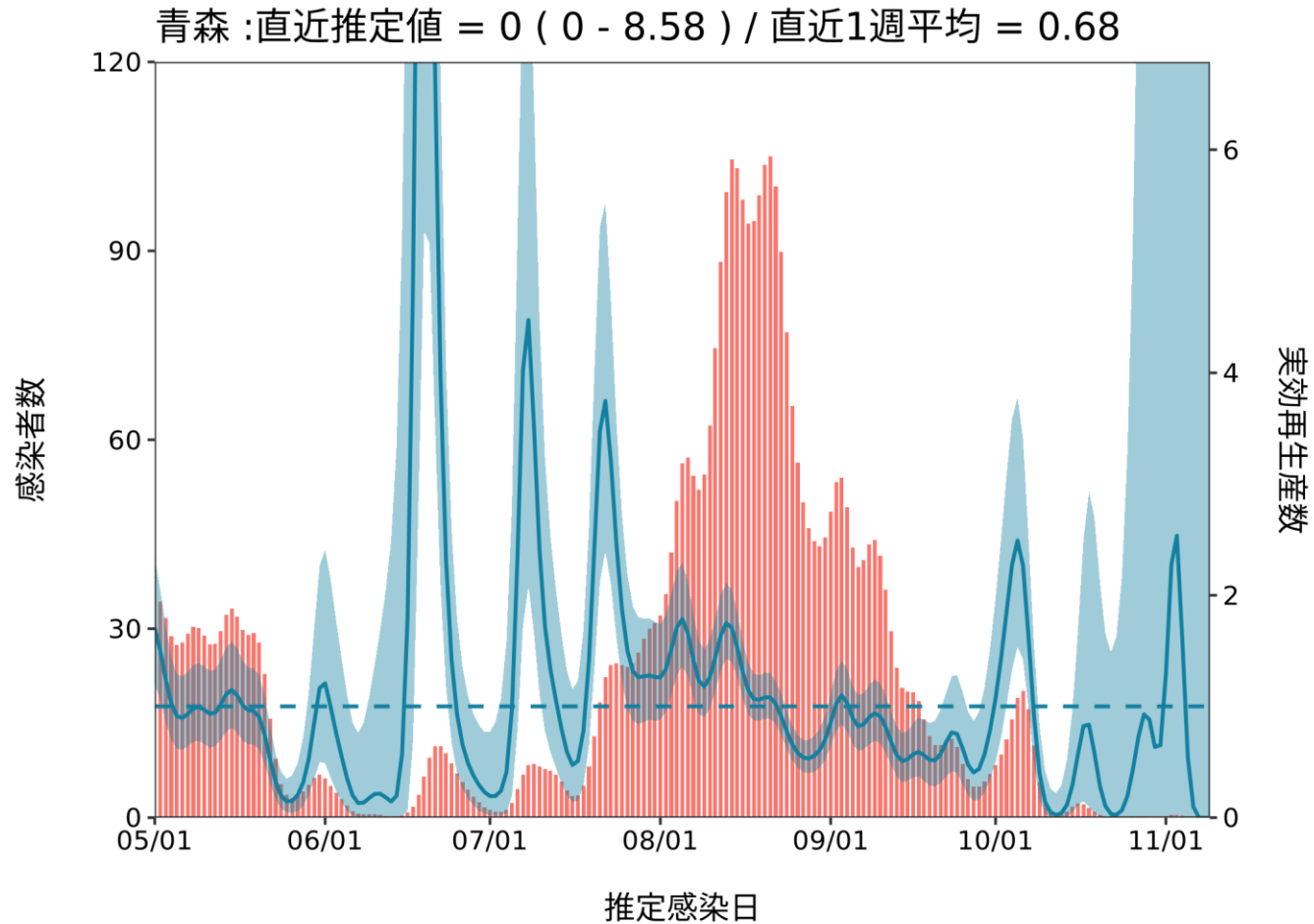
資料 3 - 3

北海道 : 直近推定値 = 1.27 ( 0.77 - 1.95 ) / 直近1週平均 = 1.69



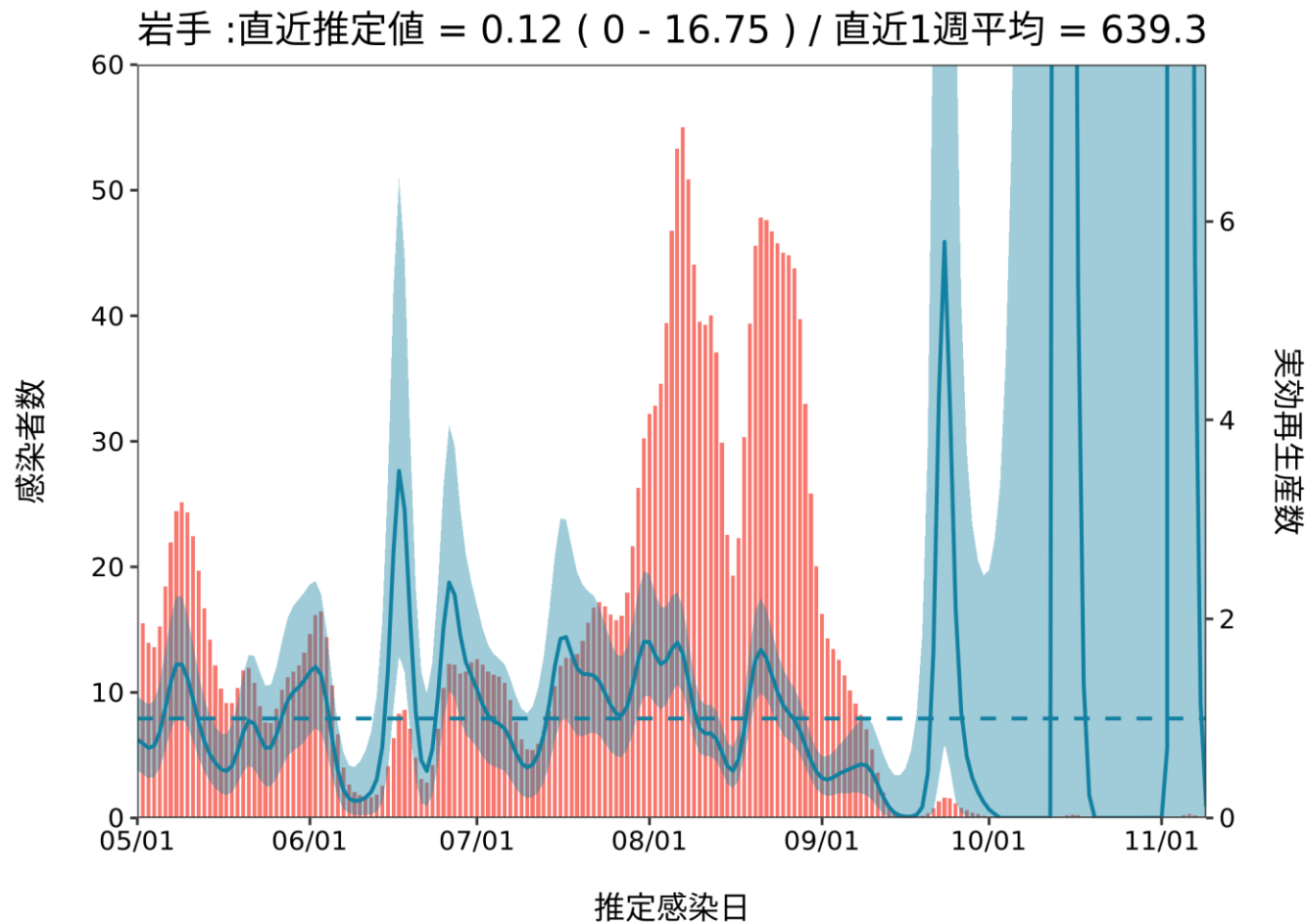
推定日 11月24日

最新推定感染日付 11月9日



推定日 11月24日

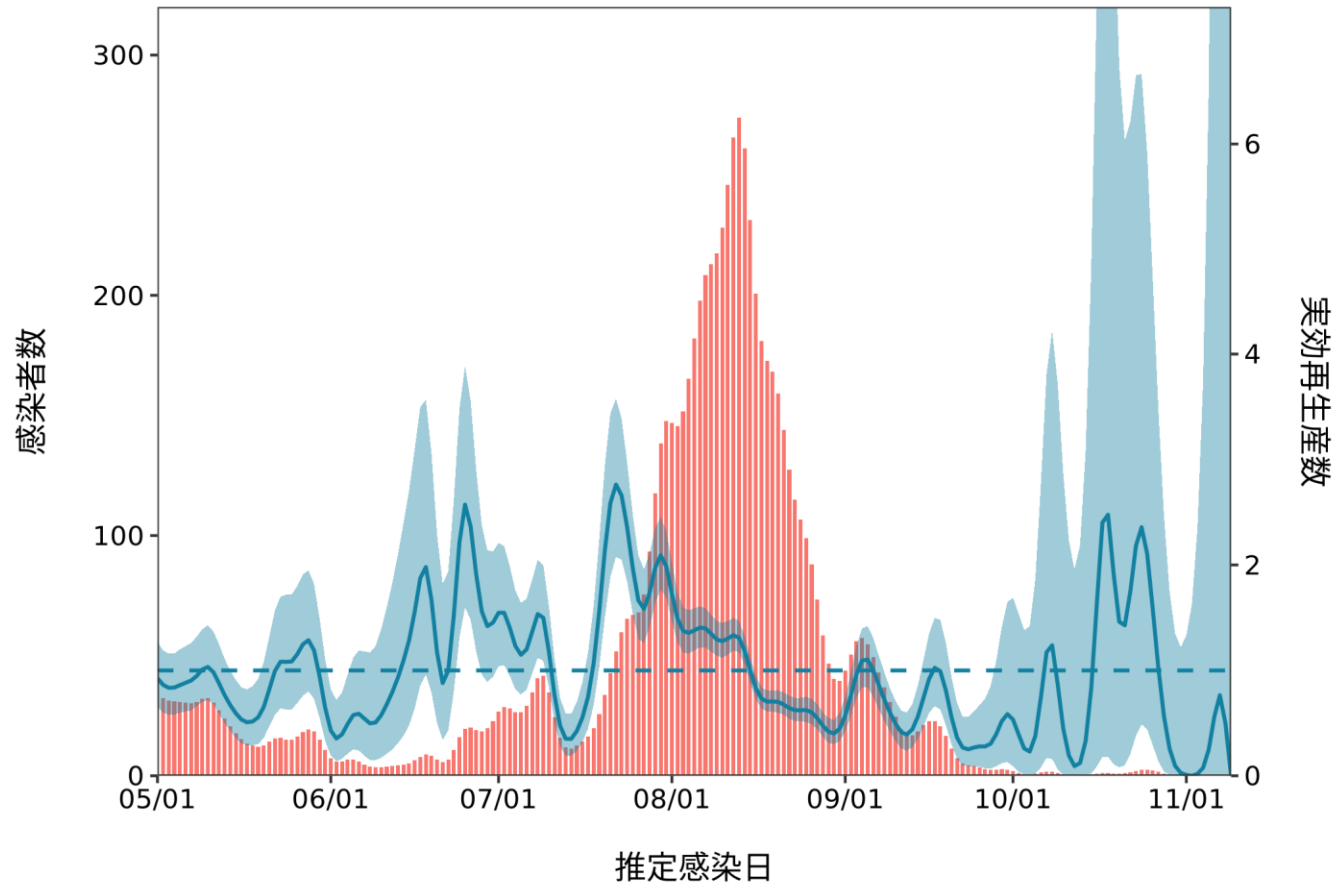
最新推定感染日付 11月9日



推定日 11月24日

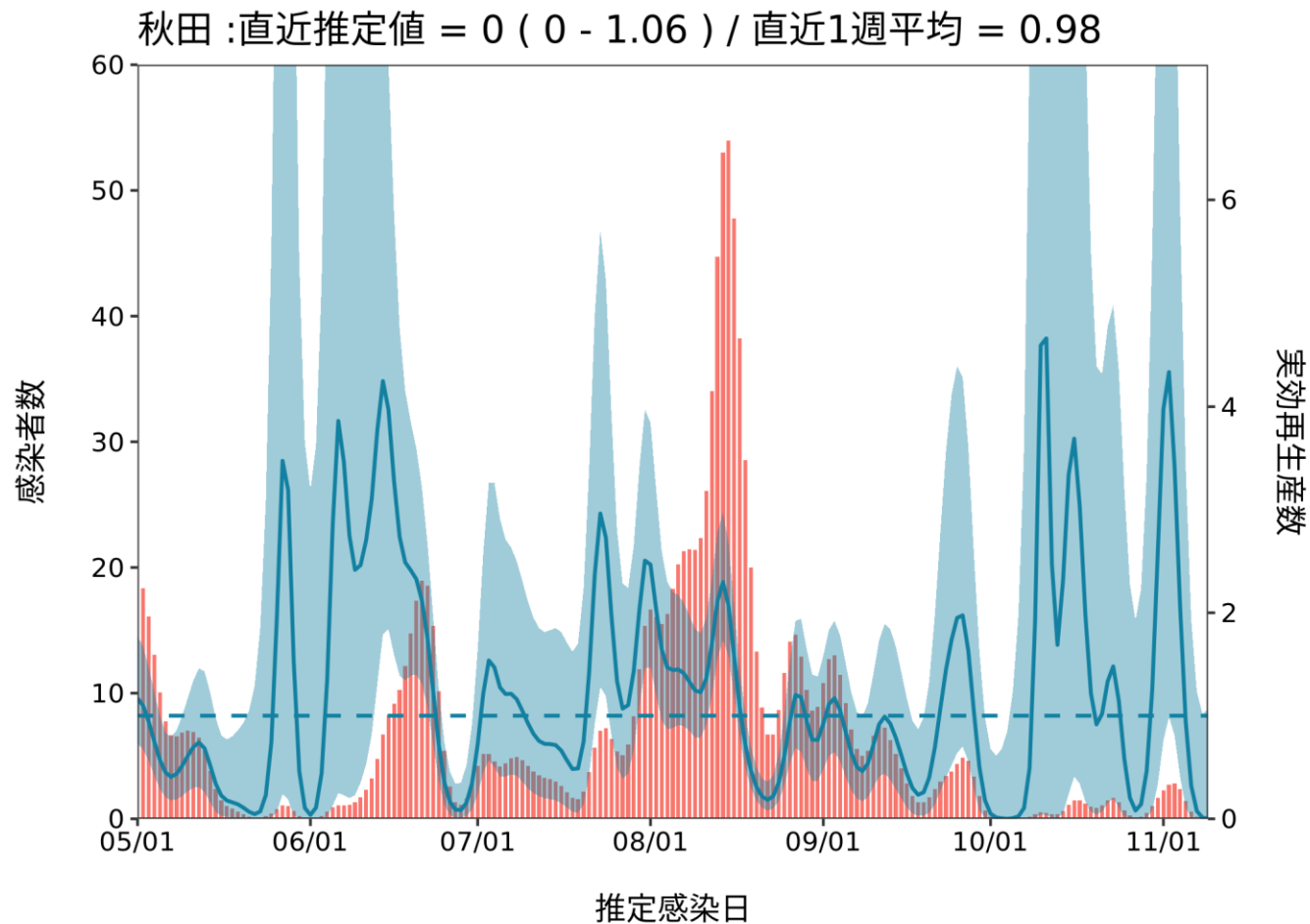
最新推定感染日付 11月9日

宮城 : 直近推定値 = 0 ( 0 - 25 ) / 直近1週平均 = 0.31



推定日 11月24日

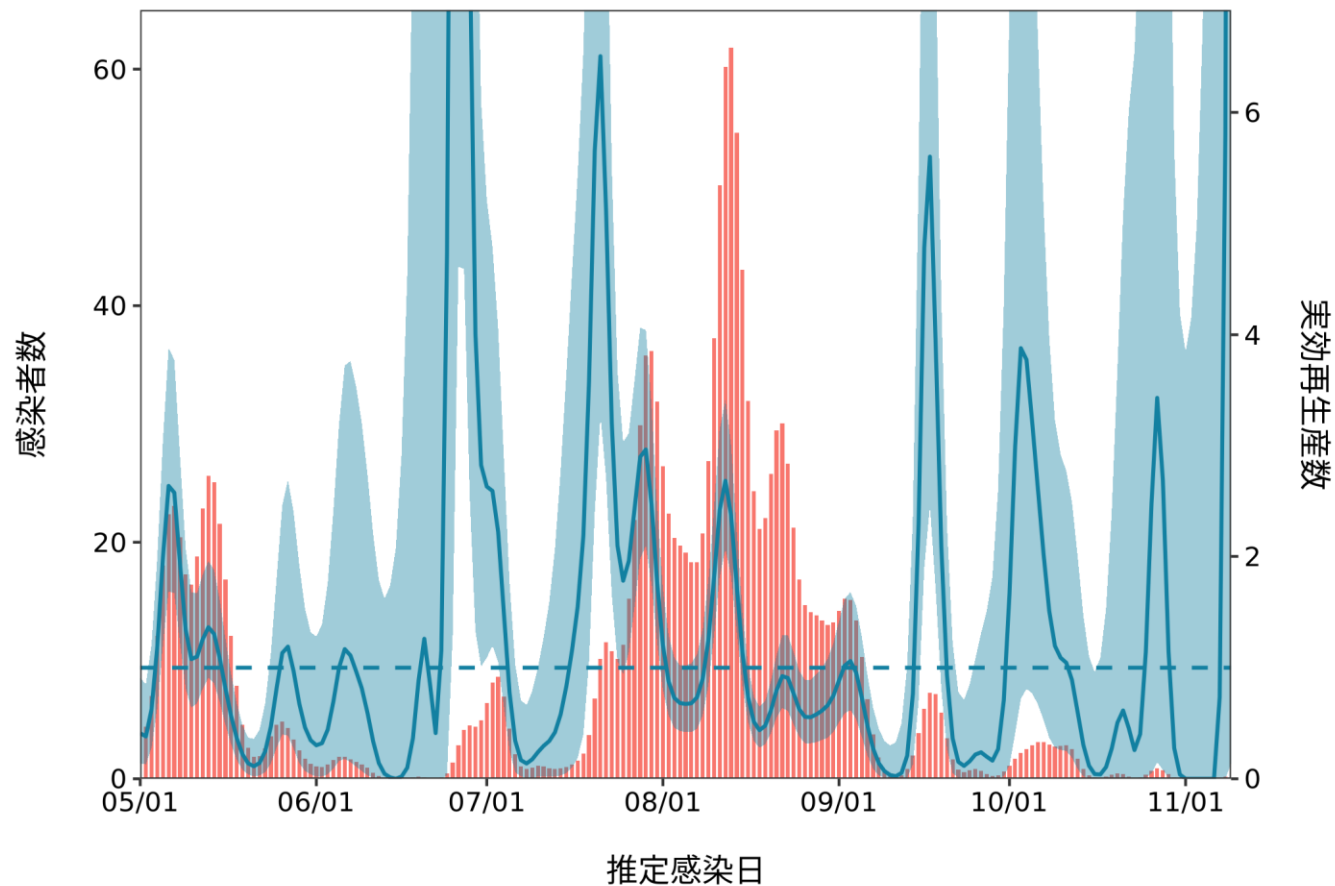
最新推定感染日付 11月9日



推定日 11月24日

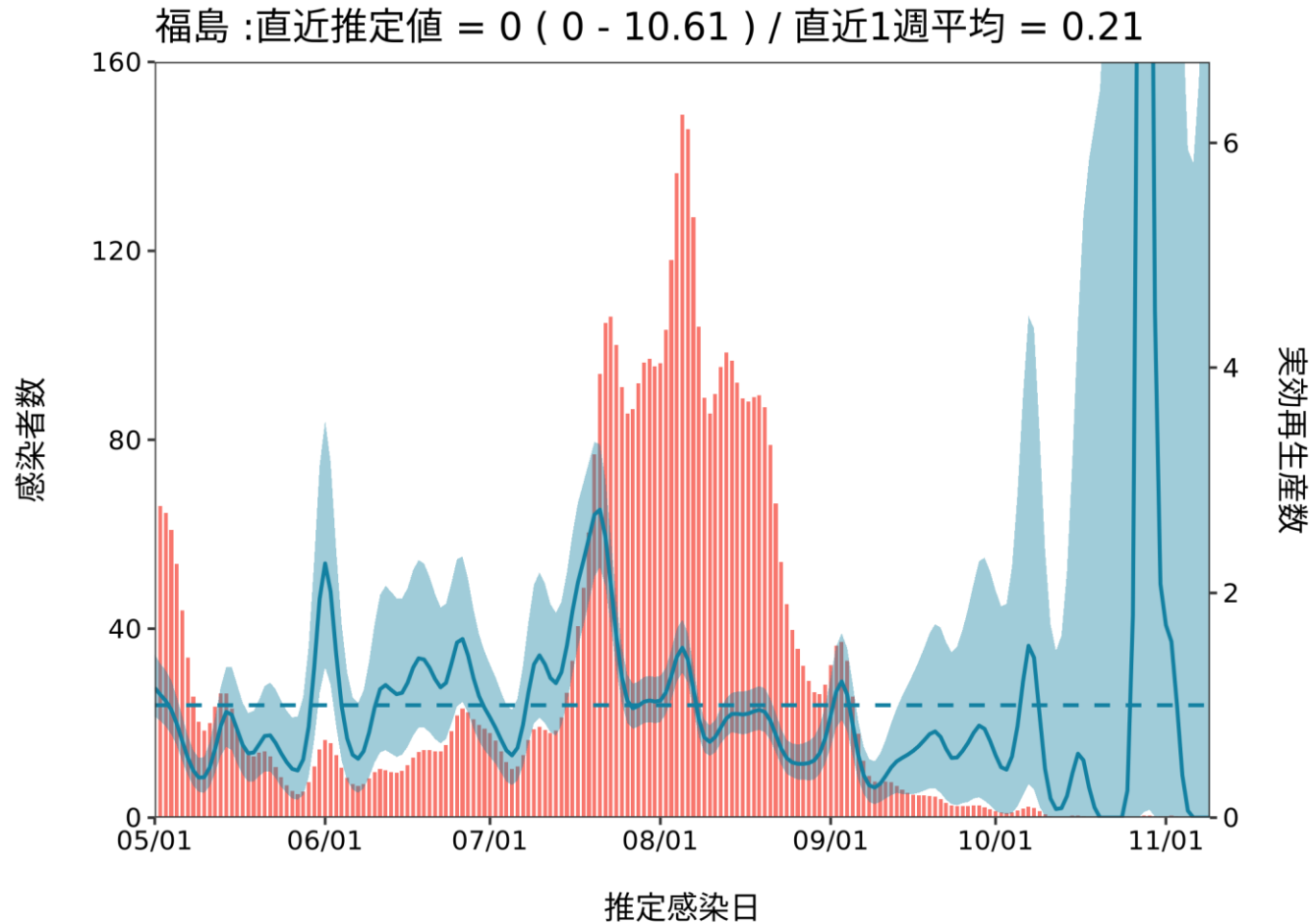
最新推定感染日付 11月9日

山形 : 直近推定値 = 22.94 ( 0.14 - 25 ) / 直近1週平均 = 4.21



推定日 11月24日

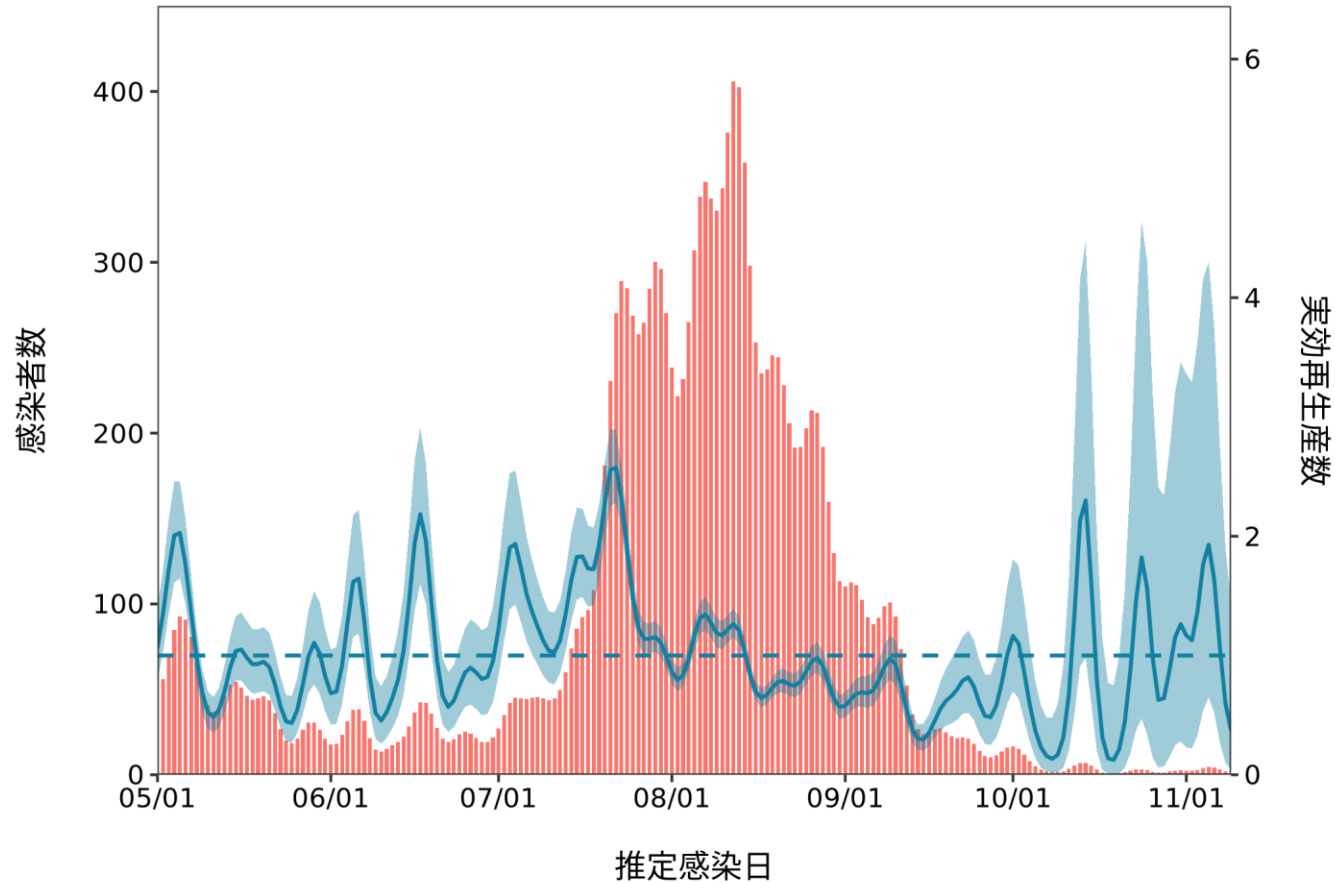
最新推定感染日付 11月9日



推定日 11月24日

最新推定感染日付 11月9日

茨城 : 直近推定値 = 0.37 ( 0.04 - 1.45 ) / 直近1週平均 = 1.25

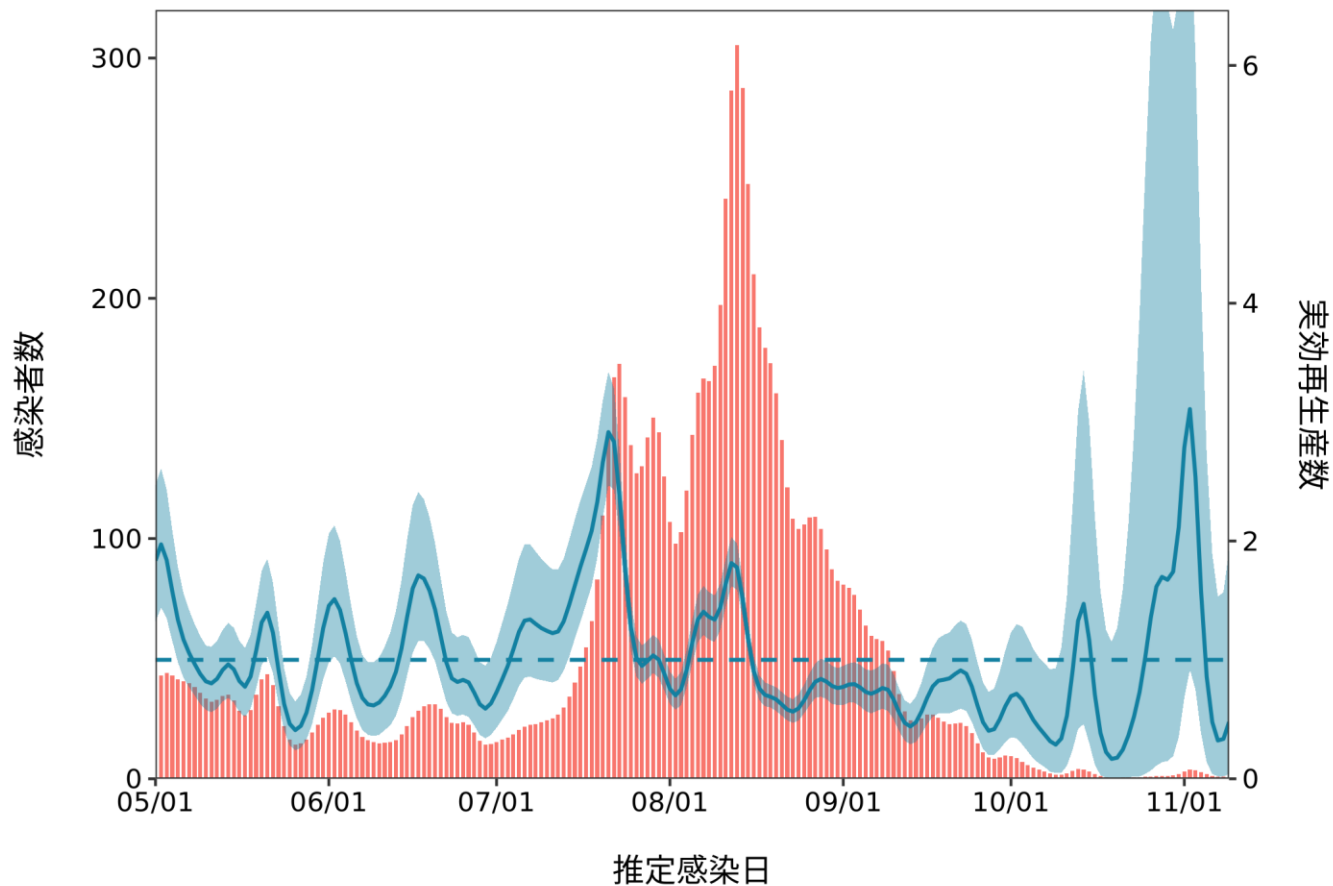




推定日 11月24日

最新推定感染日付 11月9日

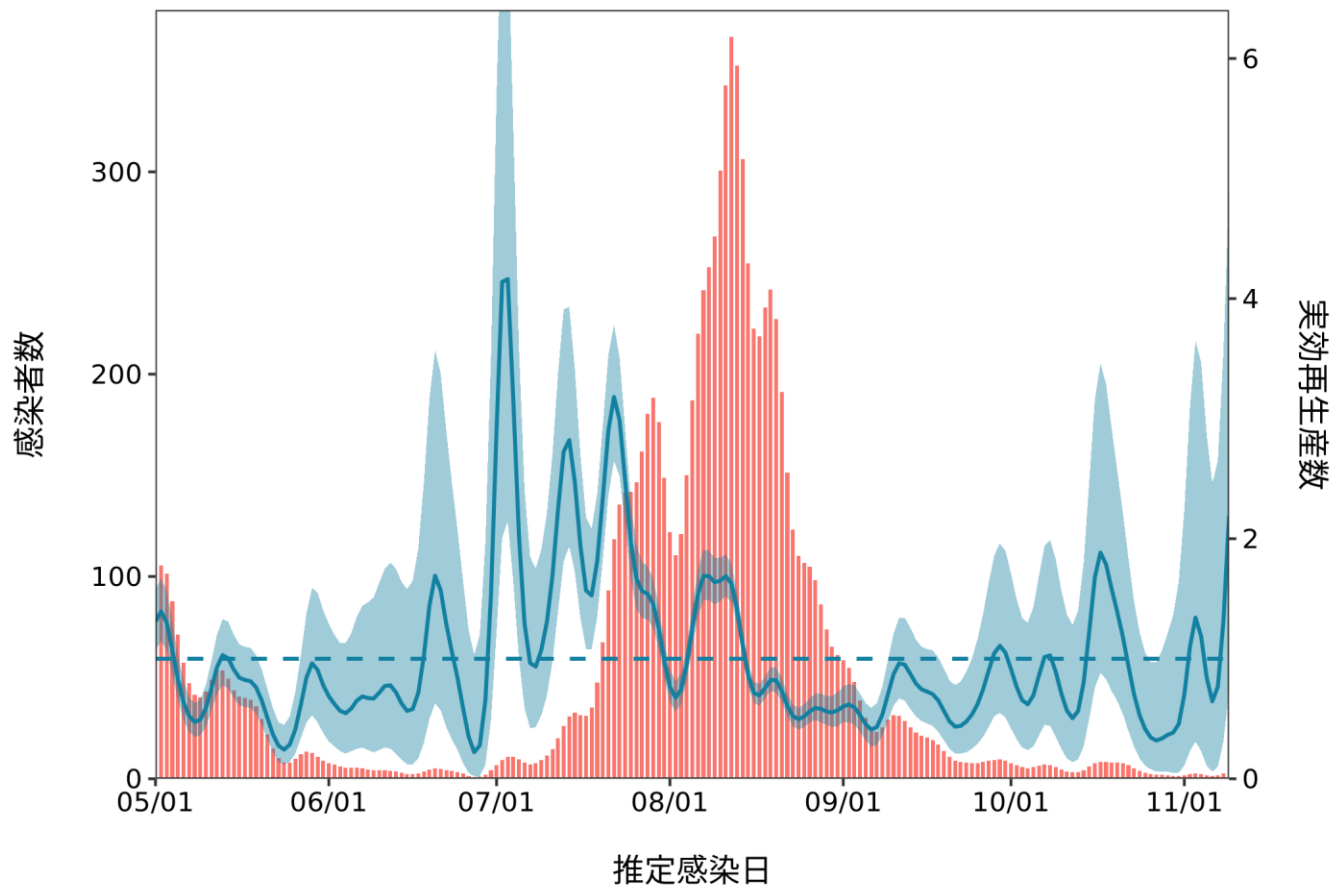
栃木 :直近推定値 = 0.48 ( 0.04 - 1.92 ) / 直近1週平均 = 0.94



推定日 11月24日

最新推定感染日付 11月9日

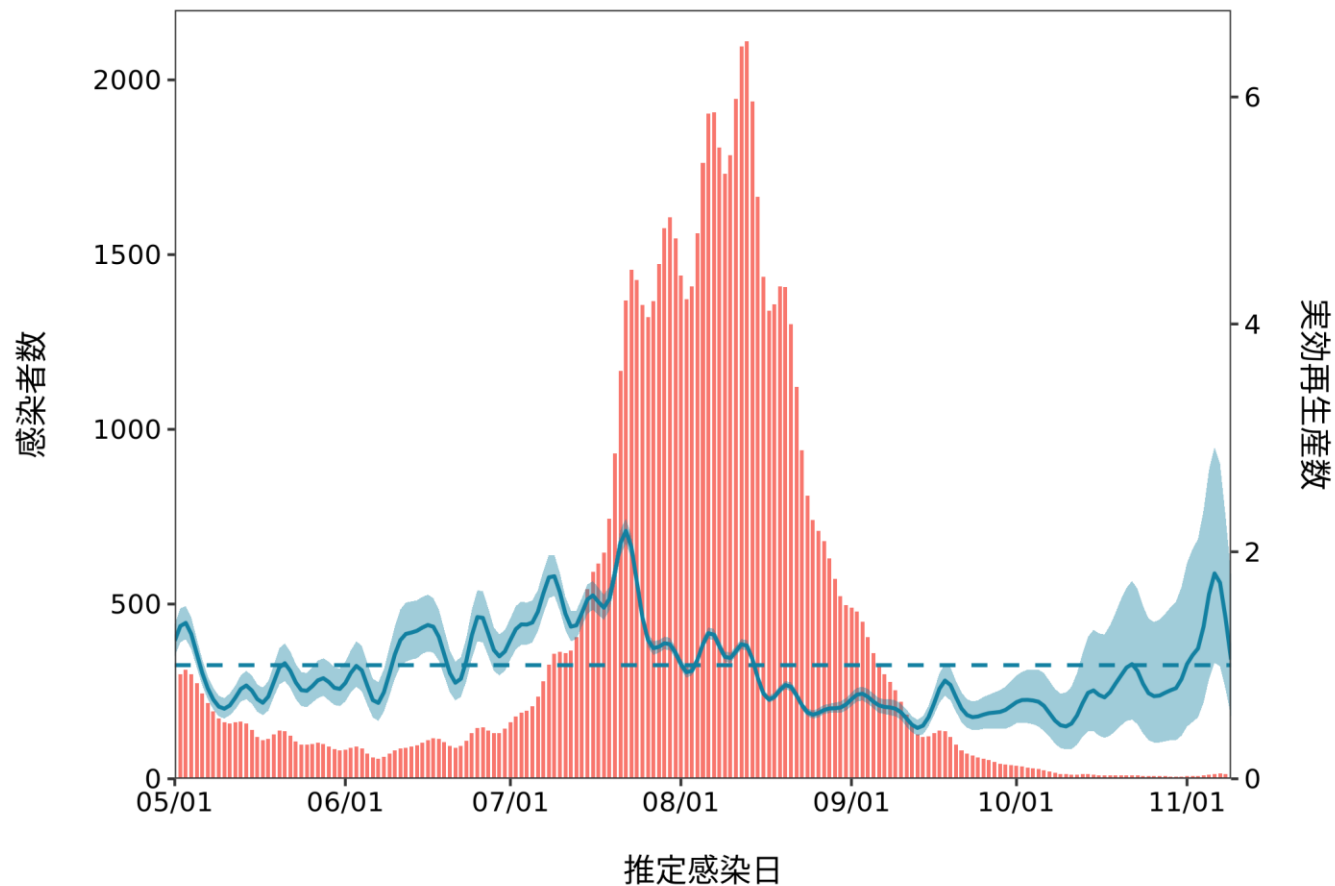
群馬 :直近推定値 = 2.19 ( 0.73 - 4.91 ) / 直近1週平均 = 1.19



推定日 11月24日

最新推定感染日付 11月9日

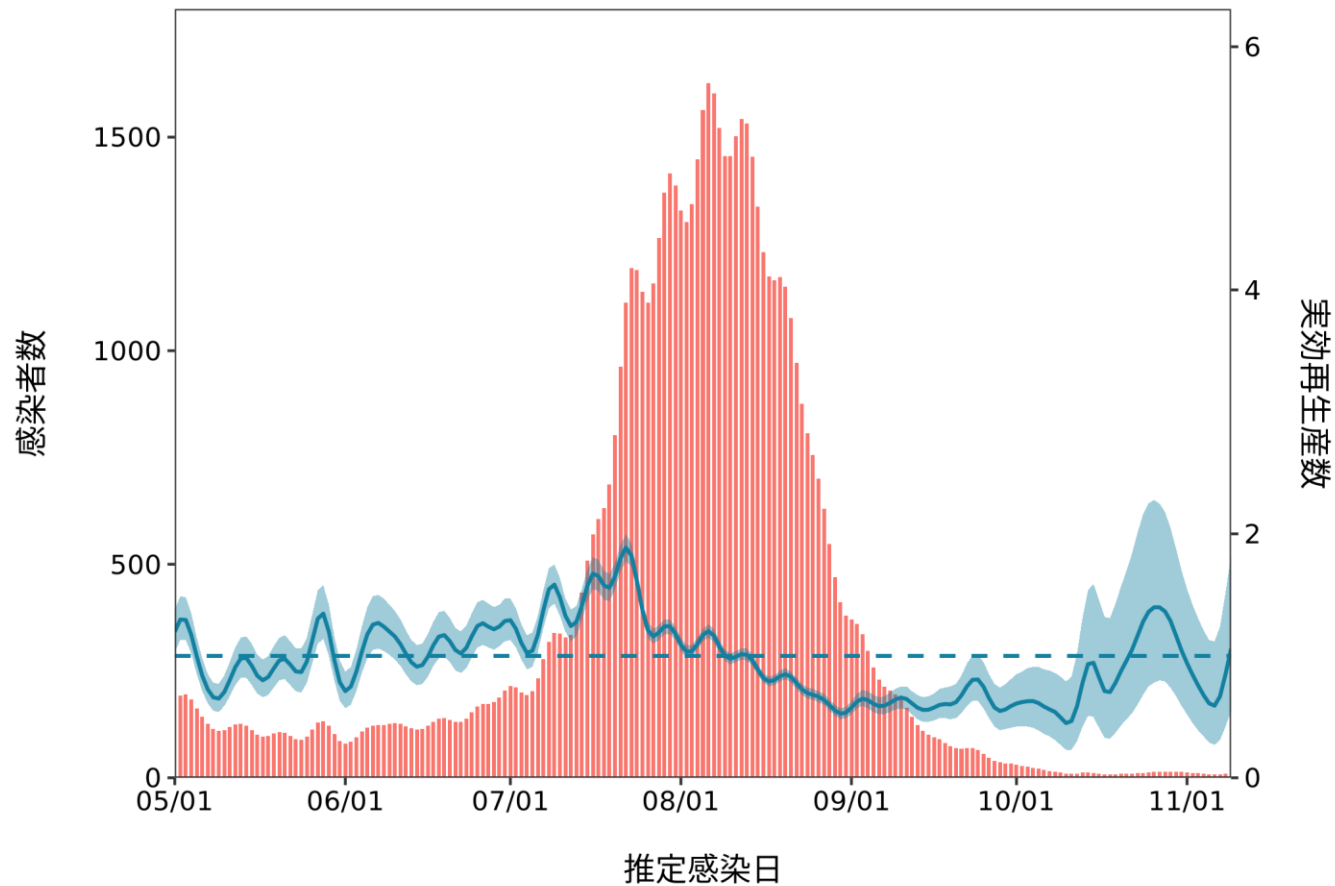
埼玉 :直近推定値 = 1.05 ( 0.55 - 1.79 ) / 直近1週平均 = 1.44



推定日 11月24日

最新推定感染日付 11月9日

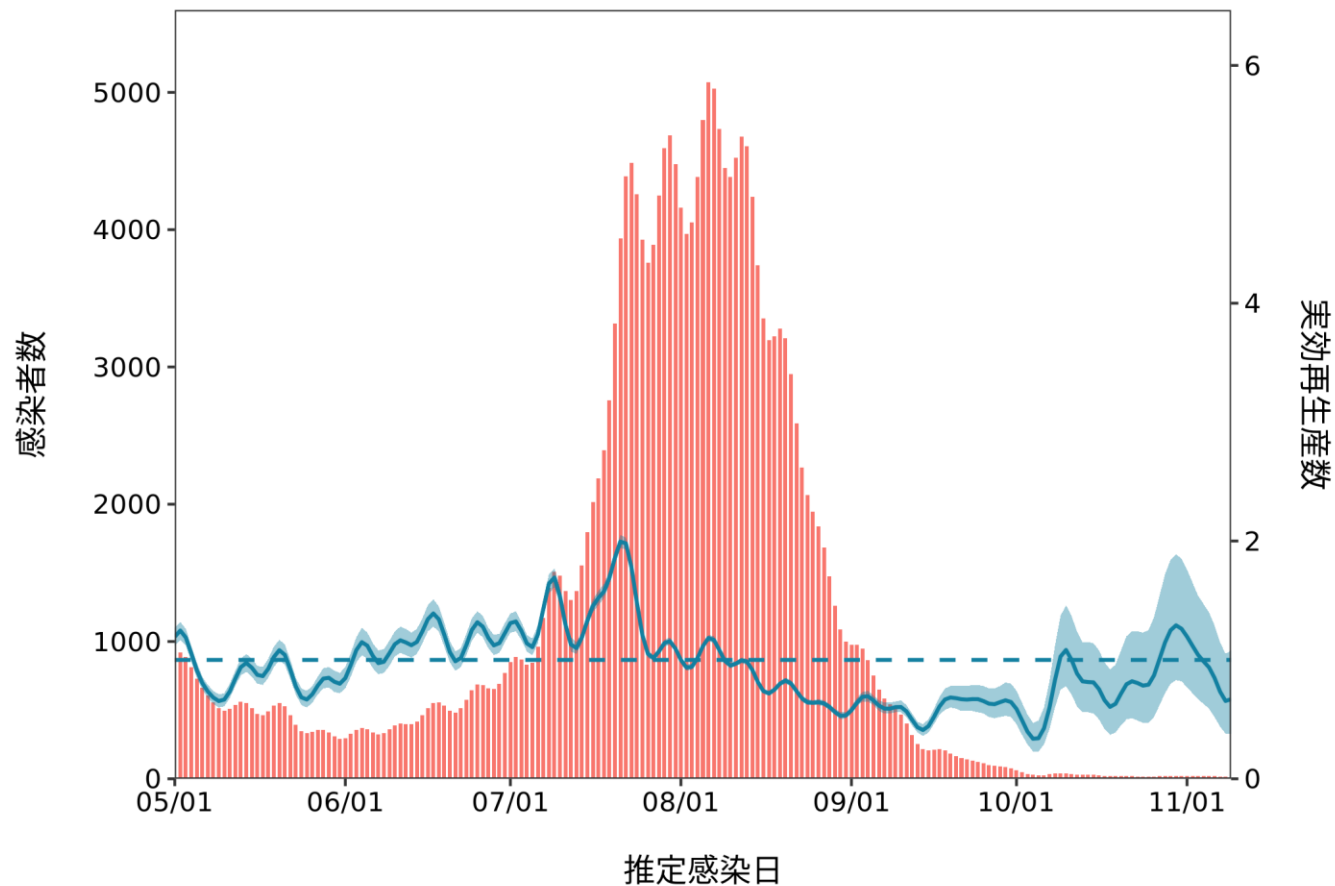
千葉 :直近推定値 = 1.06 ( 0.55 - 1.82 ) / 直近1週平均 = 0.75



推定日 11月24日

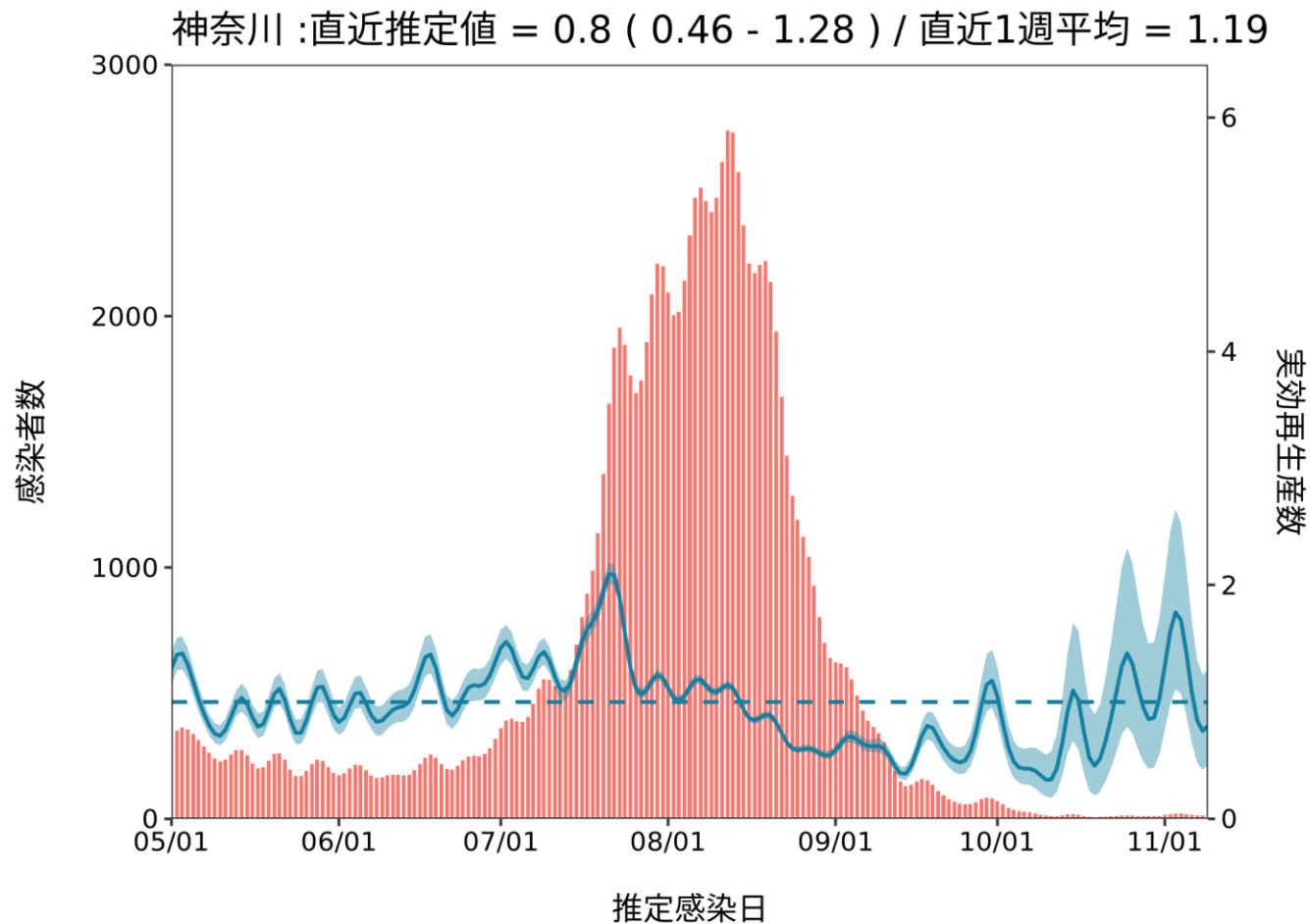
最新推定感染日付 11月9日

東京 :直近推定値 = 0.67 ( 0.38 - 1.08 ) / 直近1週平均 = 0.84



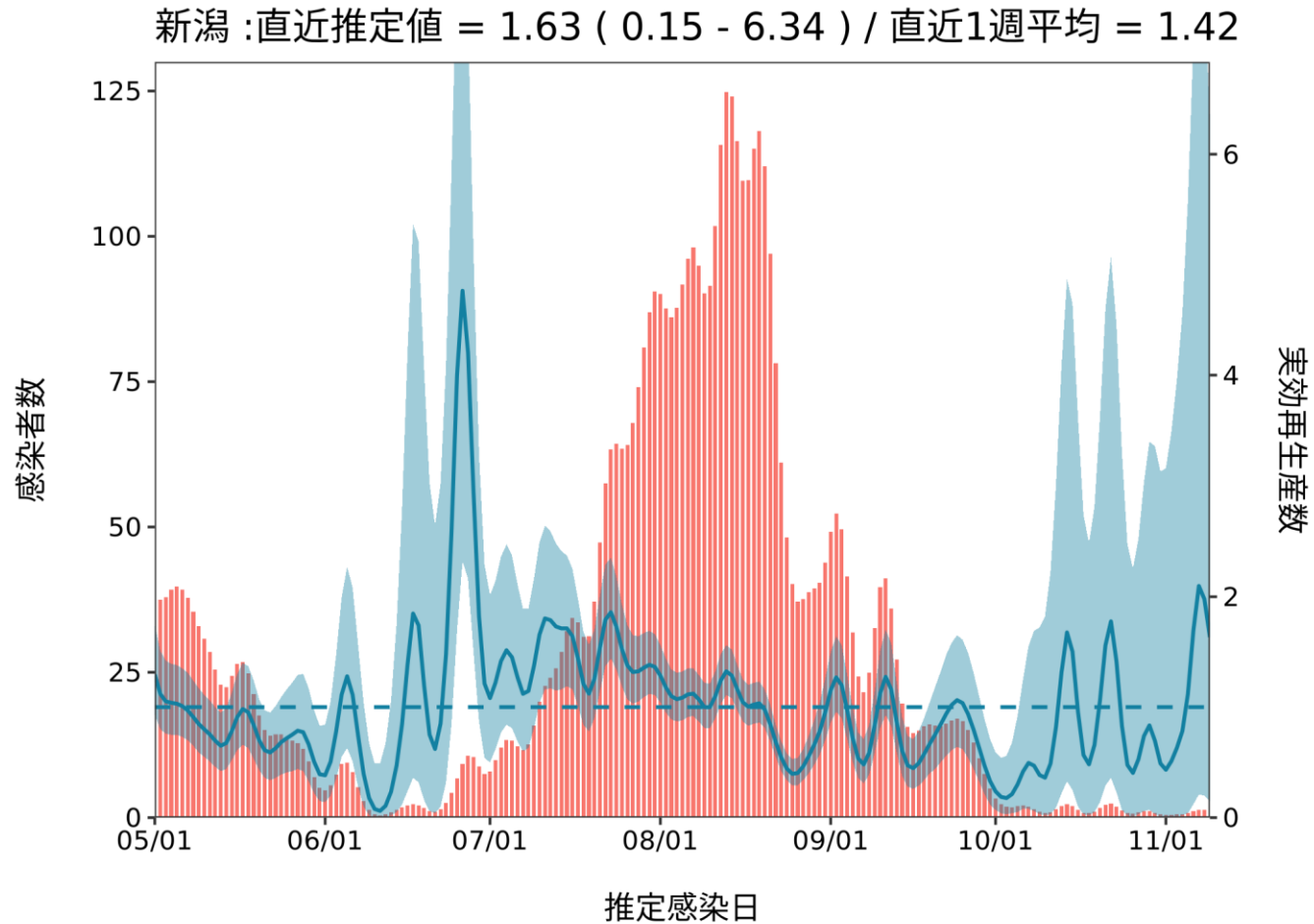
推定日 11月24日

最新推定感染日付 11月9日



推定日 11月24日

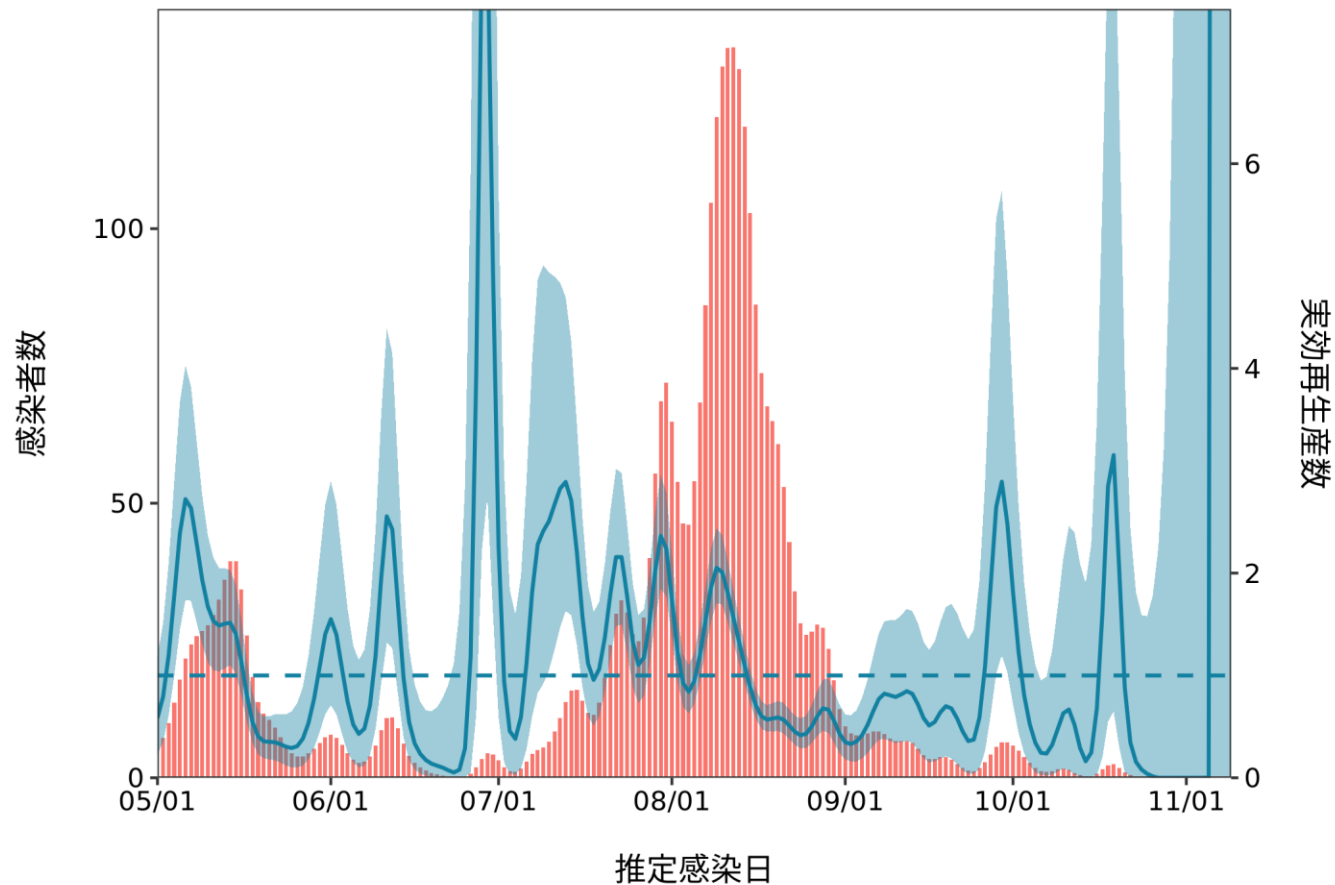
最新推定感染日付 11月9日



推定日 11月24日

最新推定感染日付 11月9日

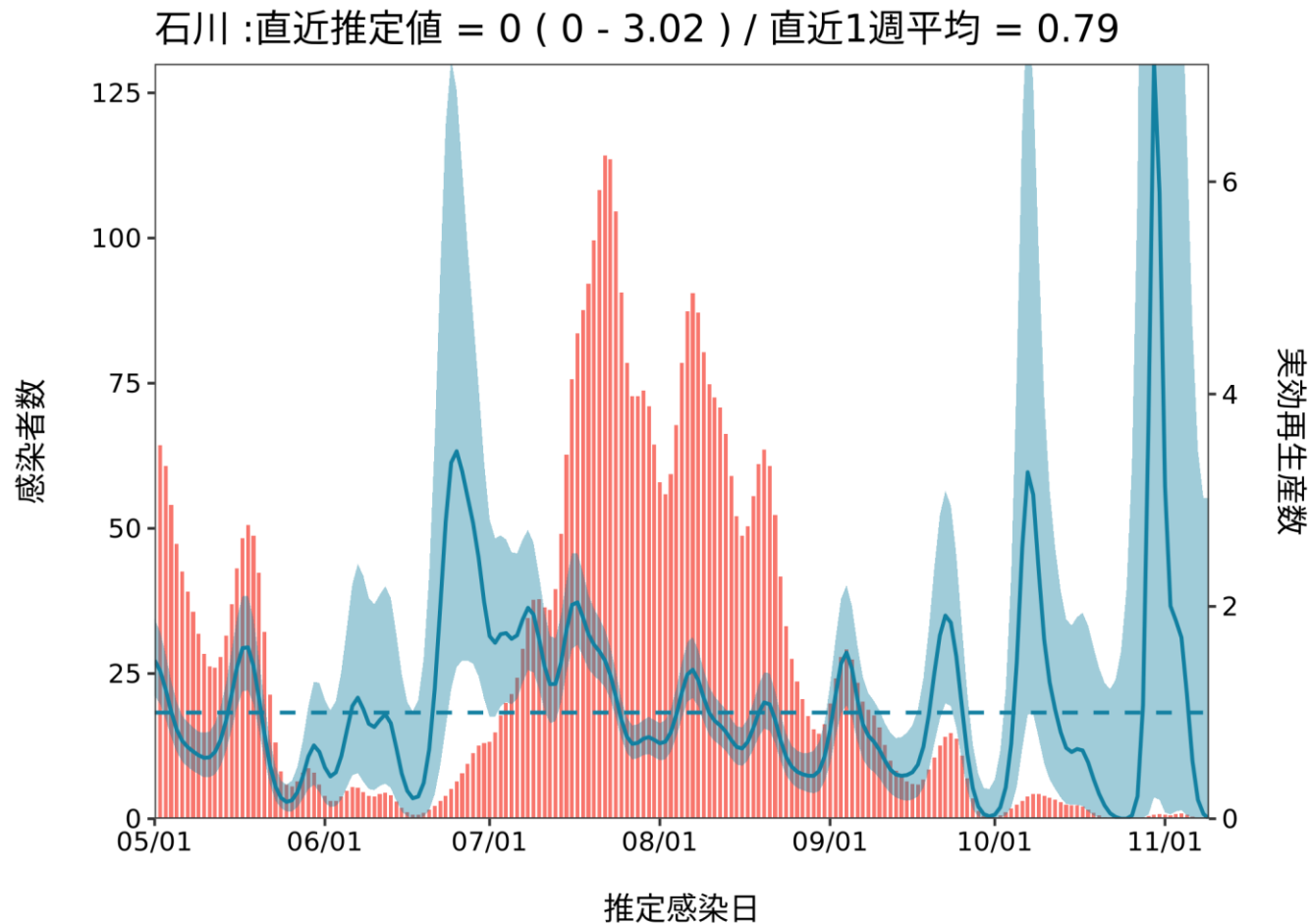
富山 :直近推定値 = 18.09 ( 0.02 - 25 ) / 直近1週平均 = 32.01





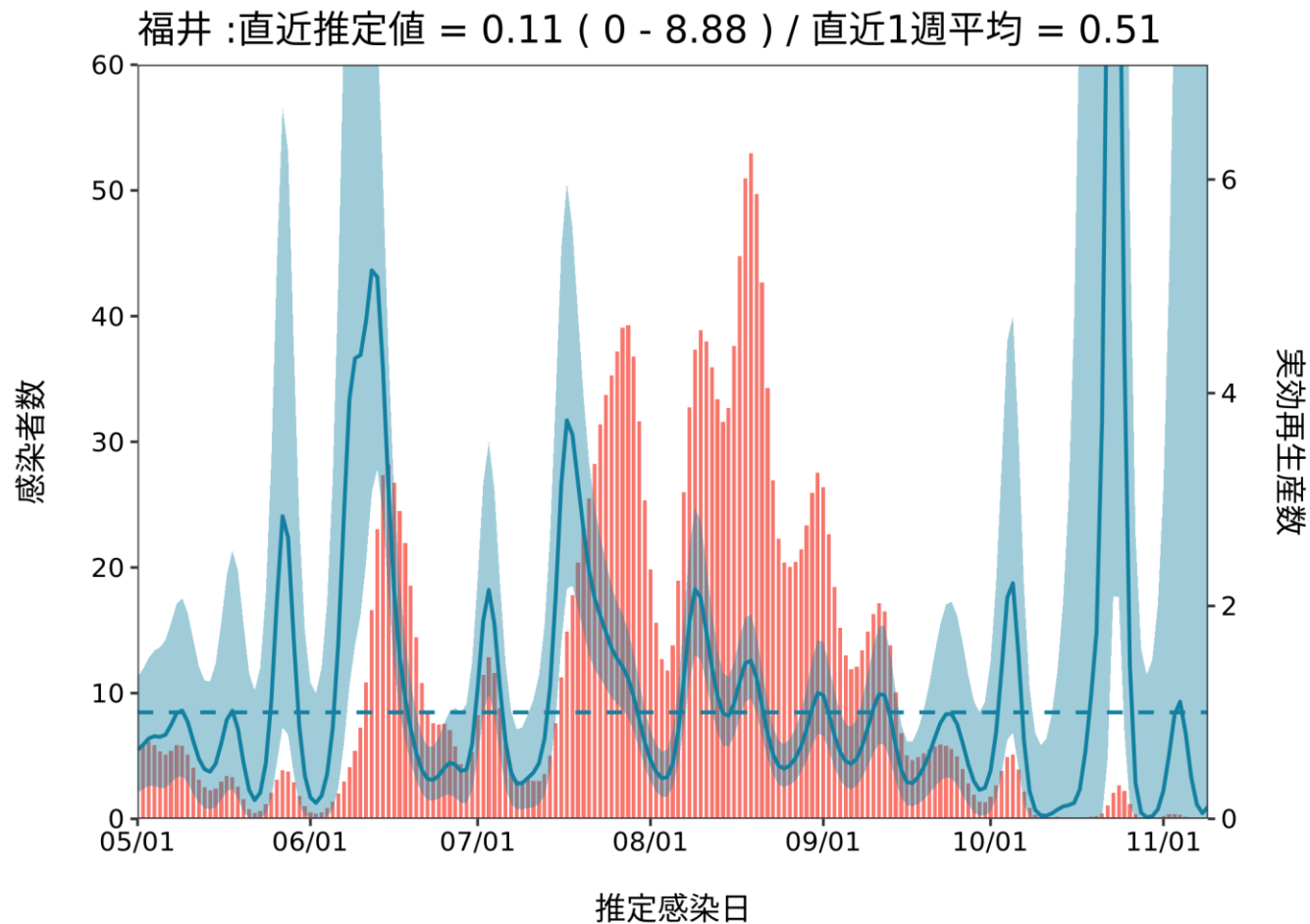
推定日 11月24日

最新推定感染日付 11月9日



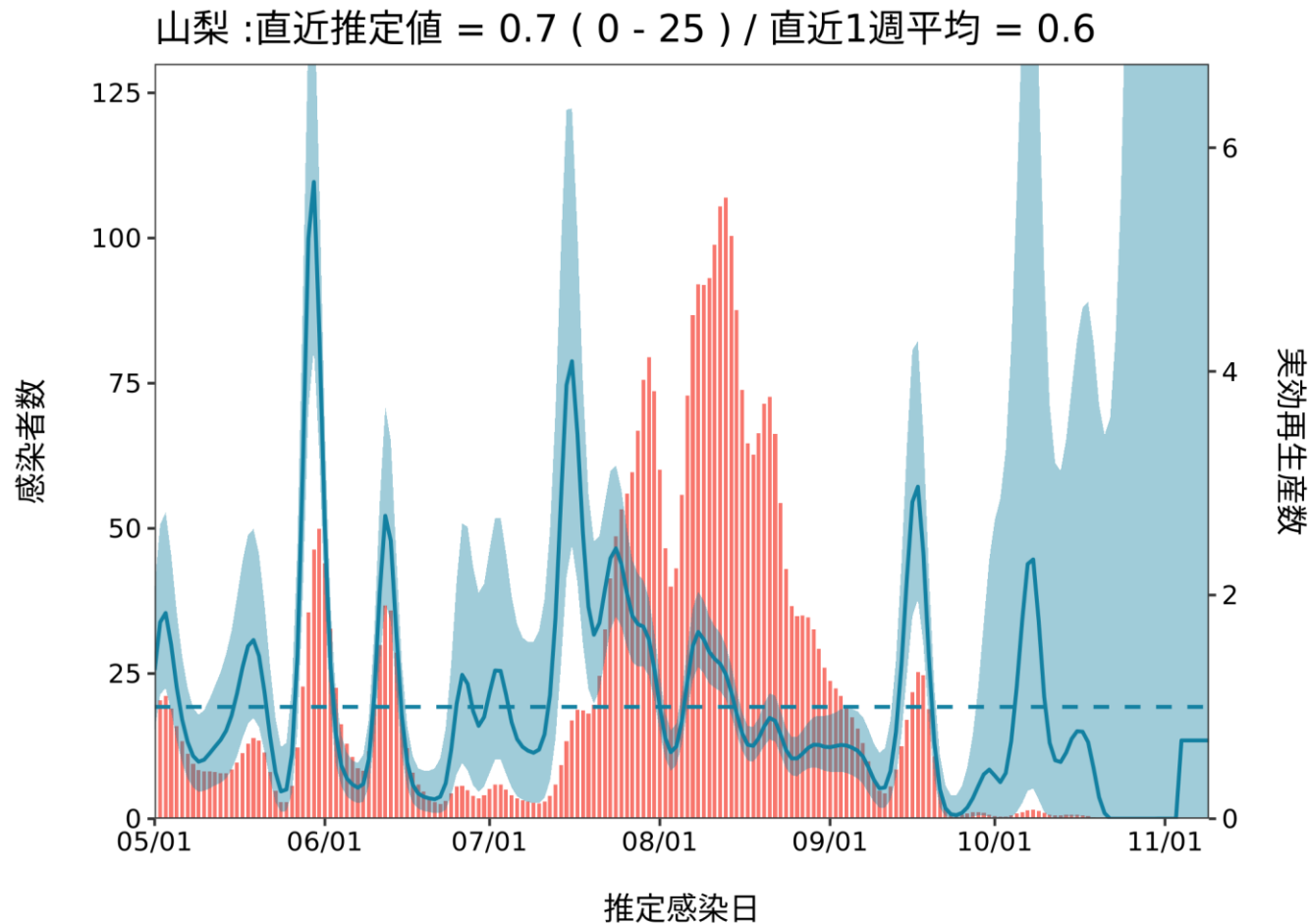
推定日 11月24日

最新推定感染日付 11月9日



推定日 11月24日

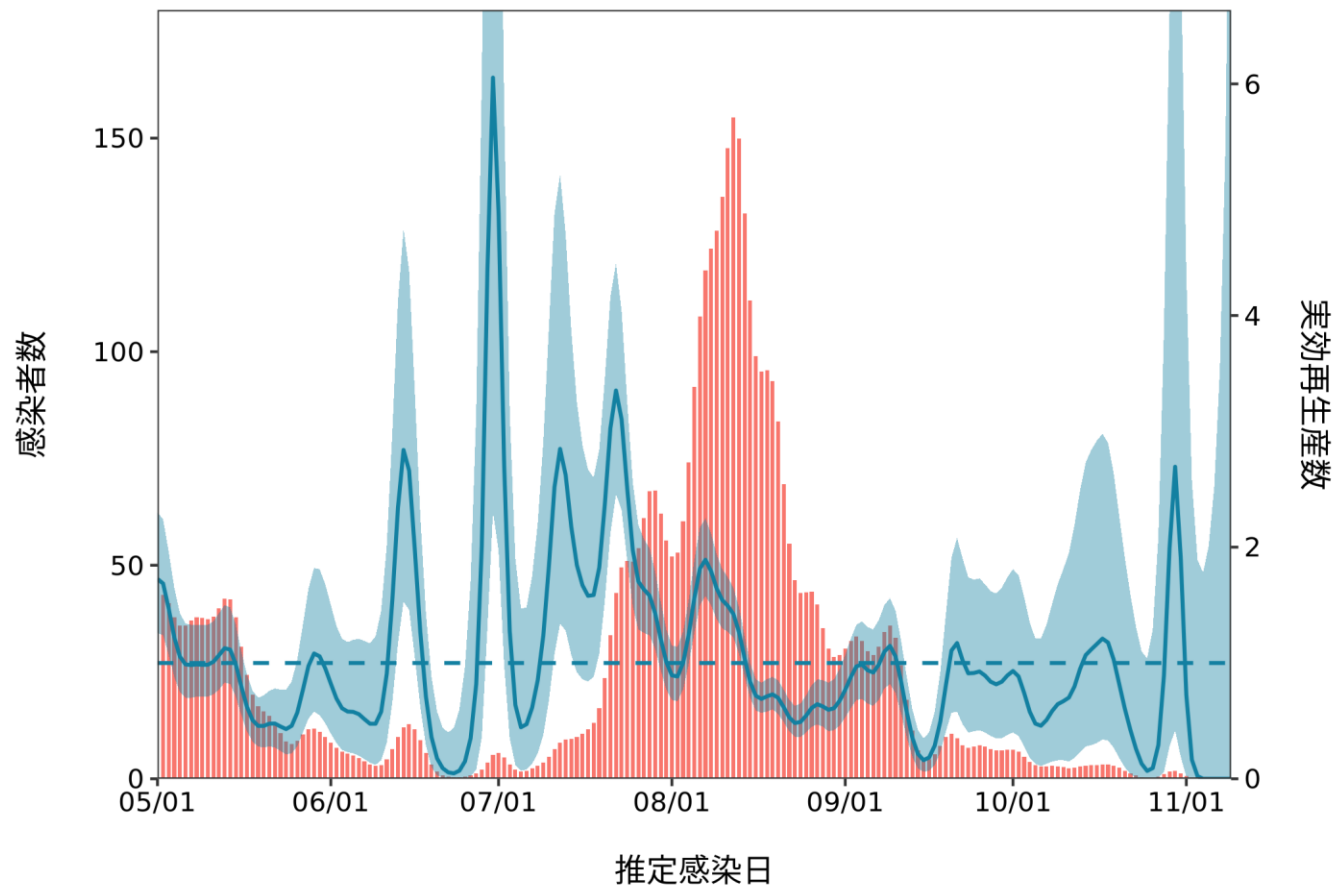
最新推定感染日付 11月9日



推定日 11月24日

最新推定感染日付 11月9日

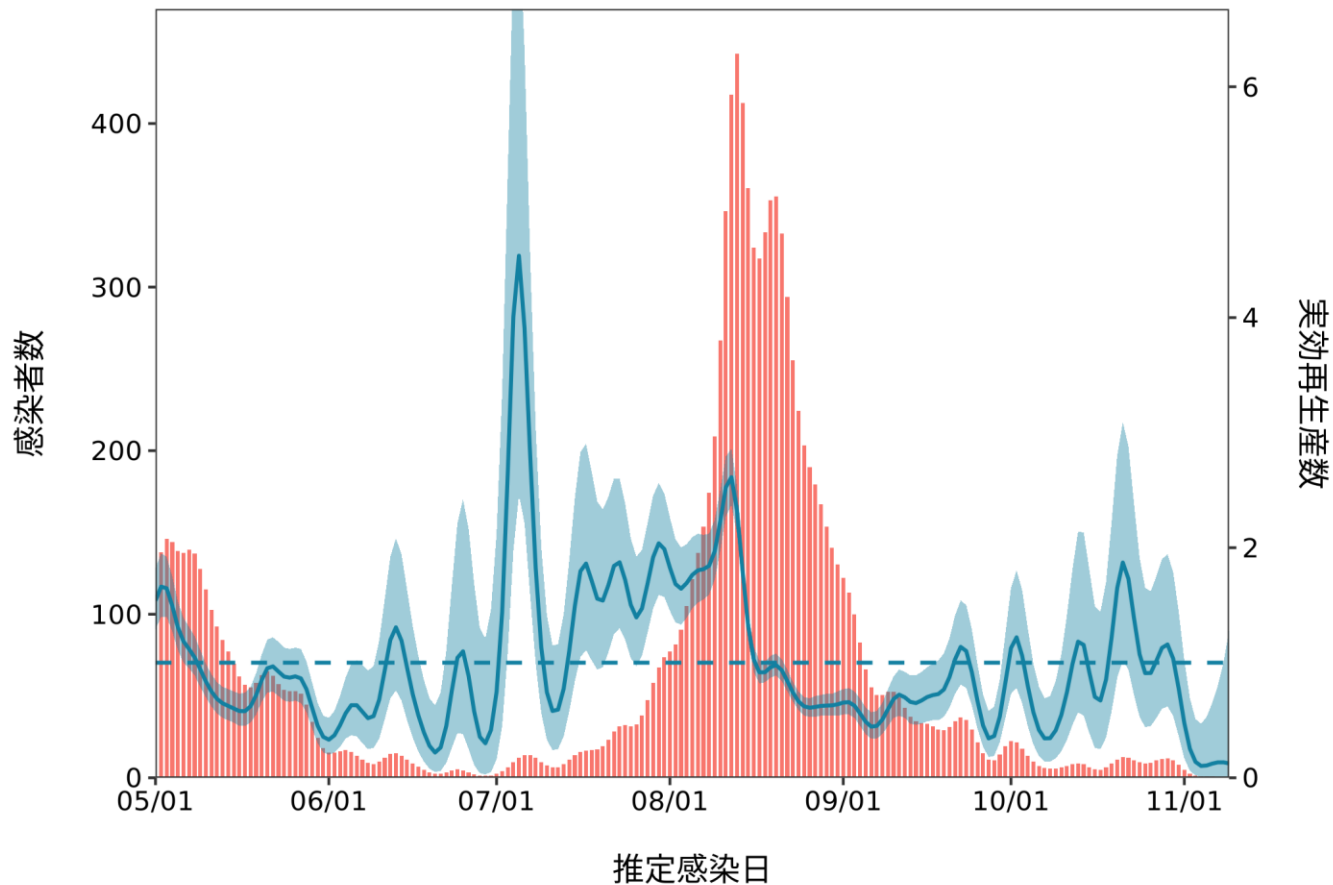
長野 :直近推定値 = 0 ( 0 - 9.44 ) / 直近1週平均 = 0



推定日 11月24日

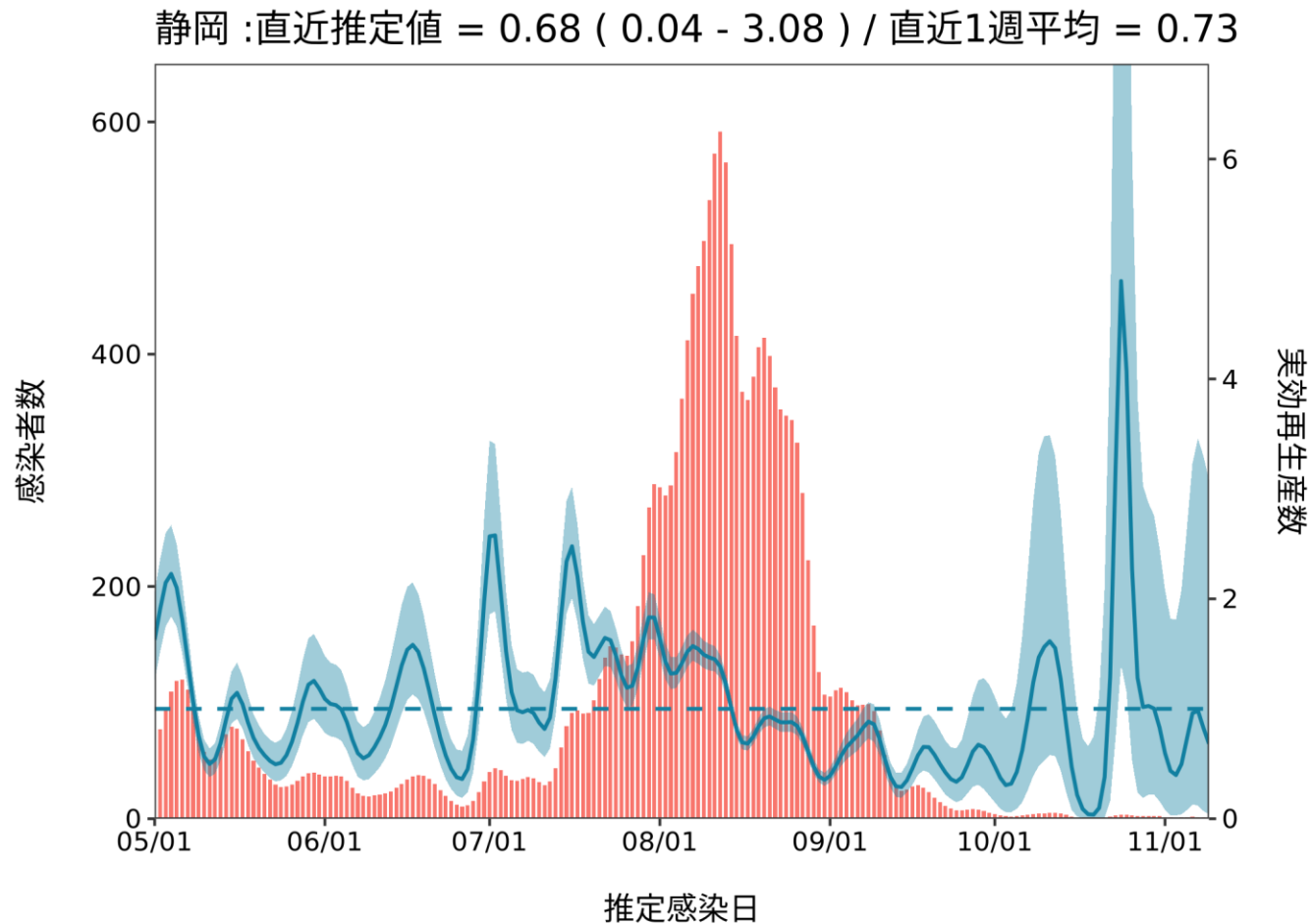
最新推定感染日付 11月9日

岐阜 :直近推定値 = 0.12 ( 0.01 - 1.28 ) / 直近1週平均 = 0.12



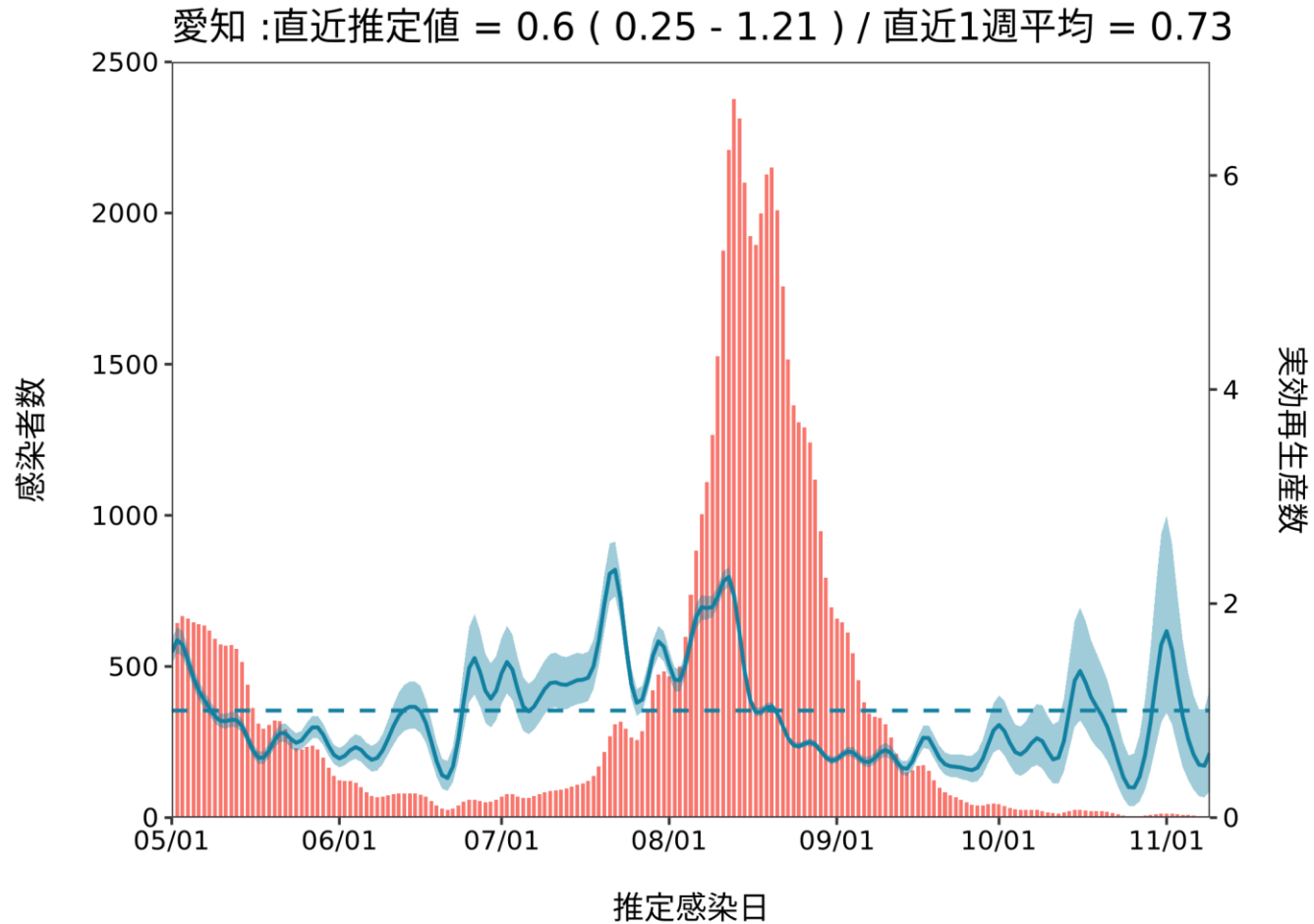
推定日 11月24日

最新推定感染日付 11月9日



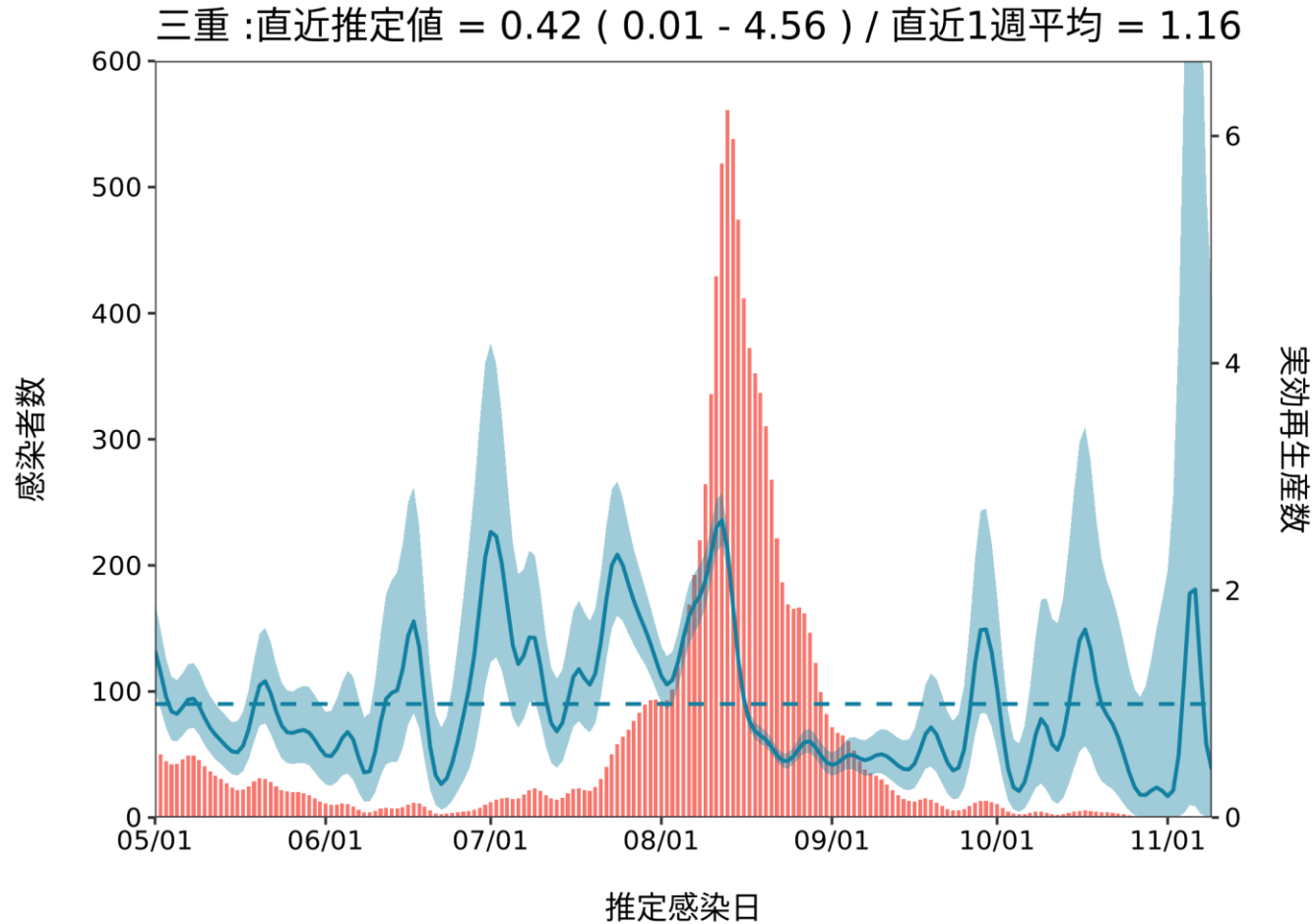
推定日 11月24日

最新推定感染日付 11月9日



推定日 11月24日

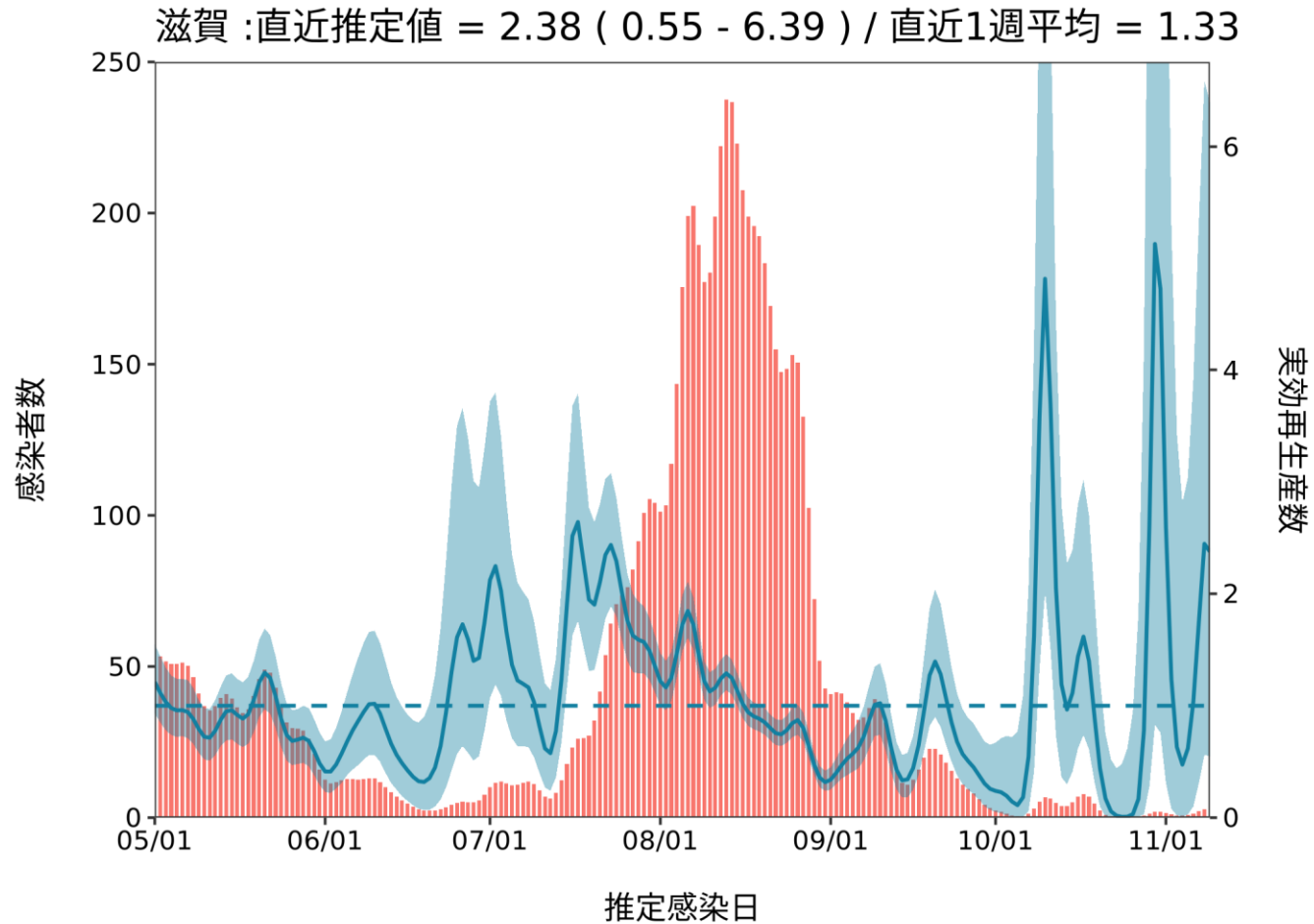
最新推定感染日付 11月9日





推定日 11月24日

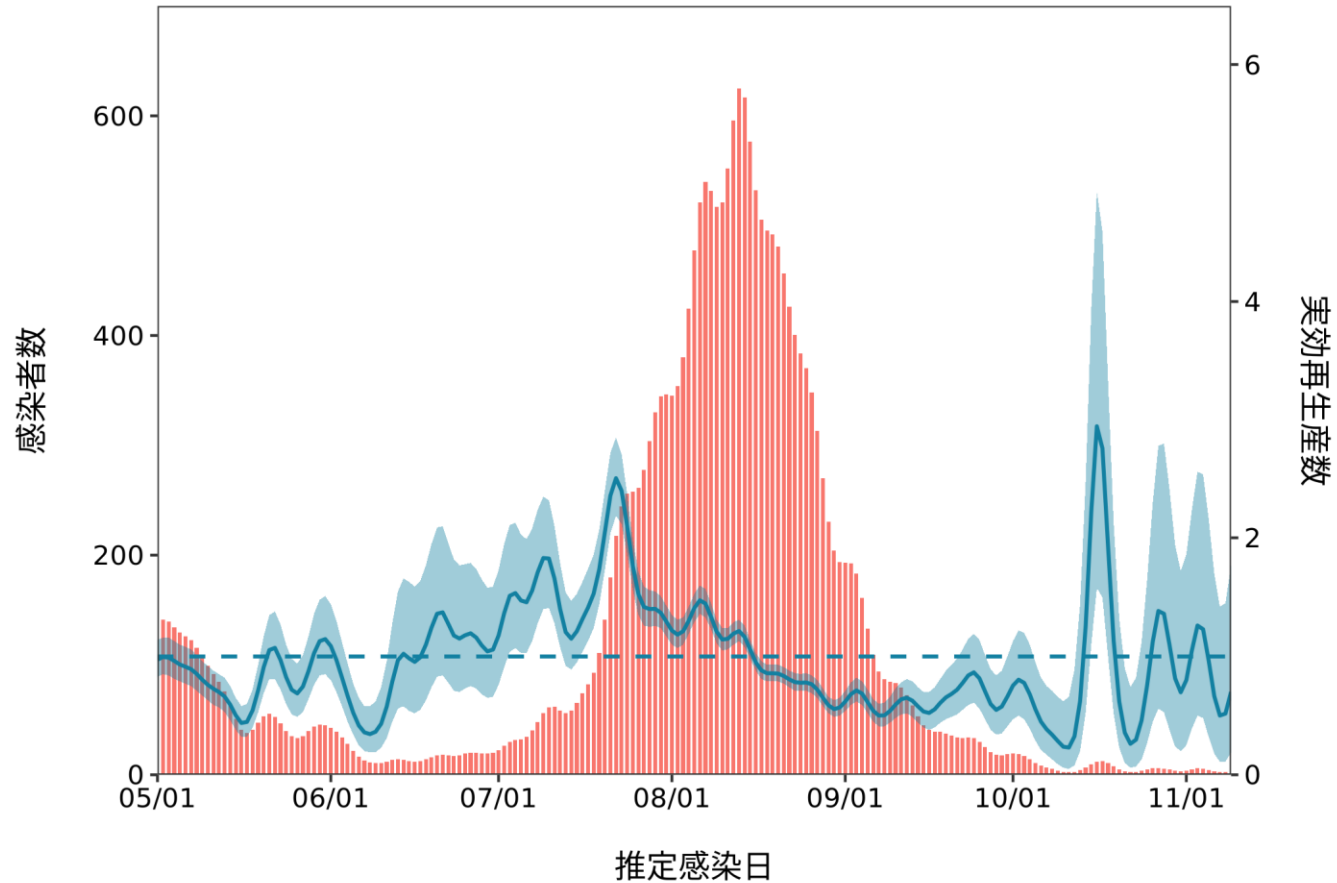
最新推定感染日付 11月9日



推定日 11月24日

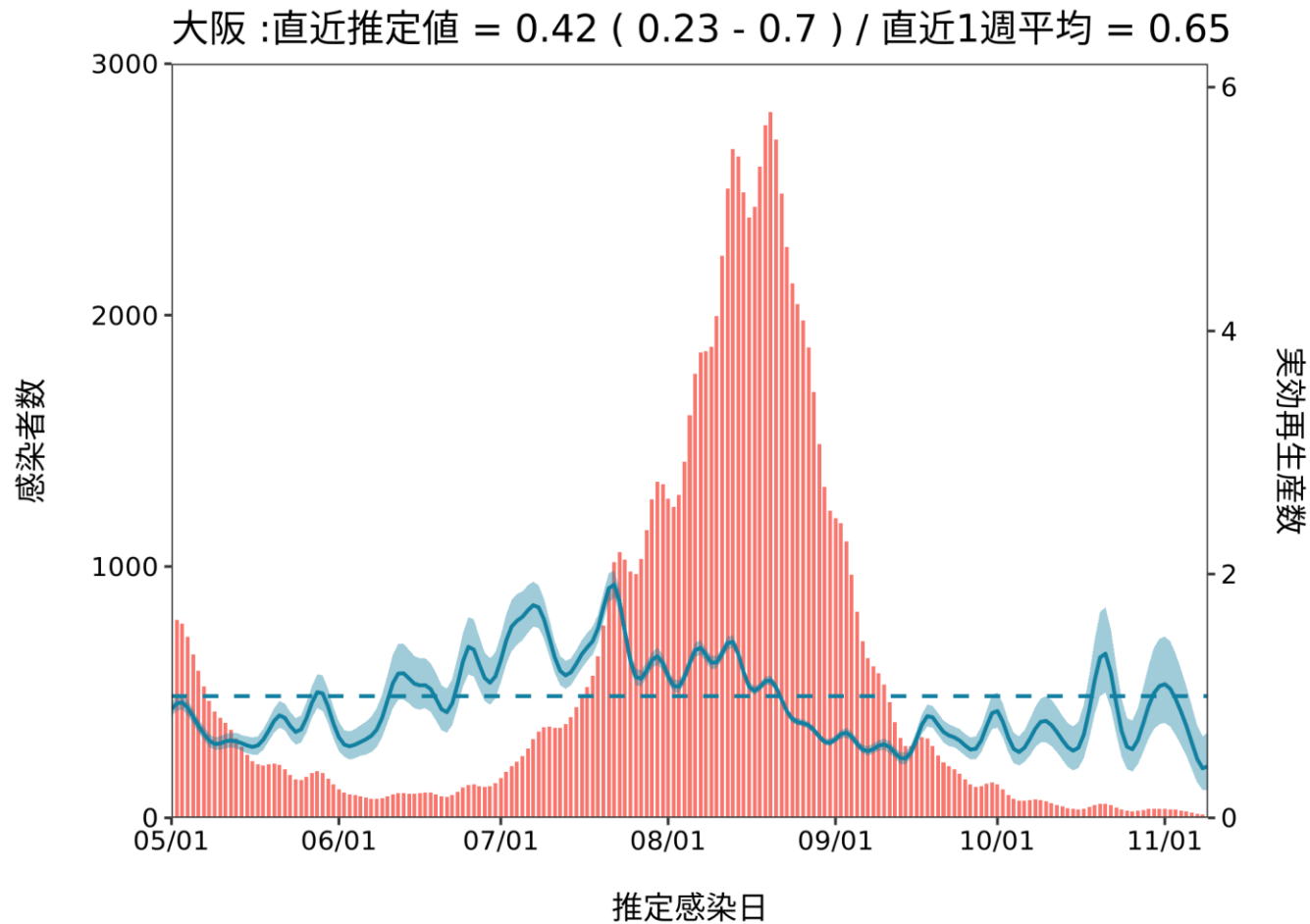
最新推定感染日付 11月9日

京都 :直近推定値 = 0.7 ( 0.19 - 1.77 ) / 直近1週平均 = 0.83



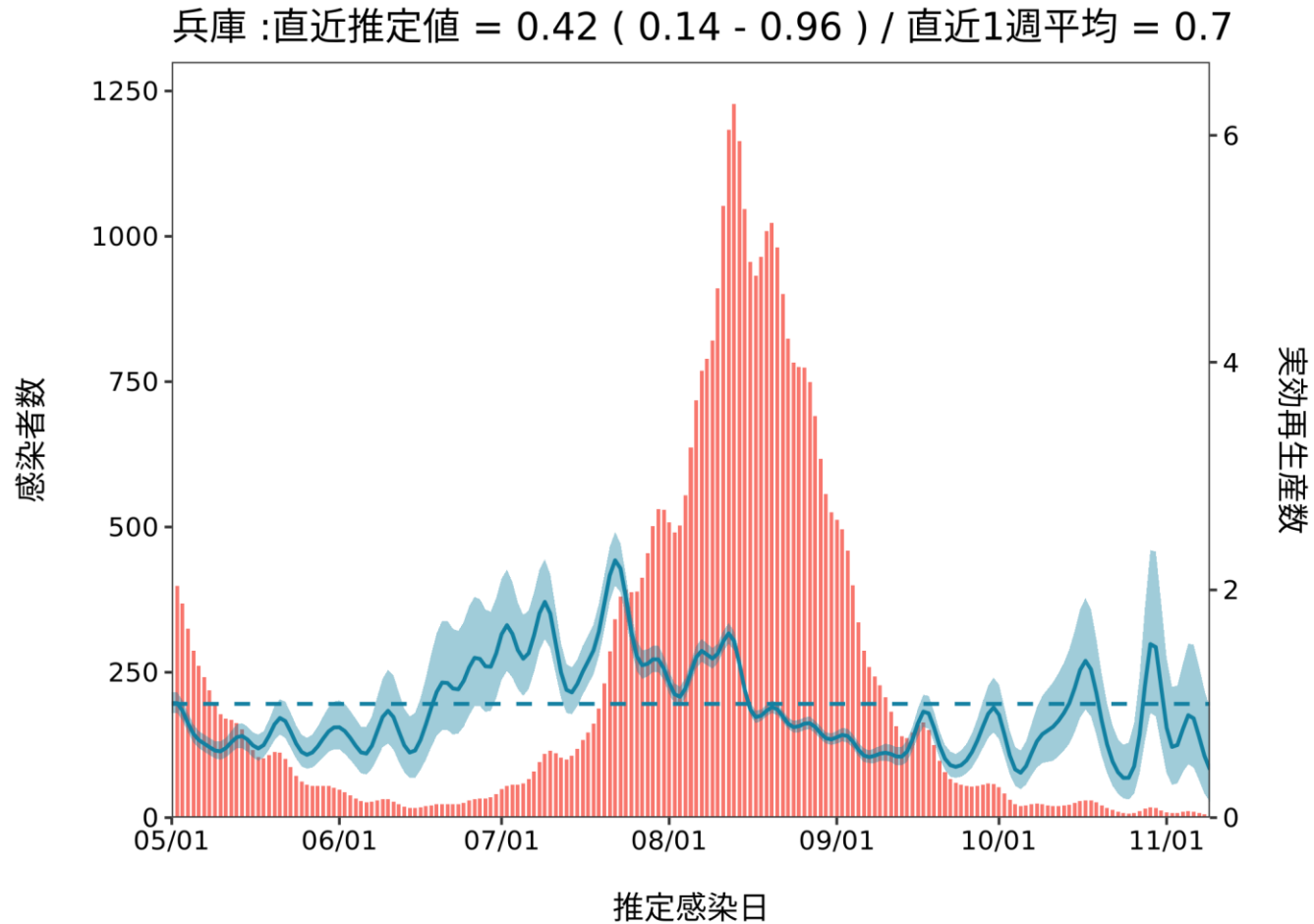
推定日 11月24日

最新推定感染日付 11月9日



推定日 11月24日

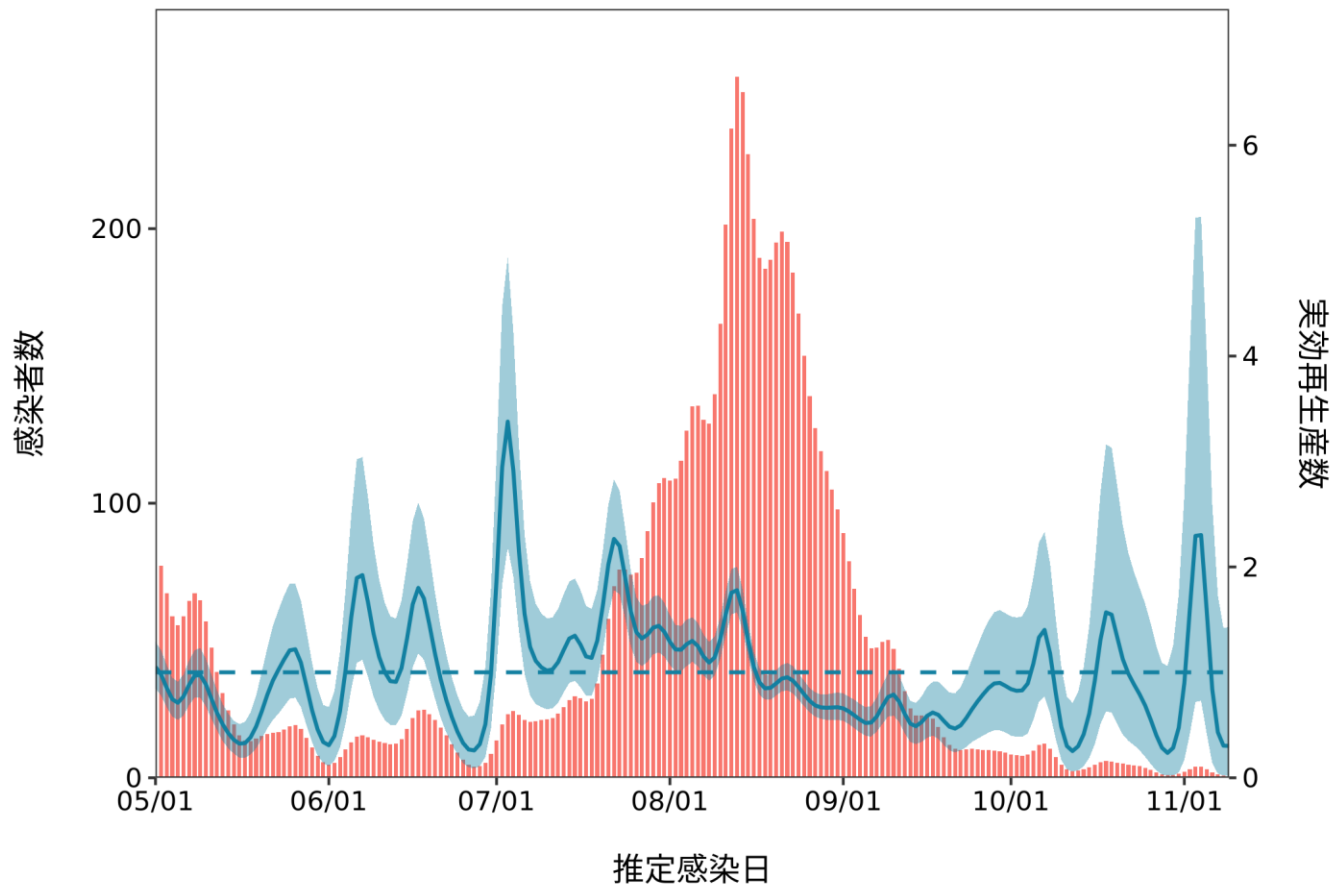
最新推定感染日付 11月9日



推定日 11月24日

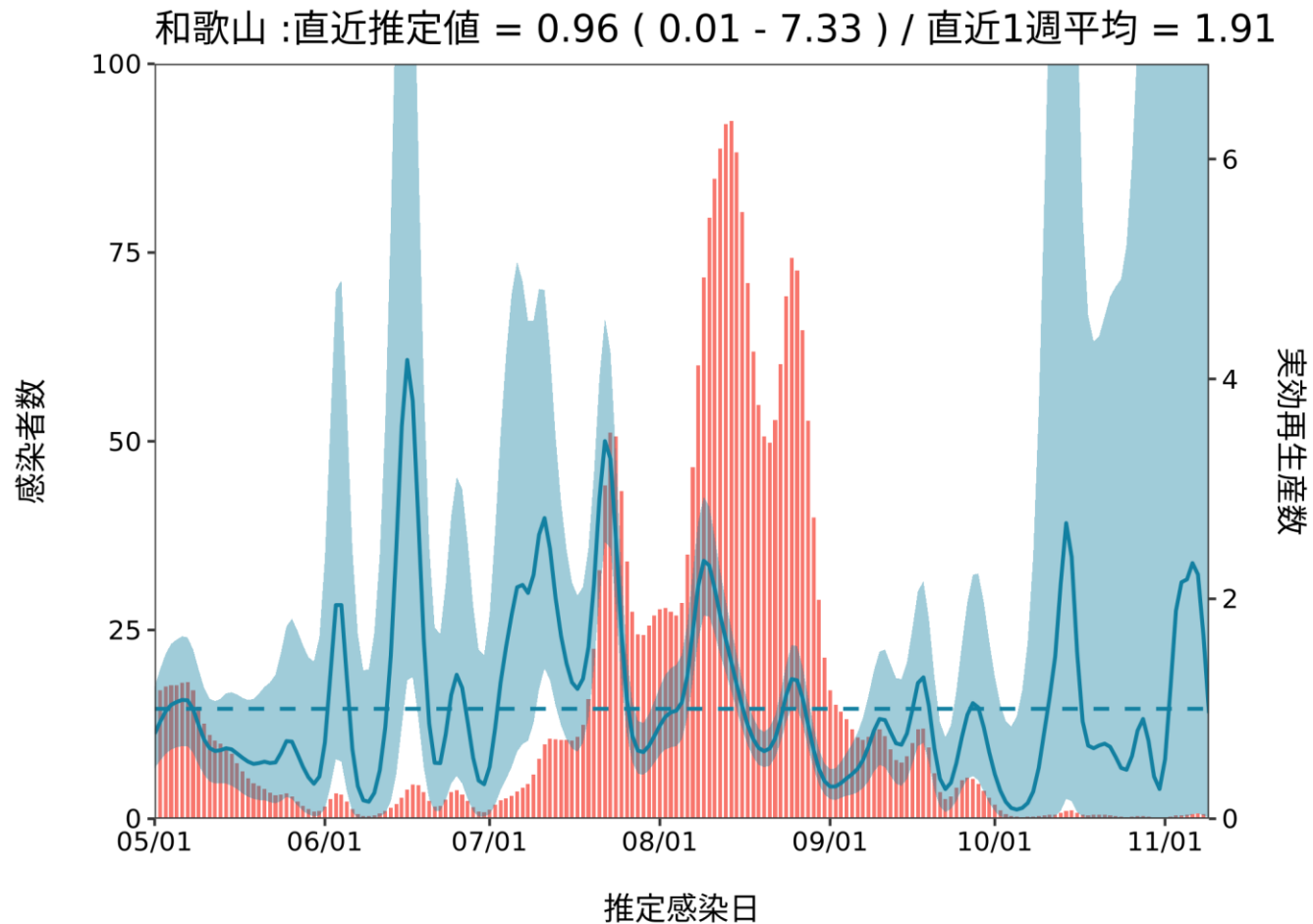
最新推定感染日付 11月9日

奈良 : 直近推定値 = 0.3 ( 0.02 - 1.43 ) / 直近1週平均 = 1.15



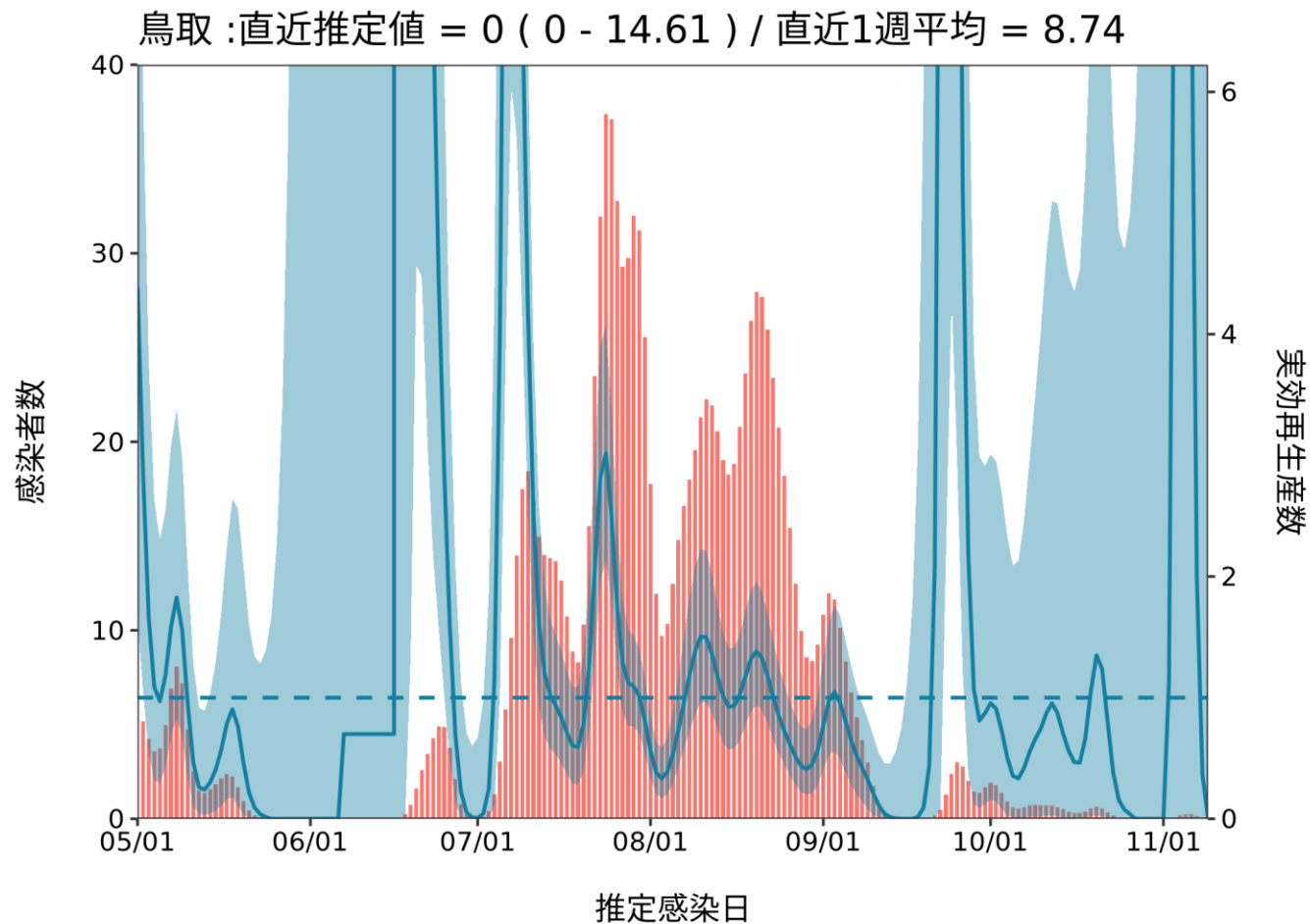
推定日 11月24日

最新推定感染日付 11月9日



推定日 11月24日

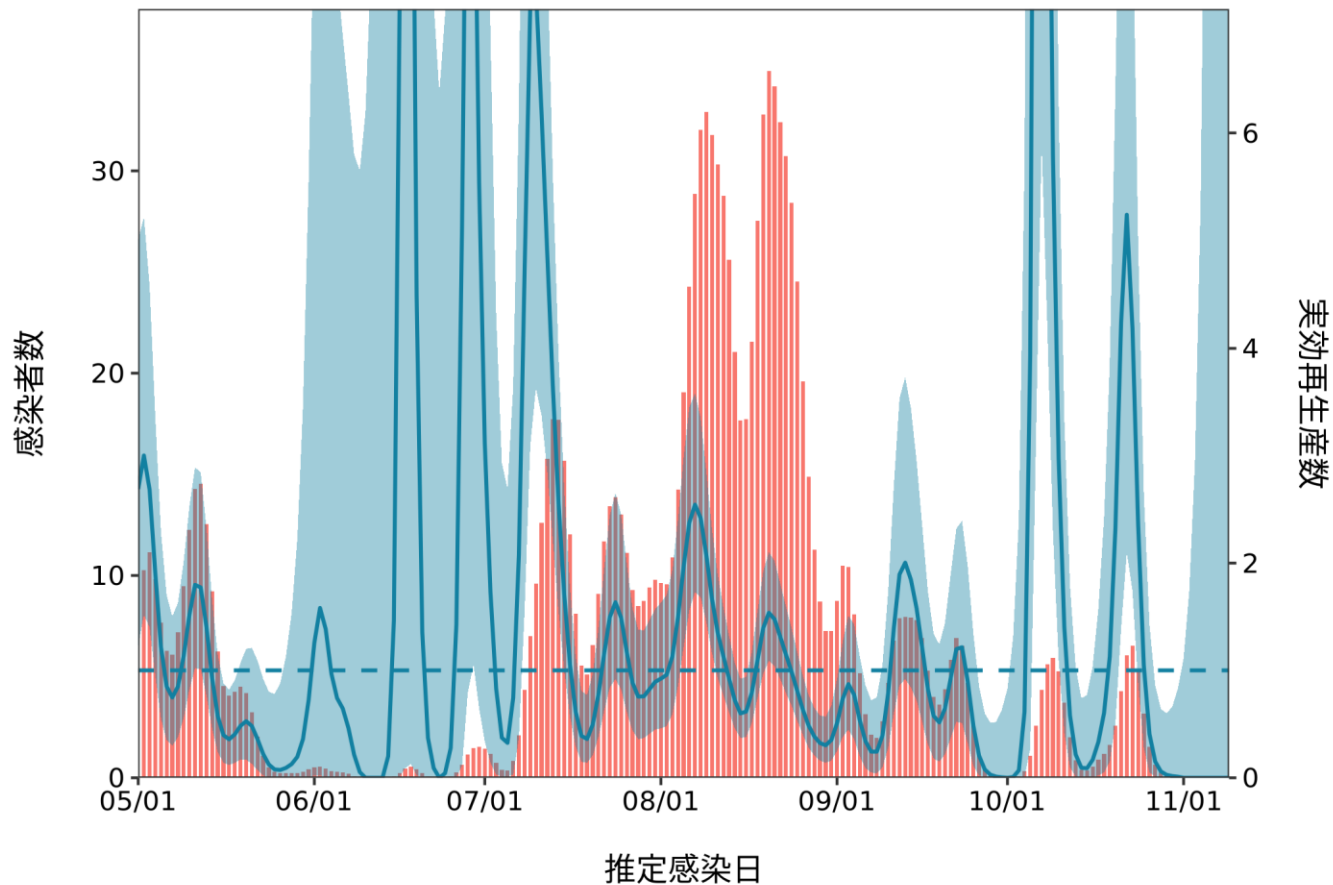
最新推定感染日付 11月9日



推定日 11月24日

最新推定感染日付 11月9日

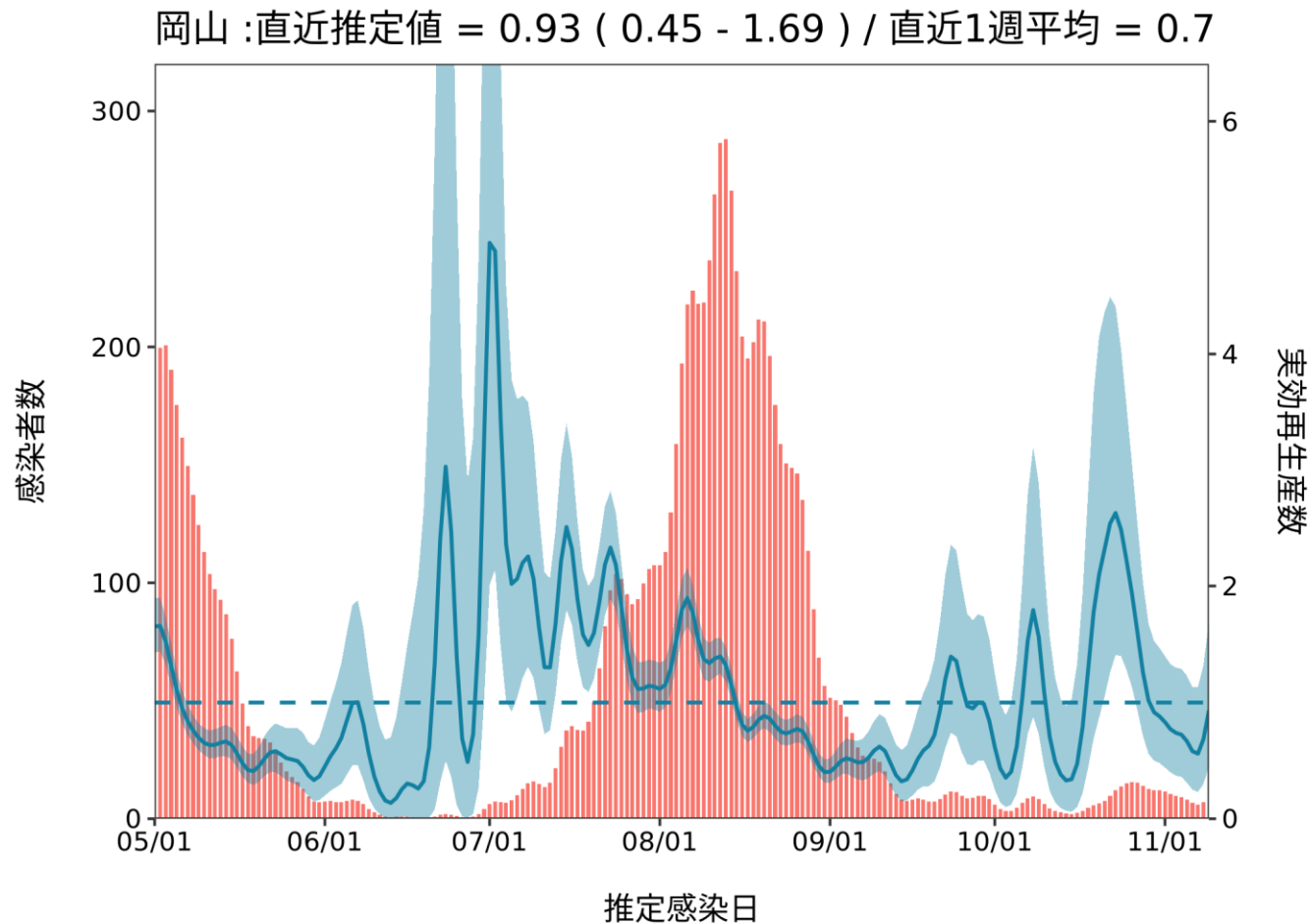
島根 : 直近推定値 = 0 ( 0 - 25 ) / 直近1週平均 = 0





推定日 11月24日

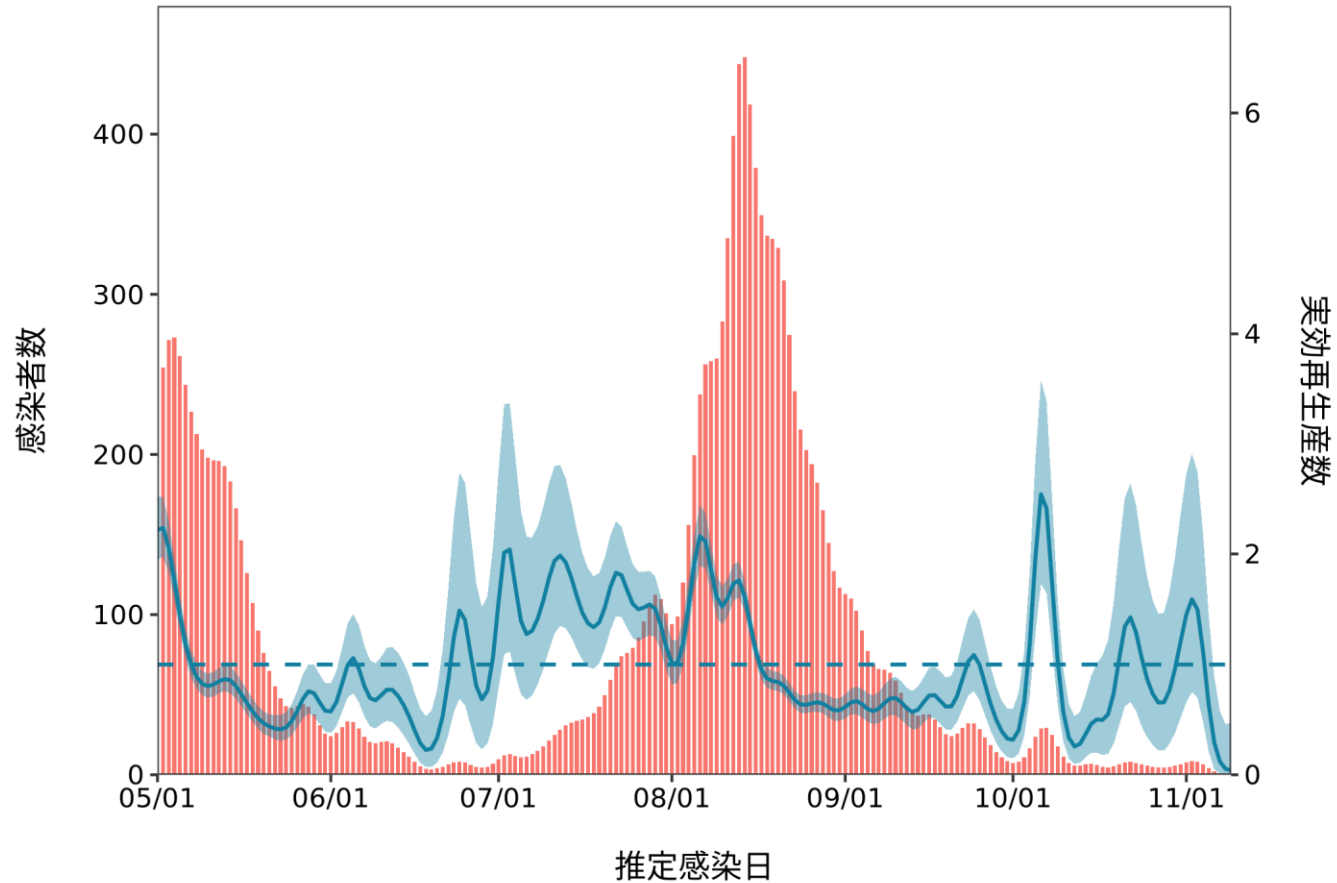
最新推定感染日付 11月9日



推定日 11月24日

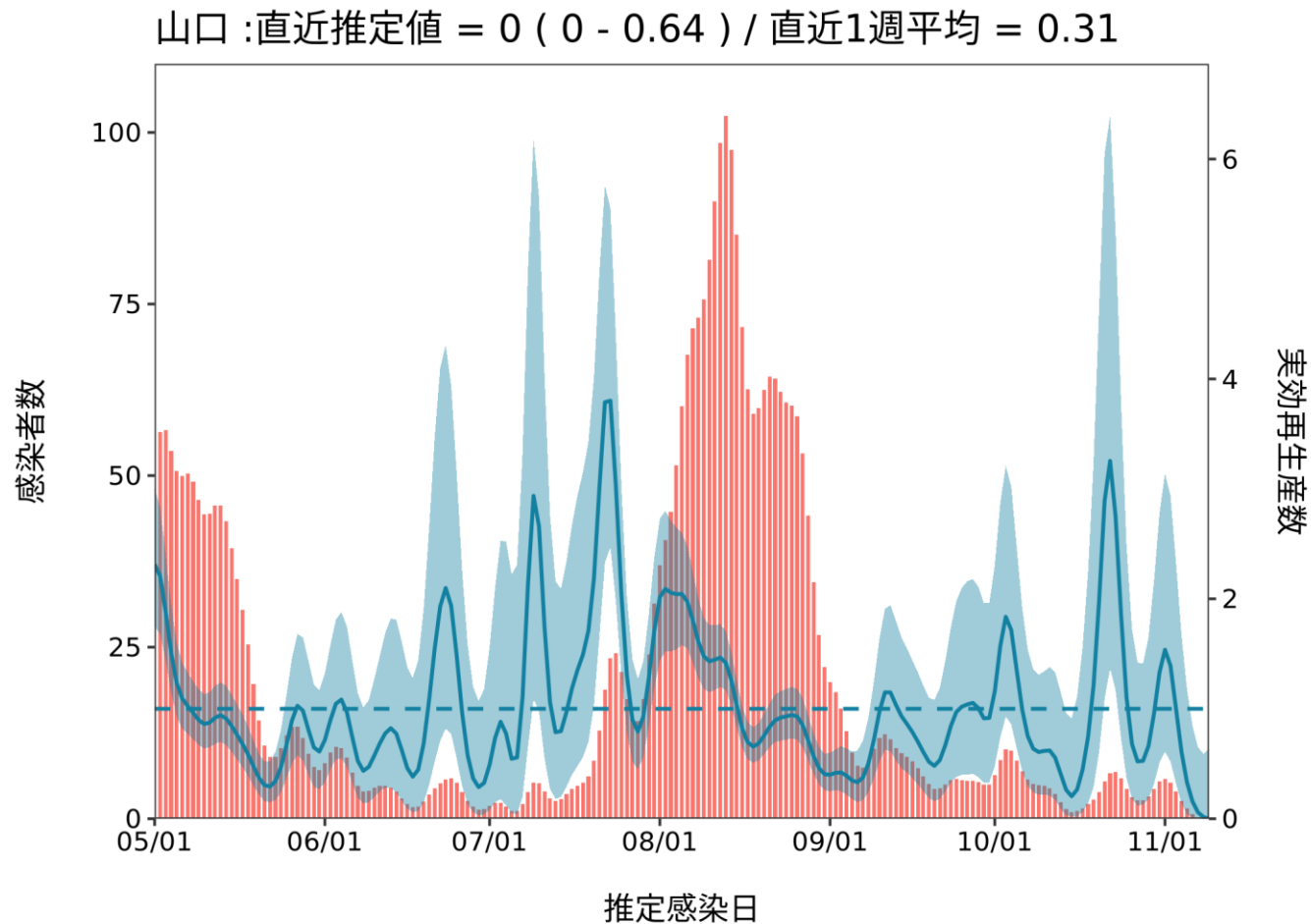
最新推定感染日付 11月9日

広島 :直近推定値 = 0.04 ( 0.01 - 0.47 ) / 直近1週平均 = 0.54



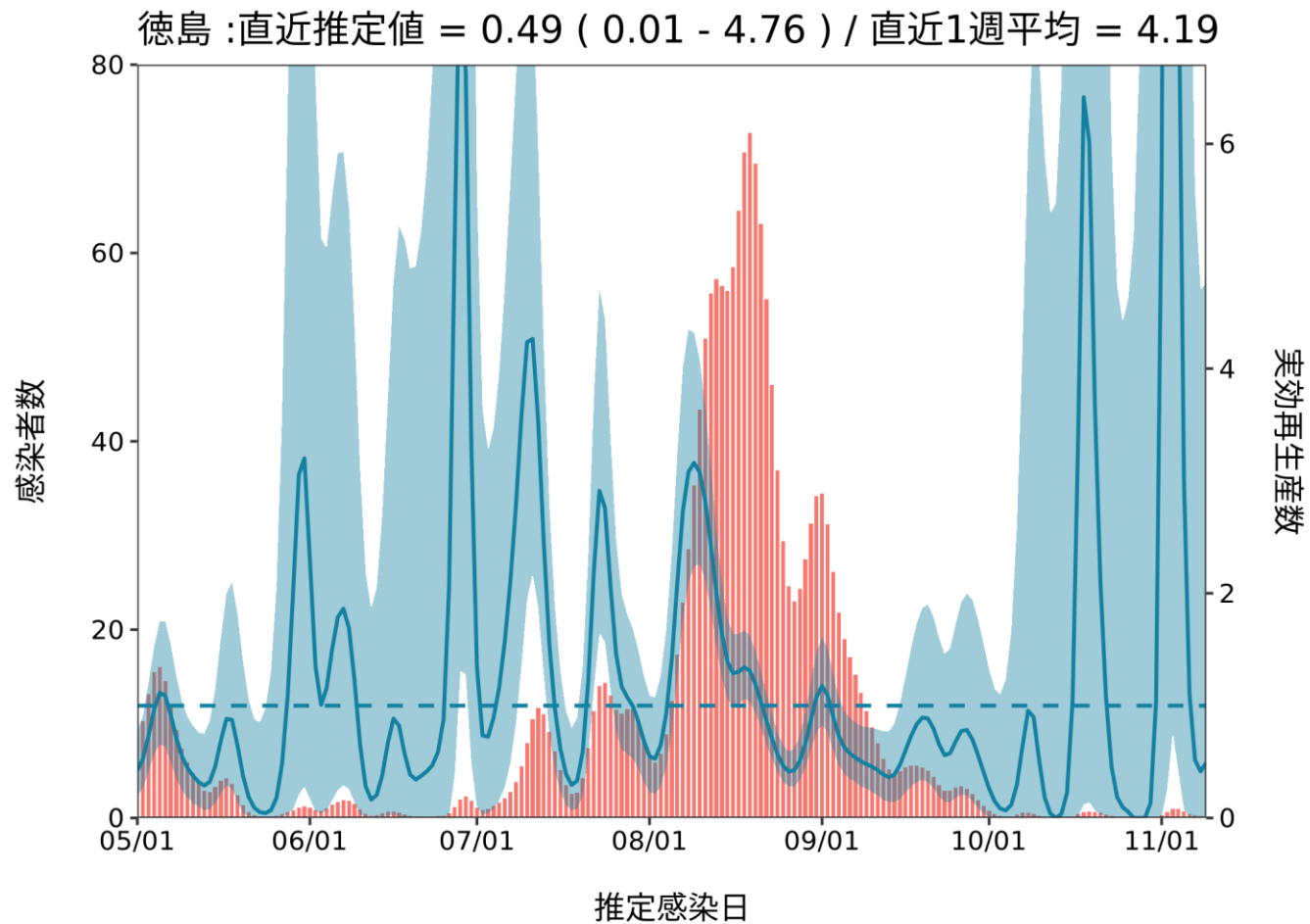
推定日 11月24日

最新推定感染日付 11月9日



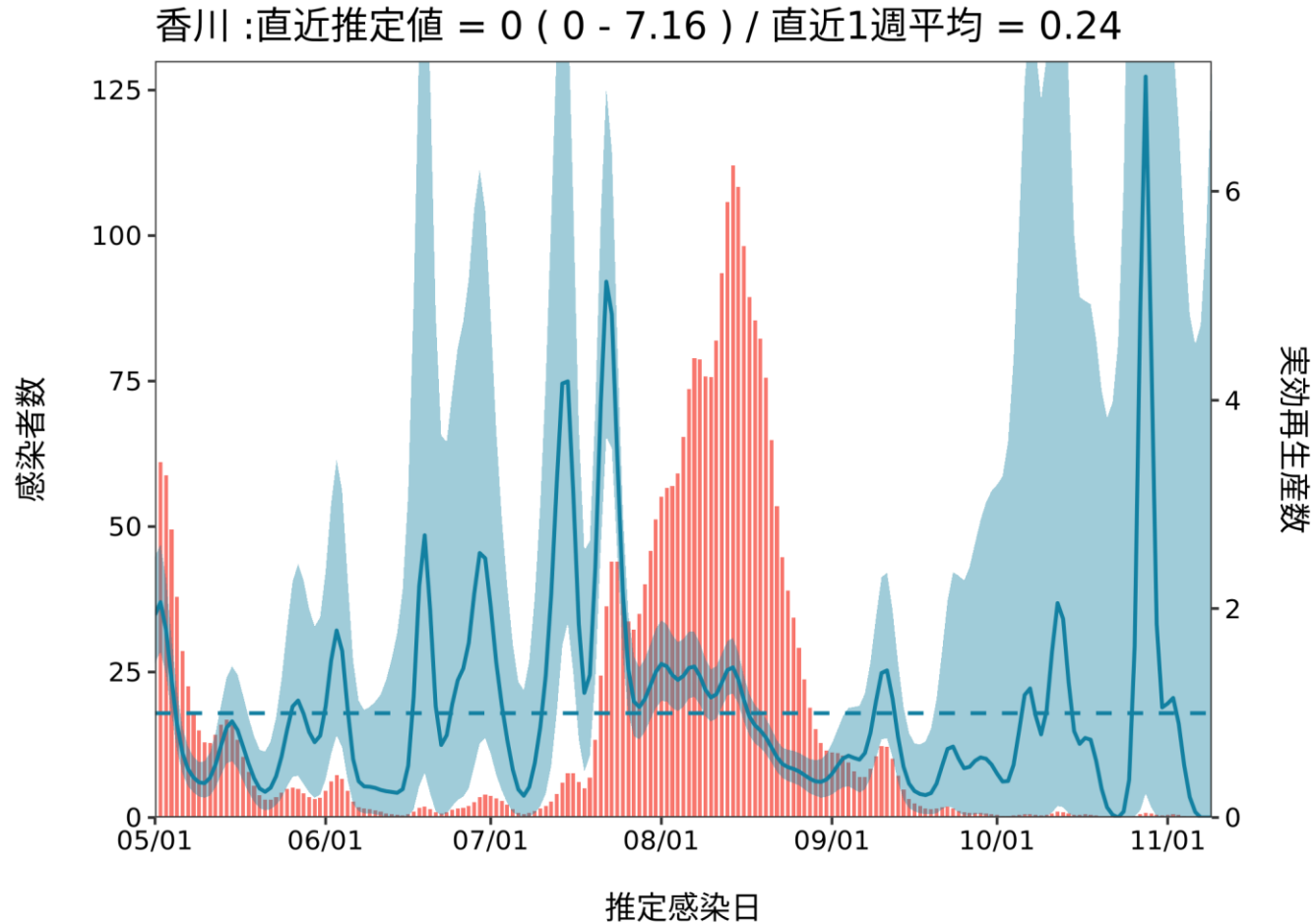
推定日 11月24日

最新推定感染日付 11月9日



推定日 11月24日

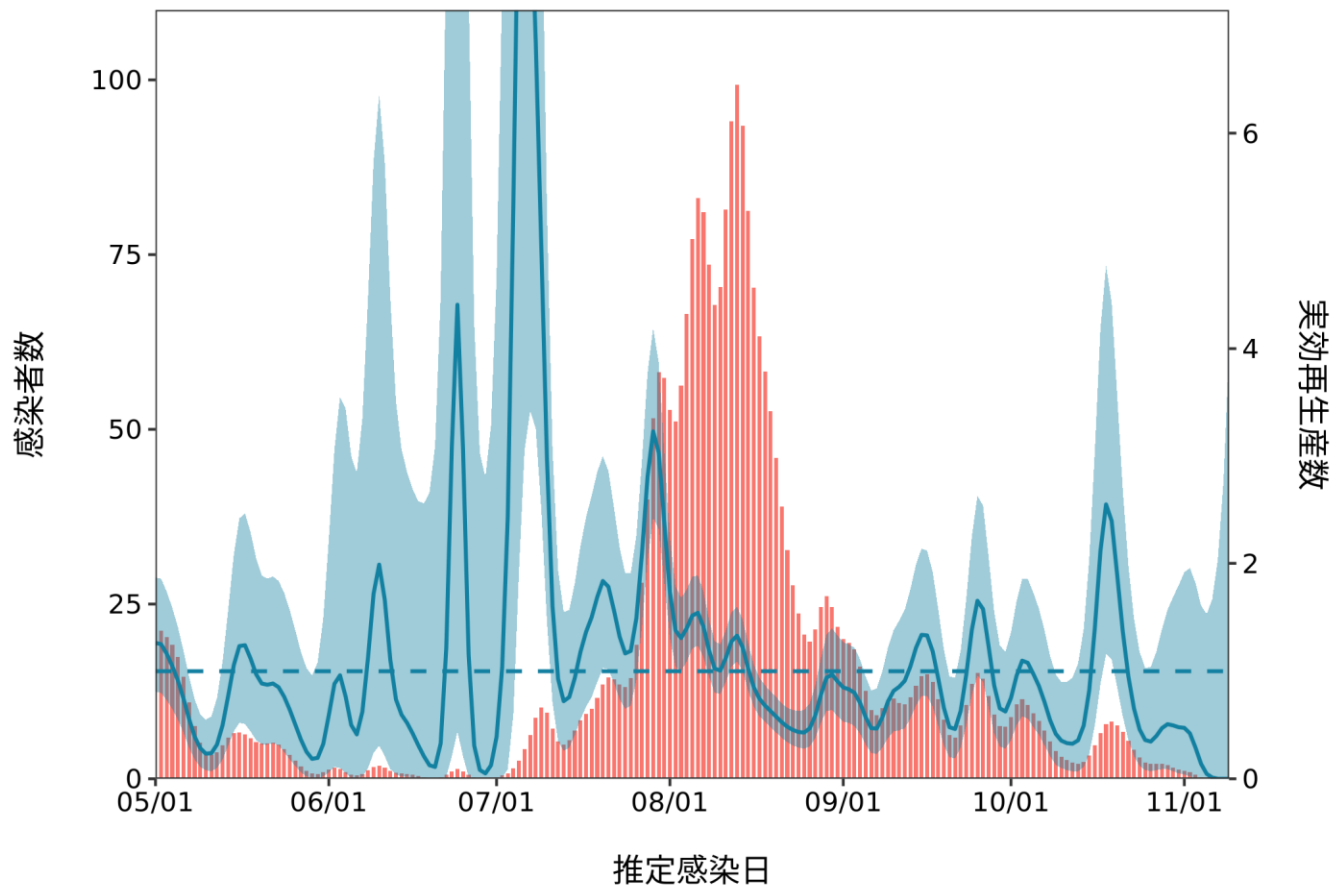
最新推定感染日付 11月9日



推定日 11月24日

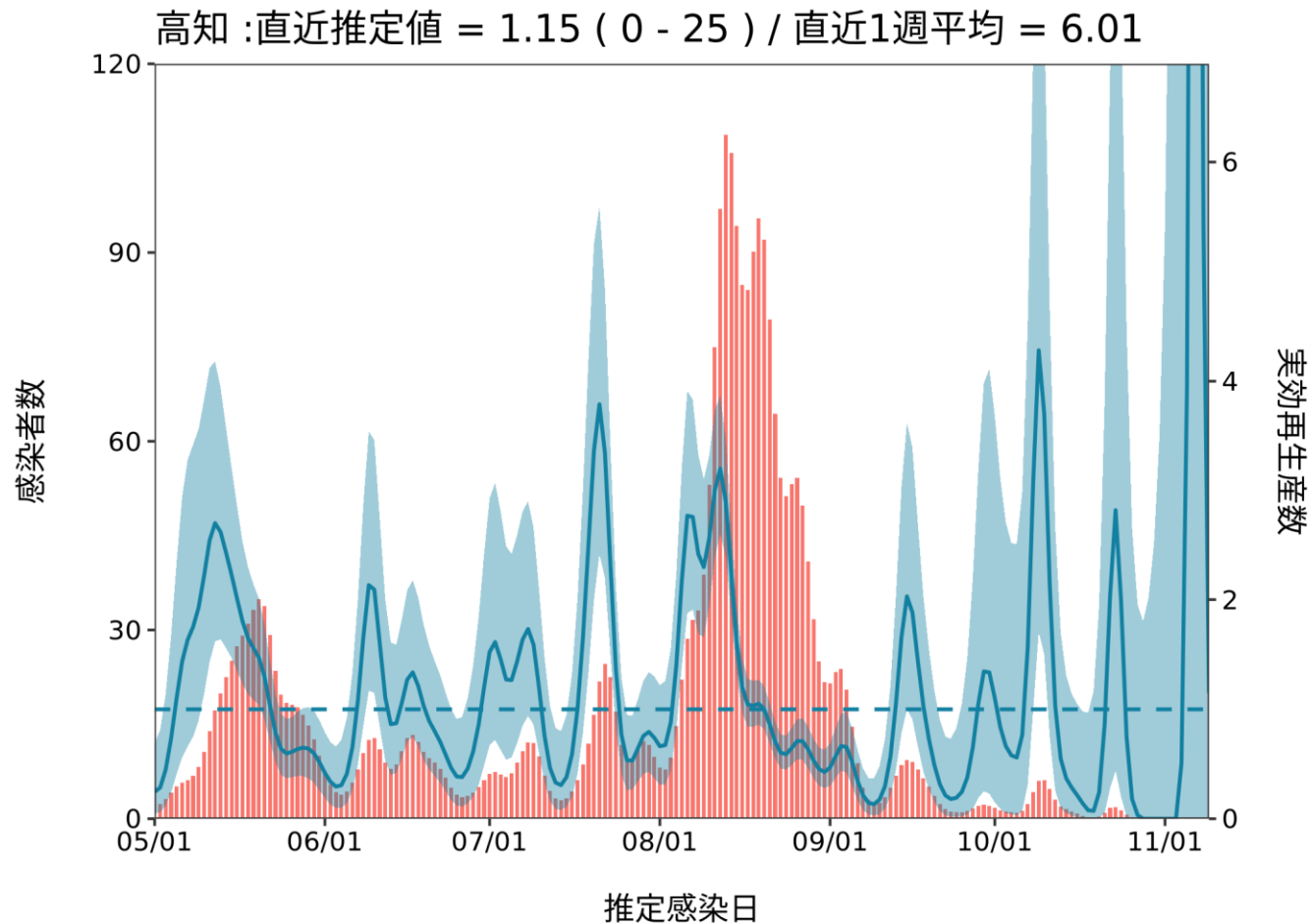
最新推定感染日付 11月9日

愛媛:直近推定値 = 0 ( 0 - 4 ) / 直近1週平均 = 0.07



推定日 11月24日

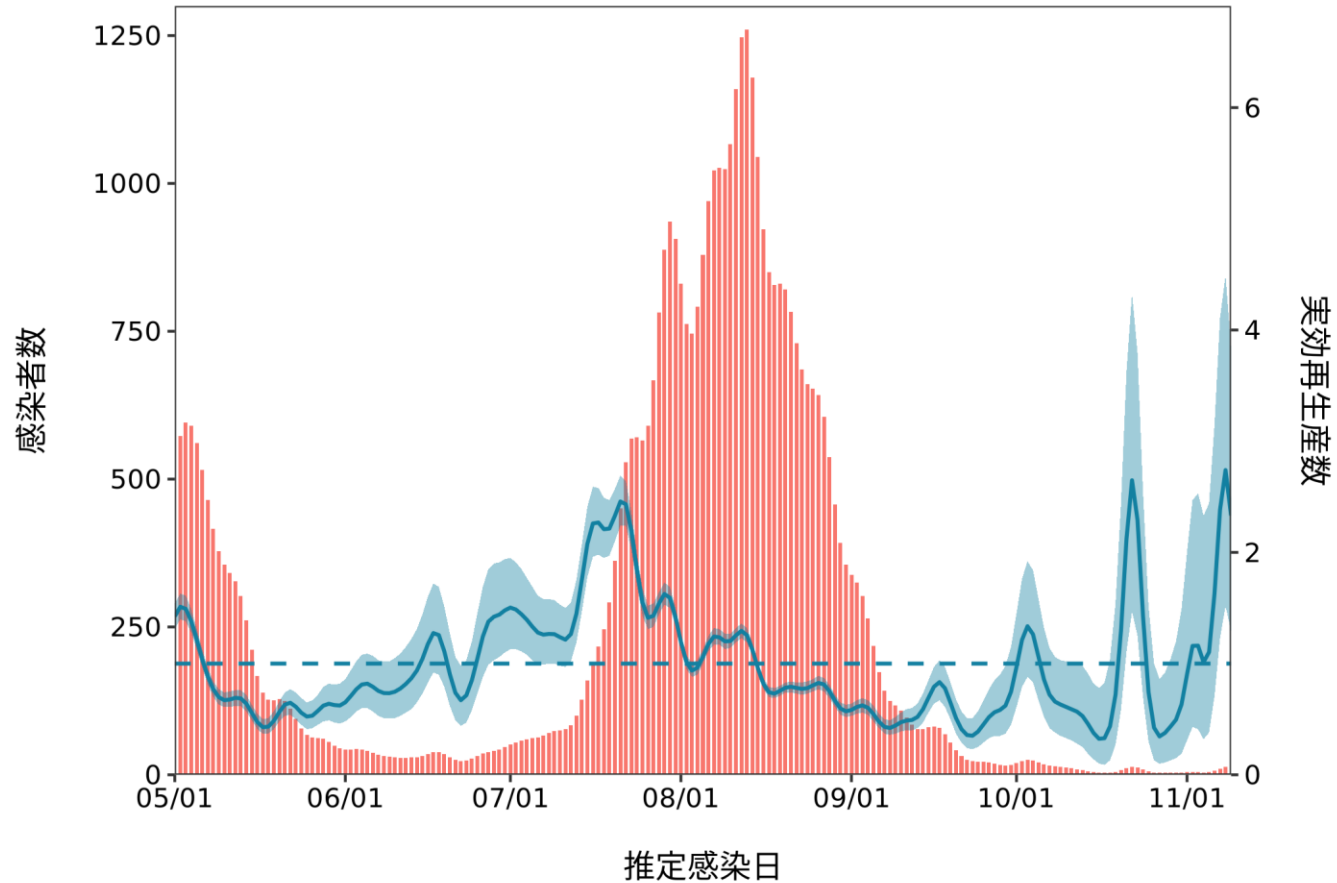
最新推定感染日付 11月9日



推定日 11月24日

最新推定感染日付 11月9日

福岡 : 直近推定値 = 2.33 ( 1.29 - 3.84 ) / 直近1週平均 = 1.77

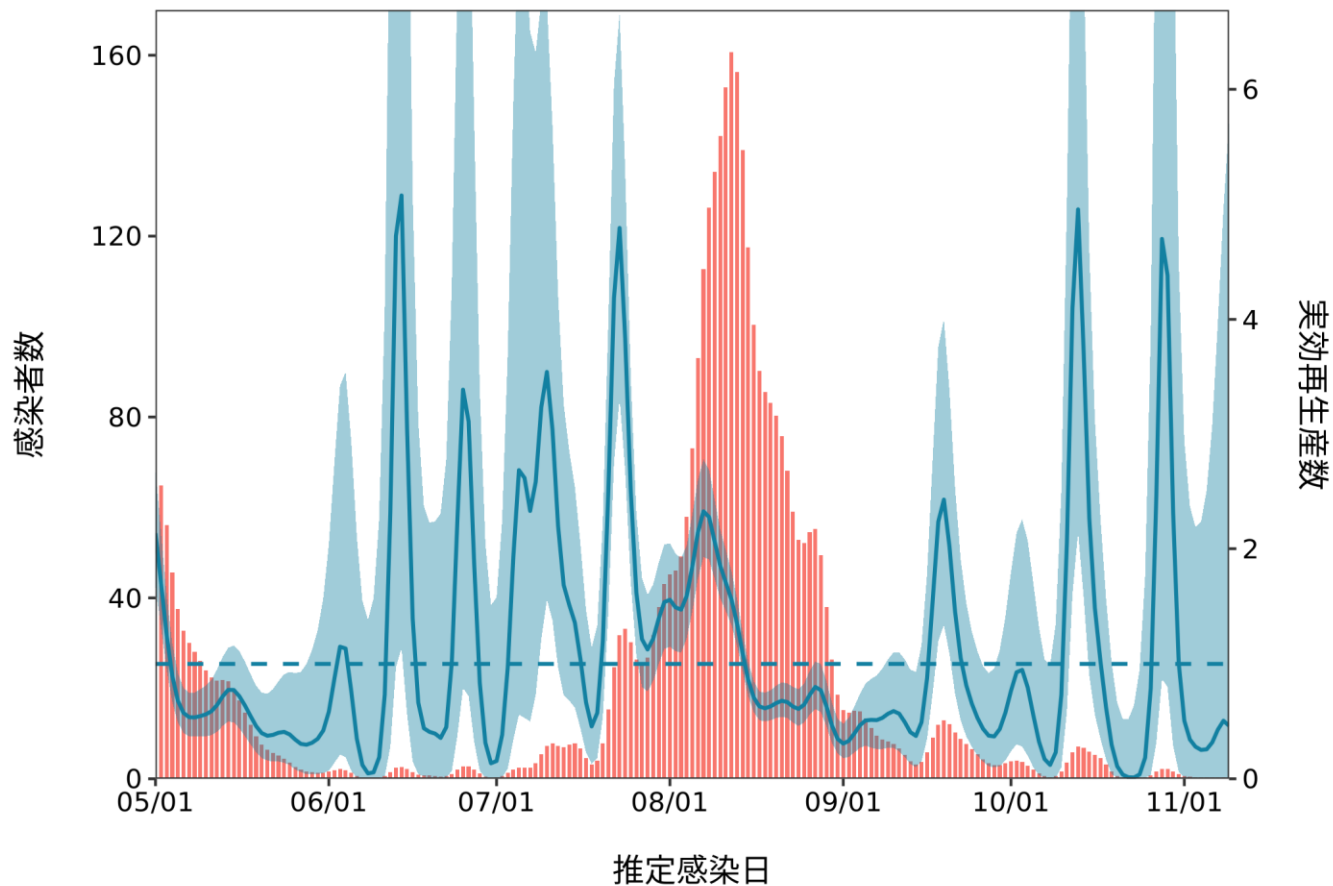




推定日 11月24日

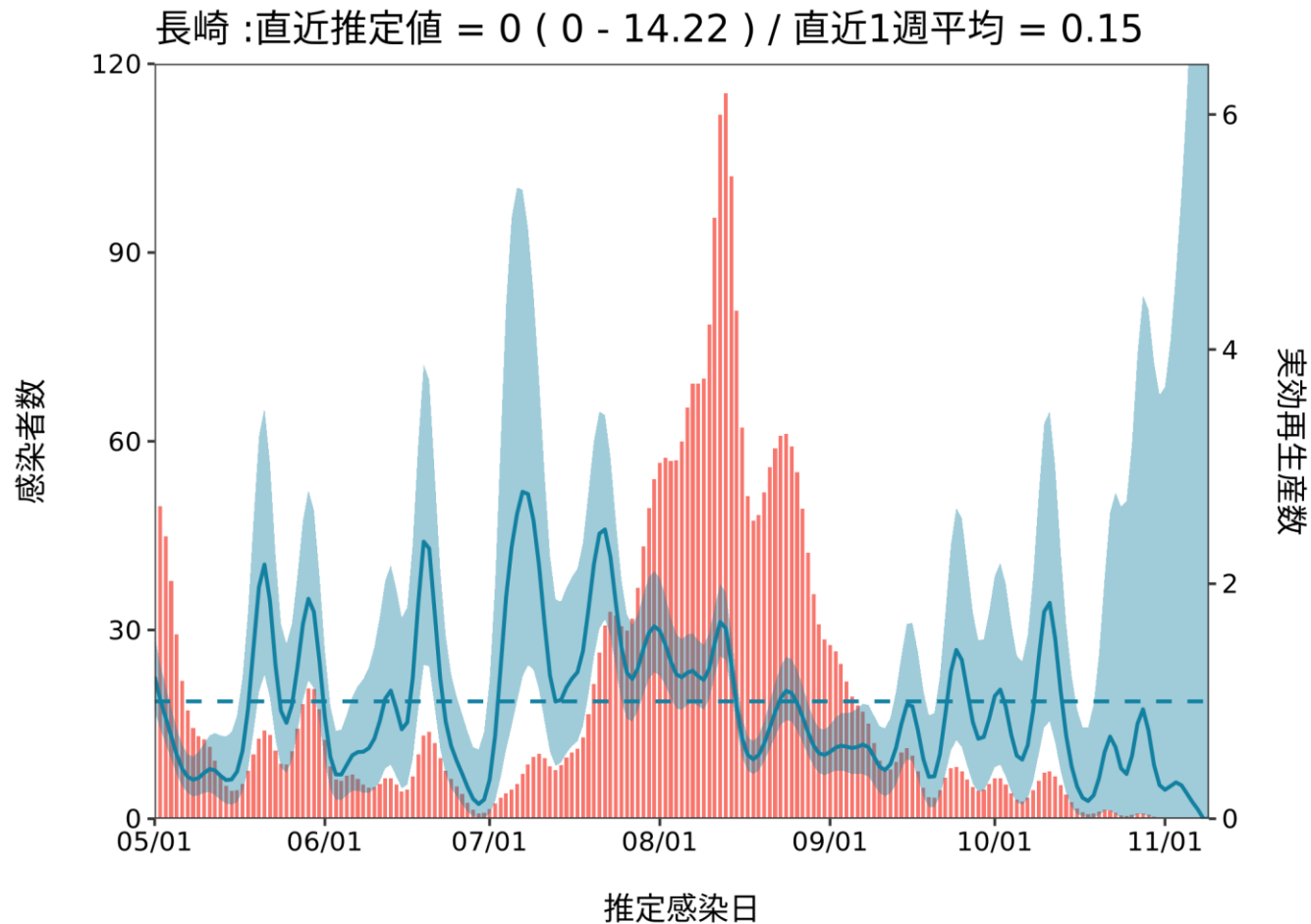
最新推定感染日付 11月9日

佐賀 :直近推定値 = 0.46 ( 0.01 - 5.72 ) / 直近1週平均 = 0.36



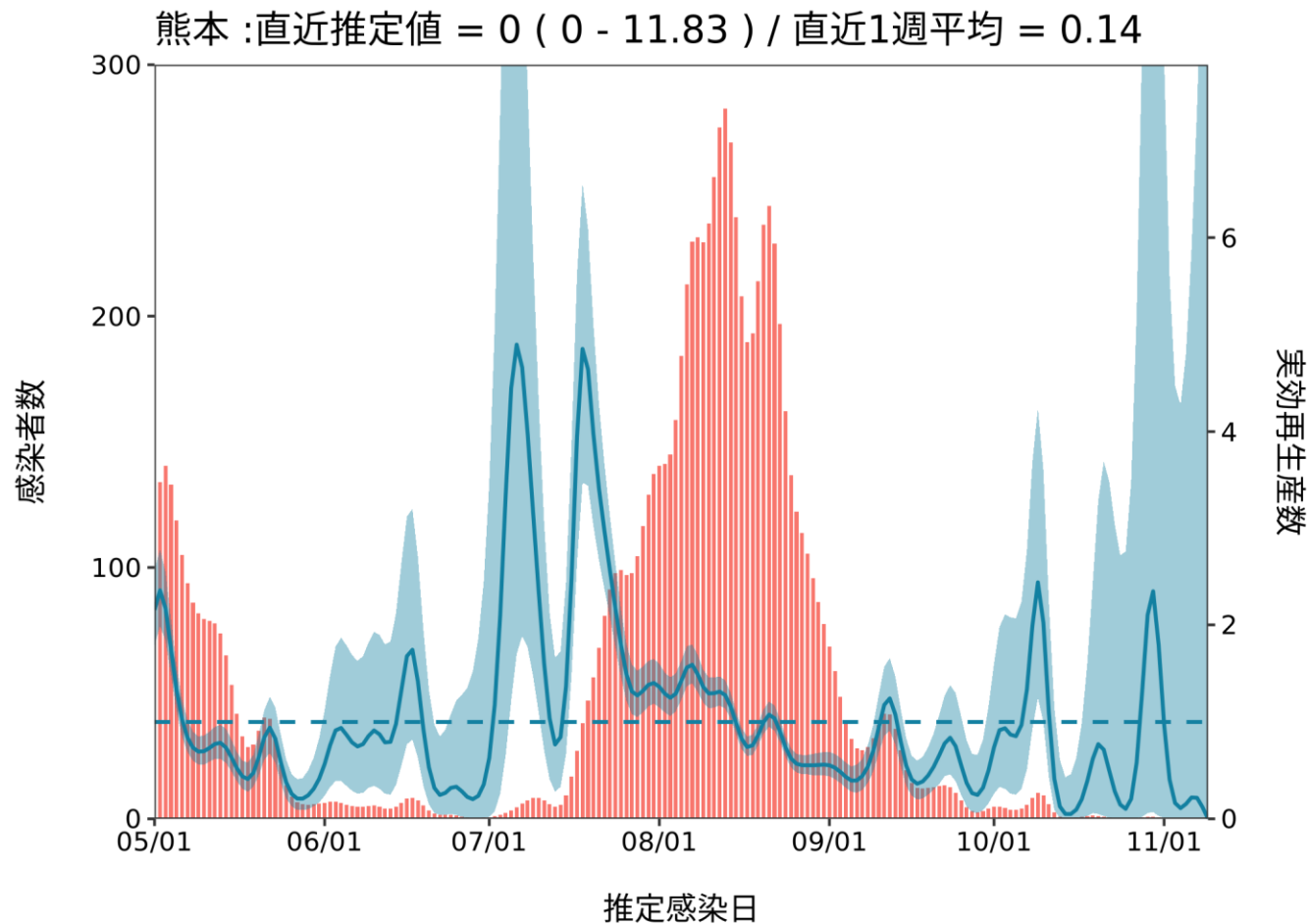
推定日 11月24日

最新推定感染日付 11月9日



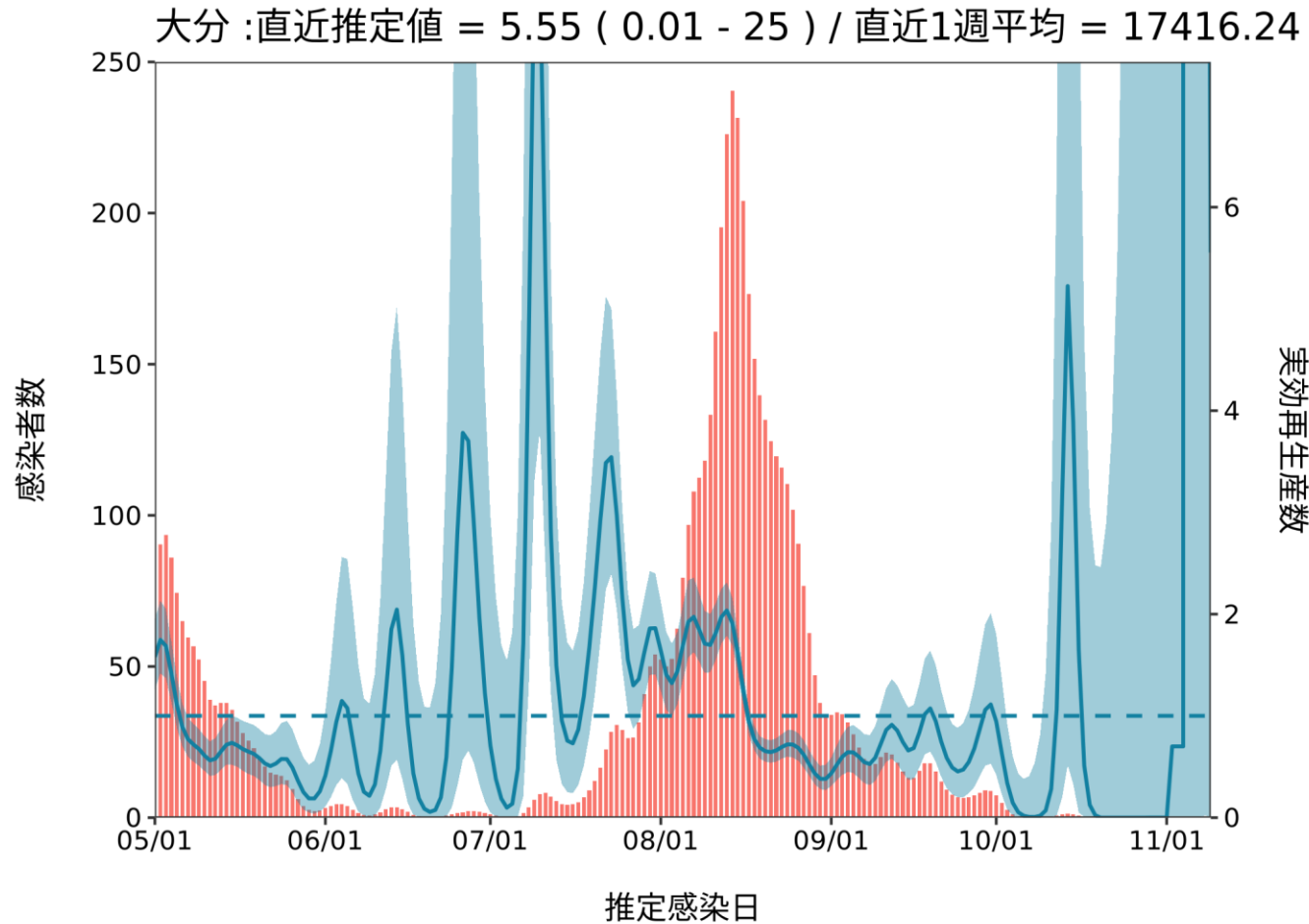
推定日 11月24日

最新推定感染日付 11月9日



推定日 11月24日

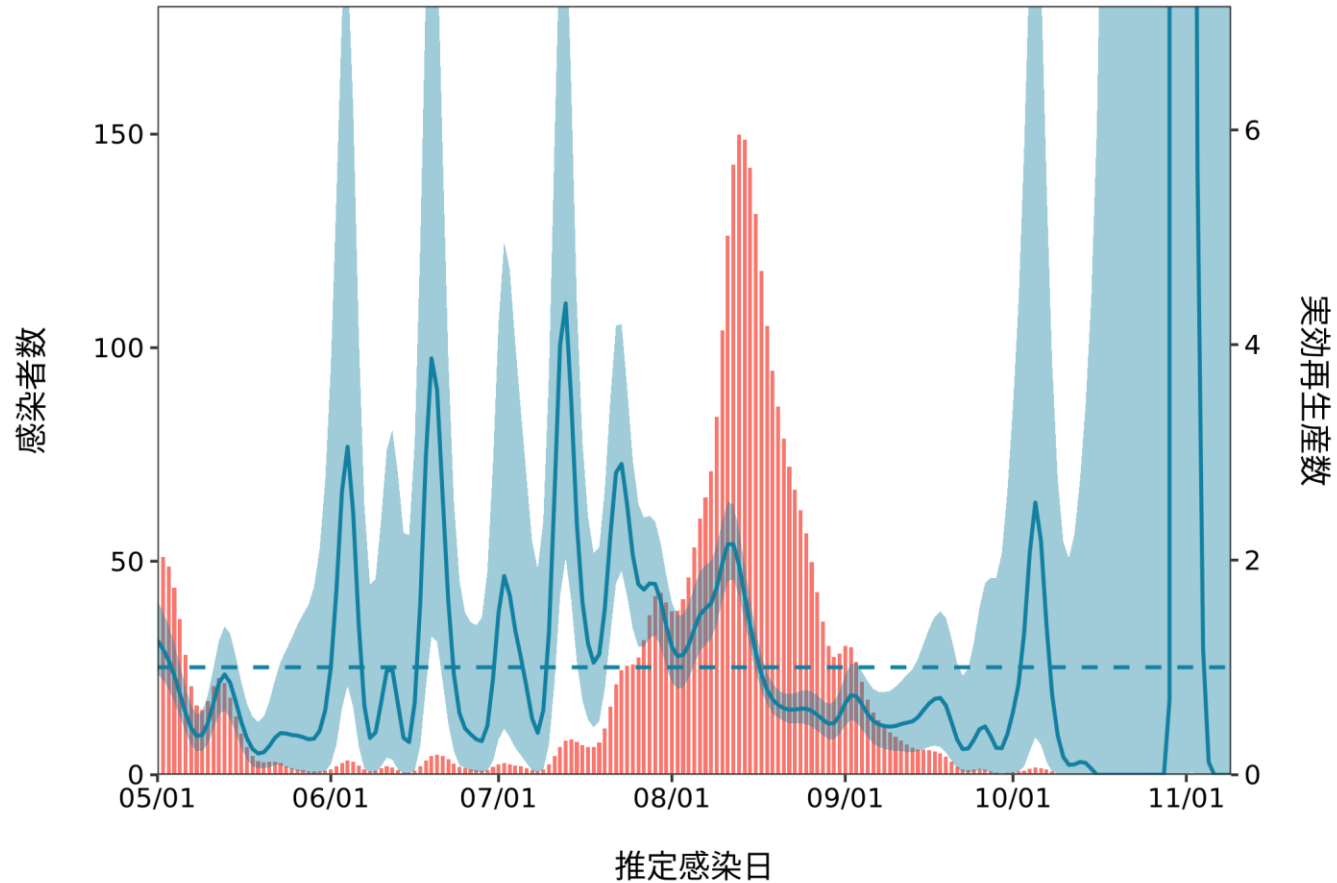
最新推定感染日付 11月9日



推定日 11月24日

最新推定感染日付 11月9日

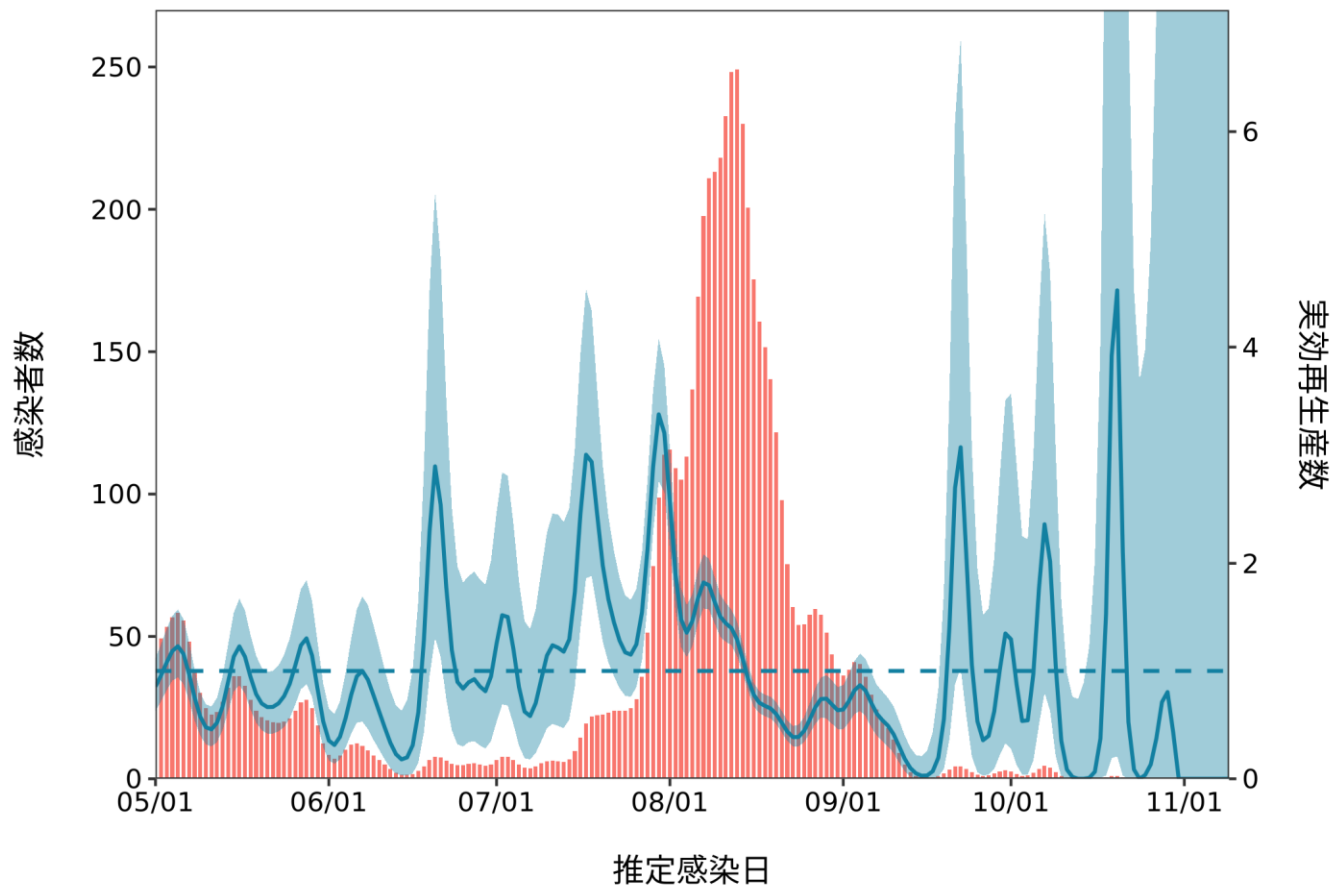
宮崎 : 直近推定値 = 0 ( 0 - 16.88 ) / 直近1週平均 = 0.99



推定日 11月24日

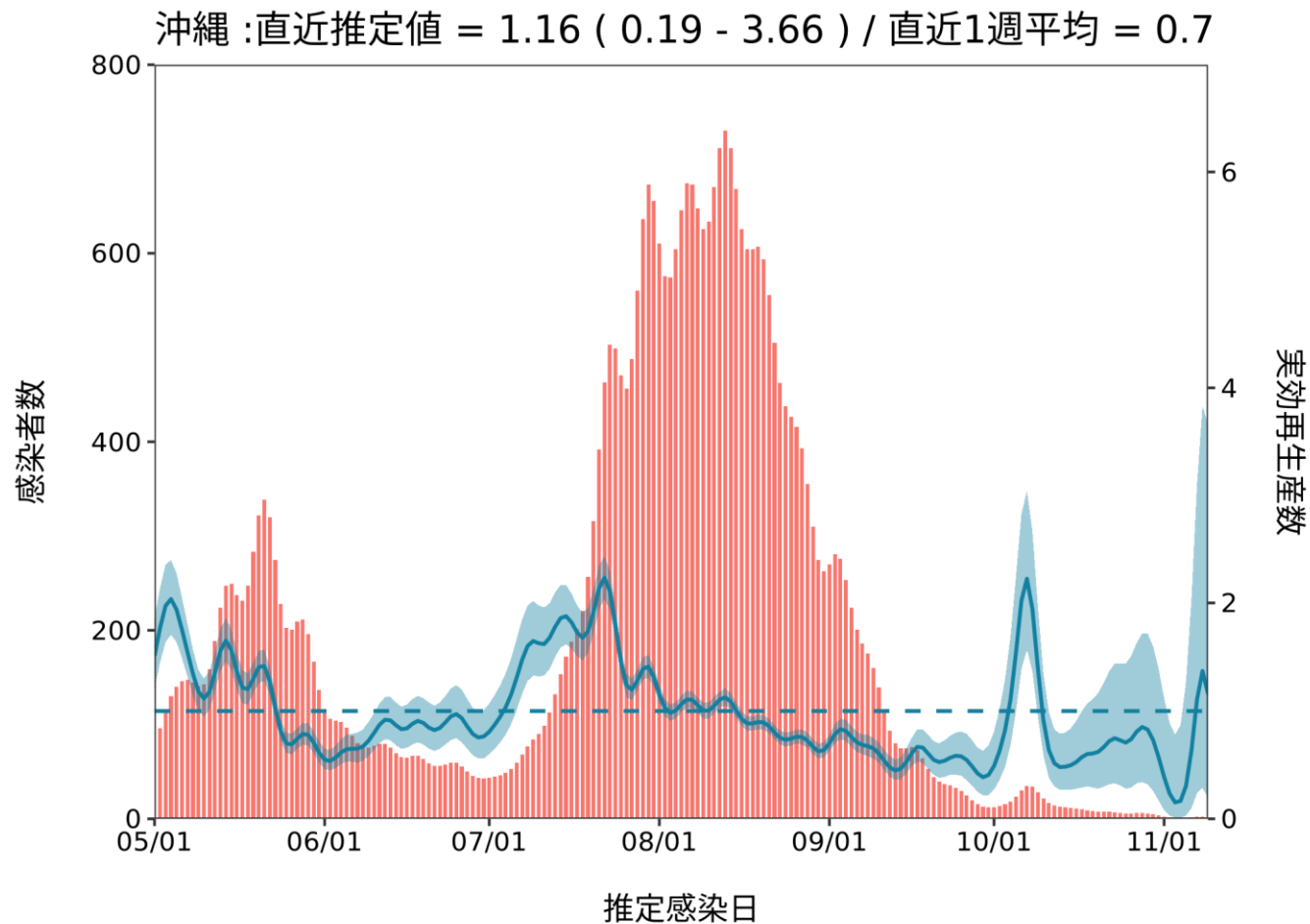
最新推定感染日付 11月9日

鹿児島 : 直近推定値 = 0 ( 0 - 25 ) / 直近1週平均 = 0

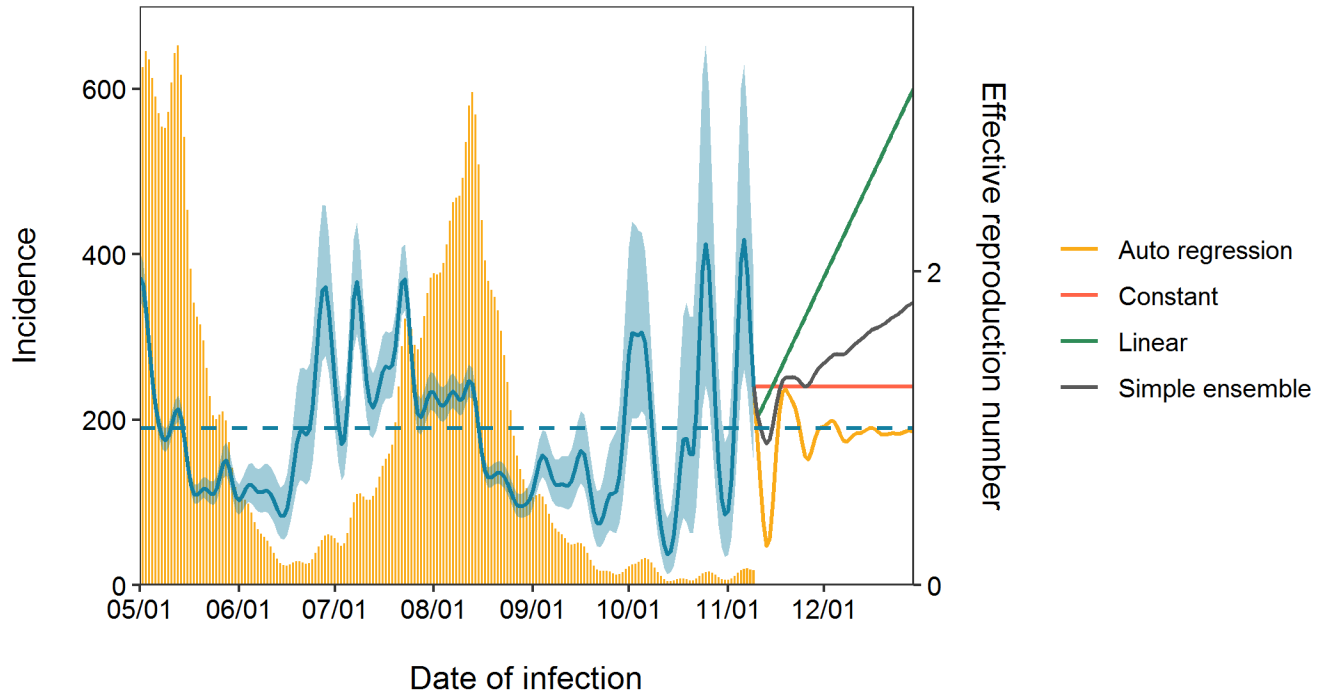


推定日 11月24日

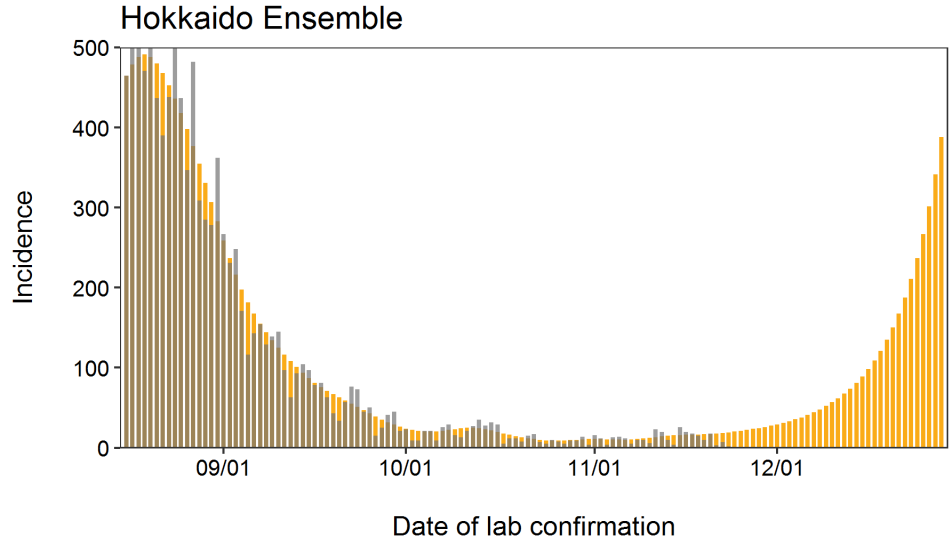
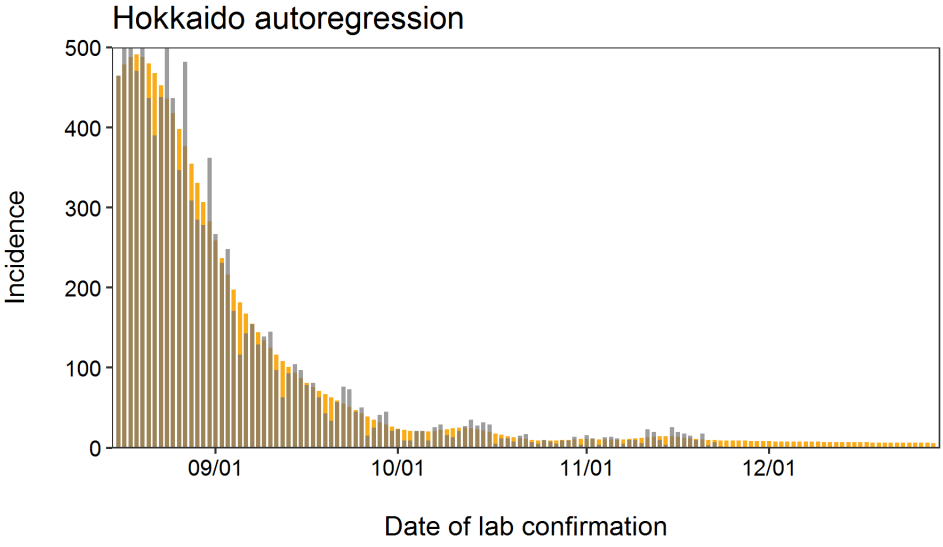
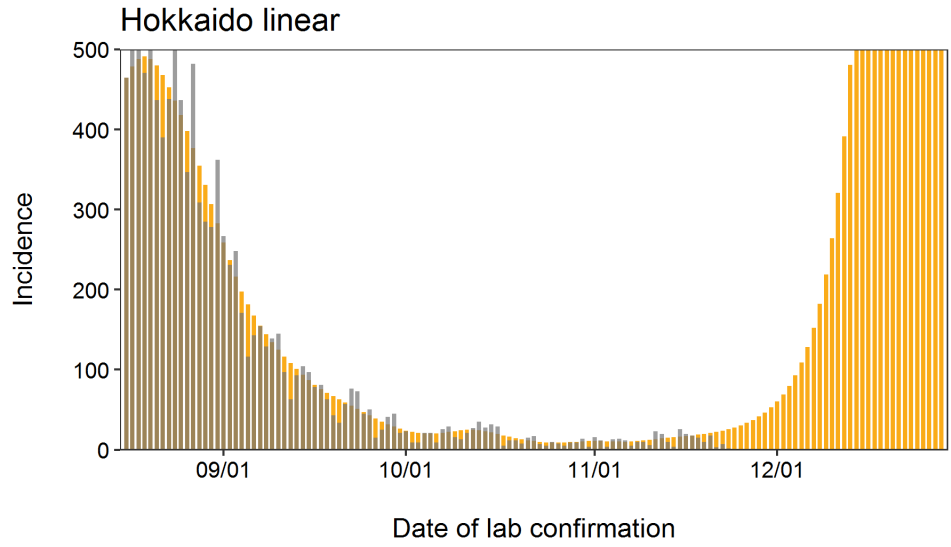
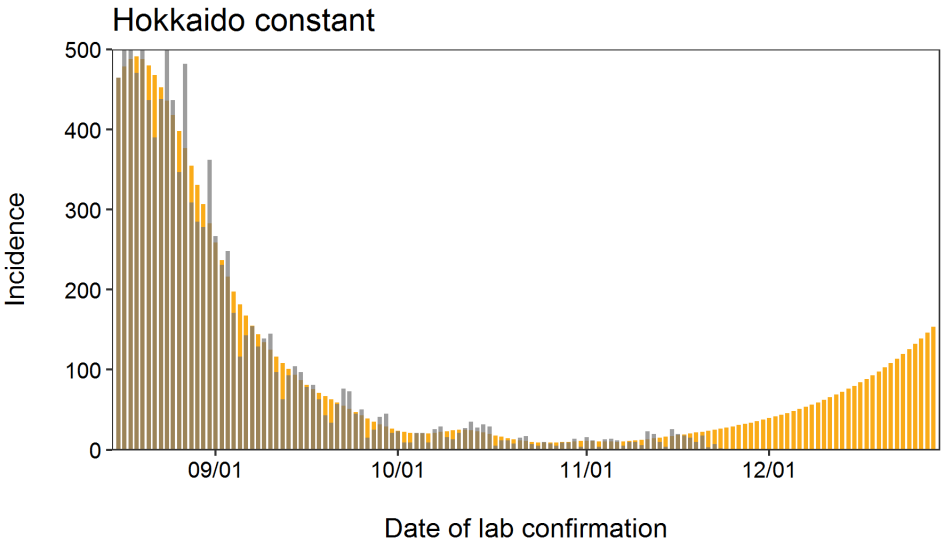
最新推定感染日付 11月9日

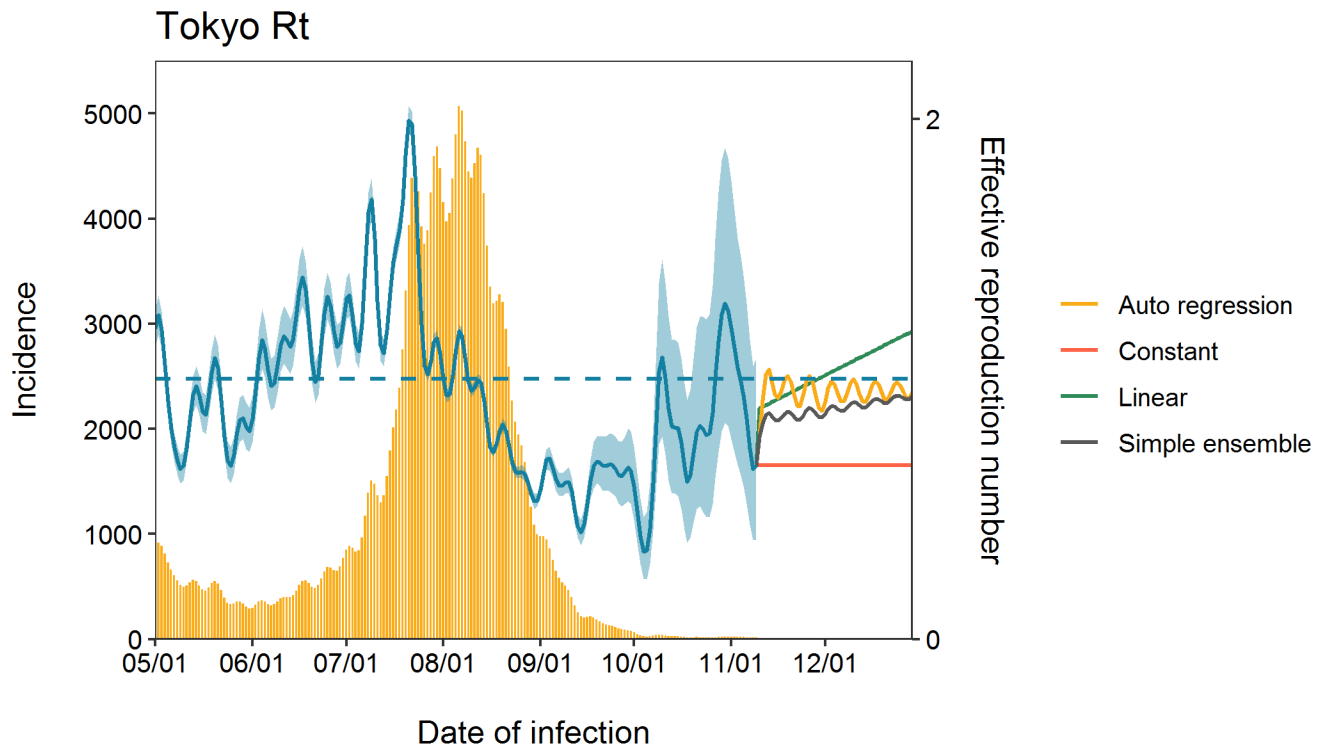


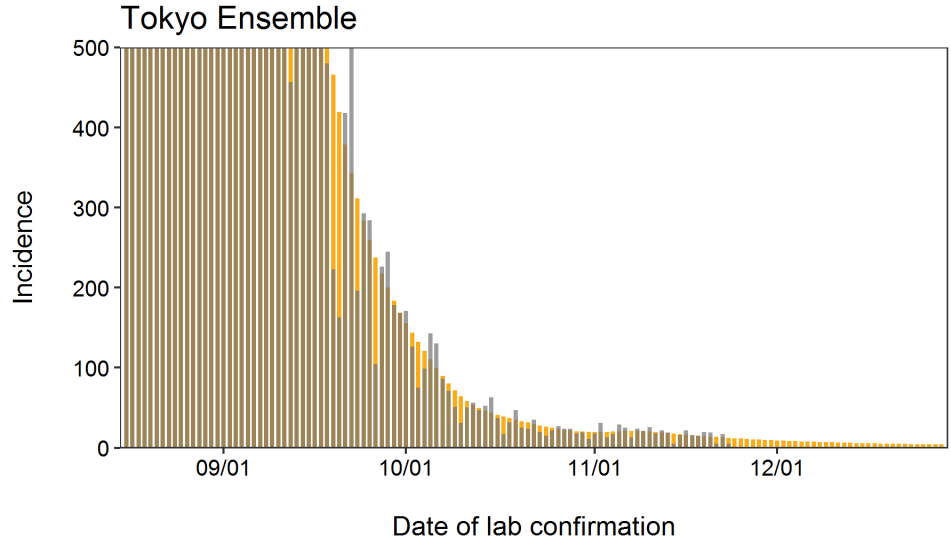
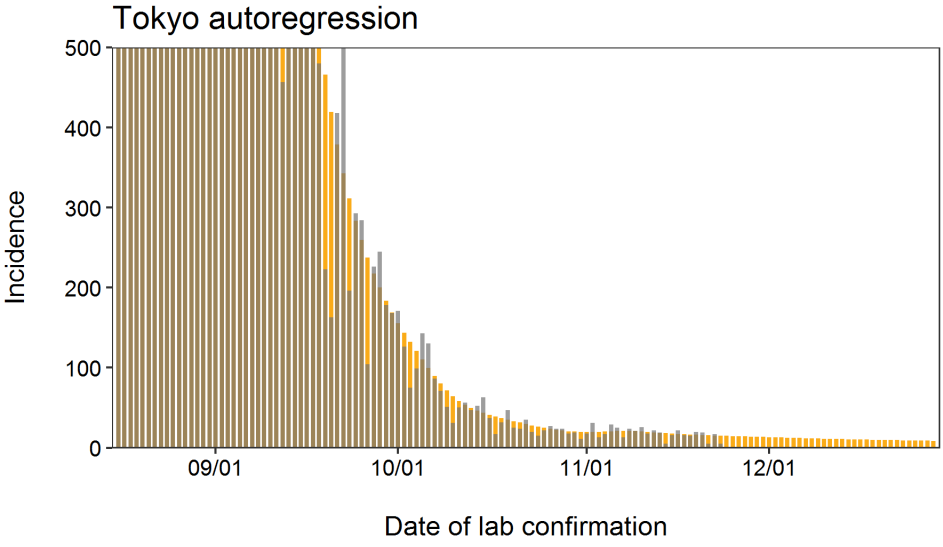
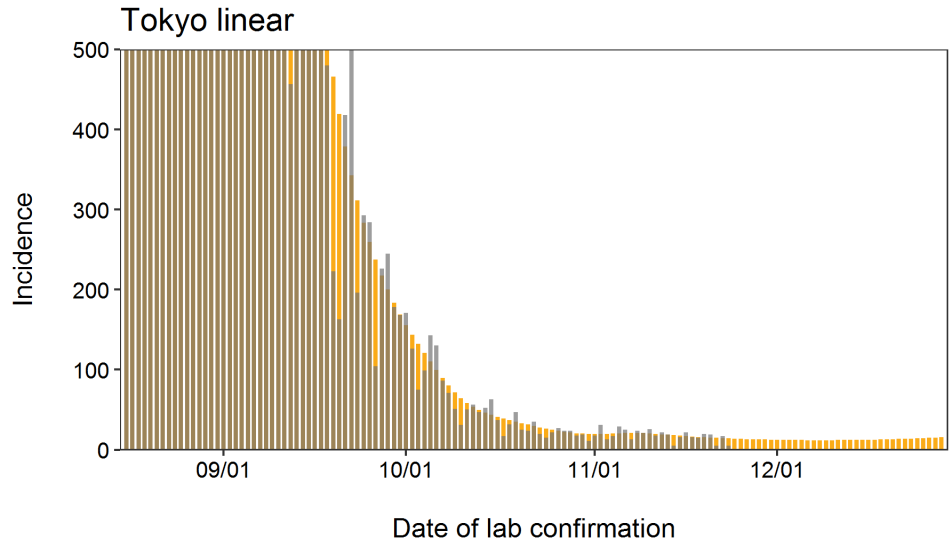
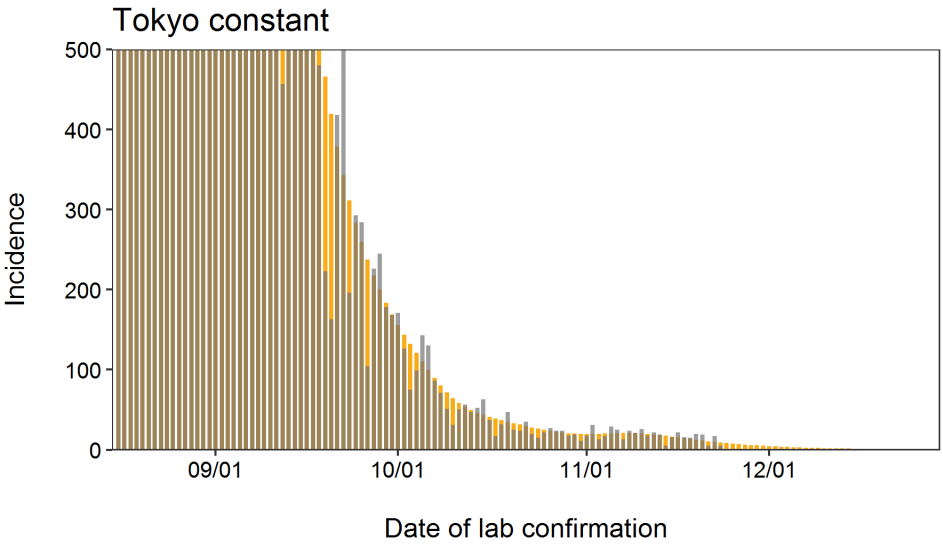
### Hokkaido Rt

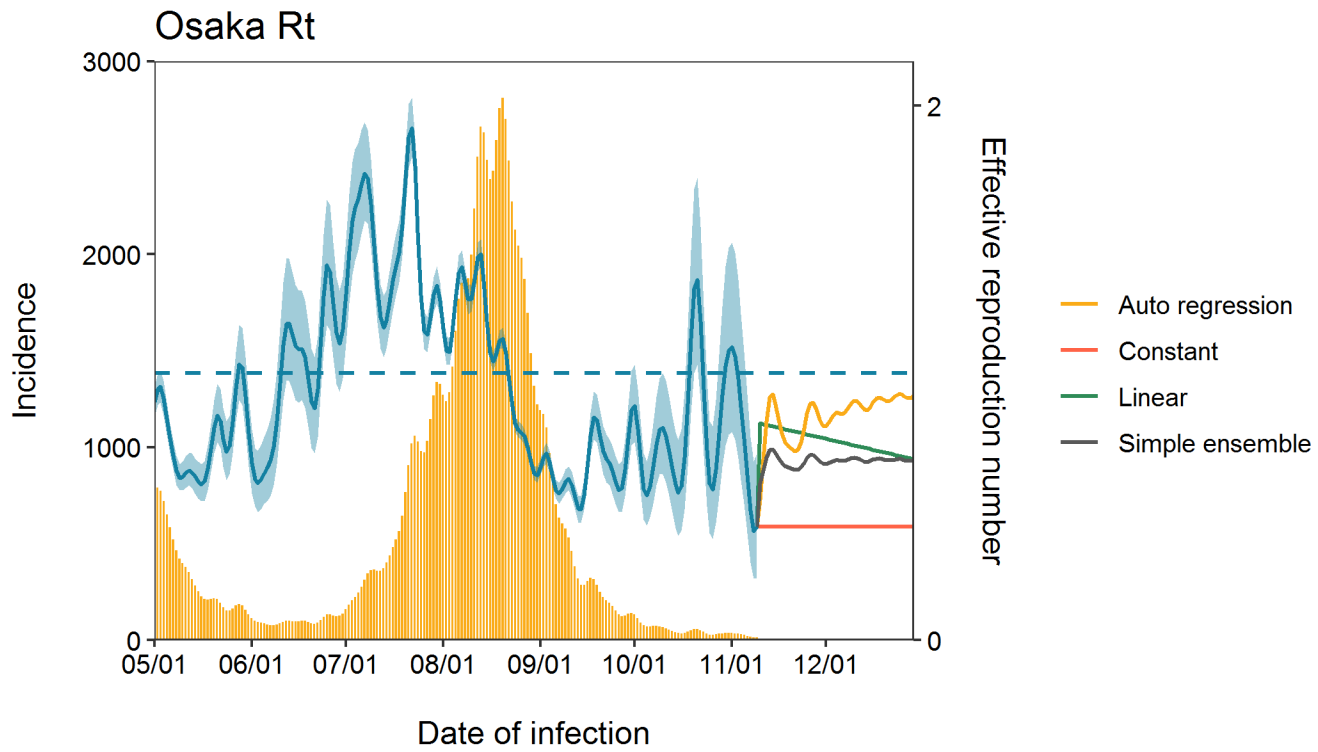


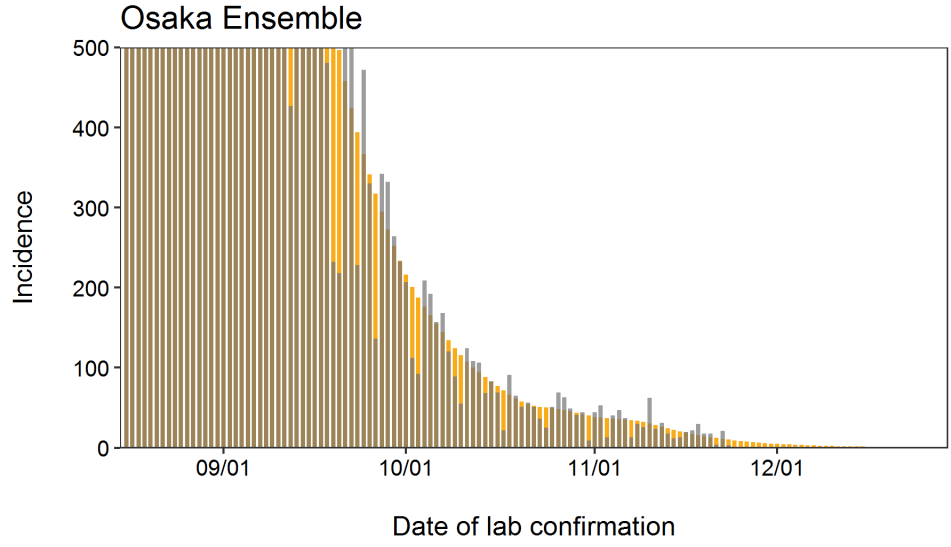
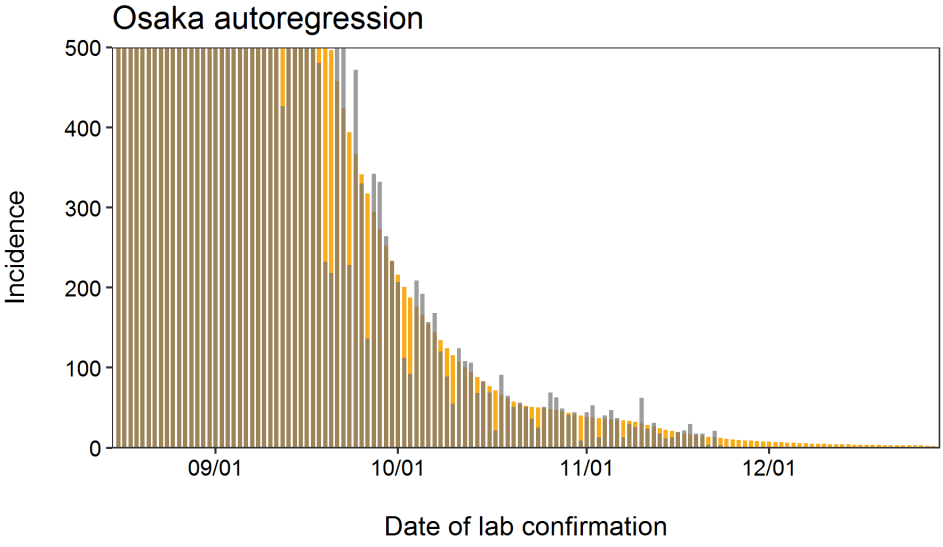
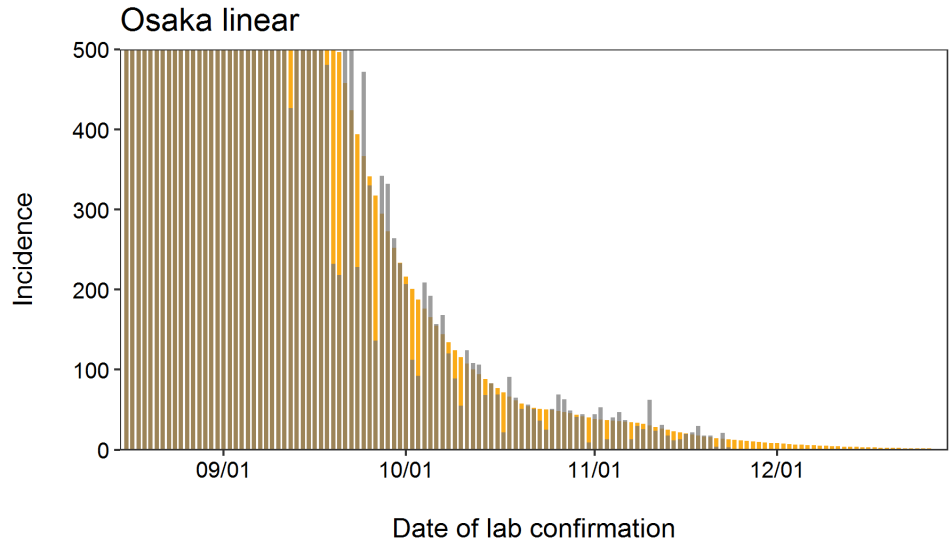
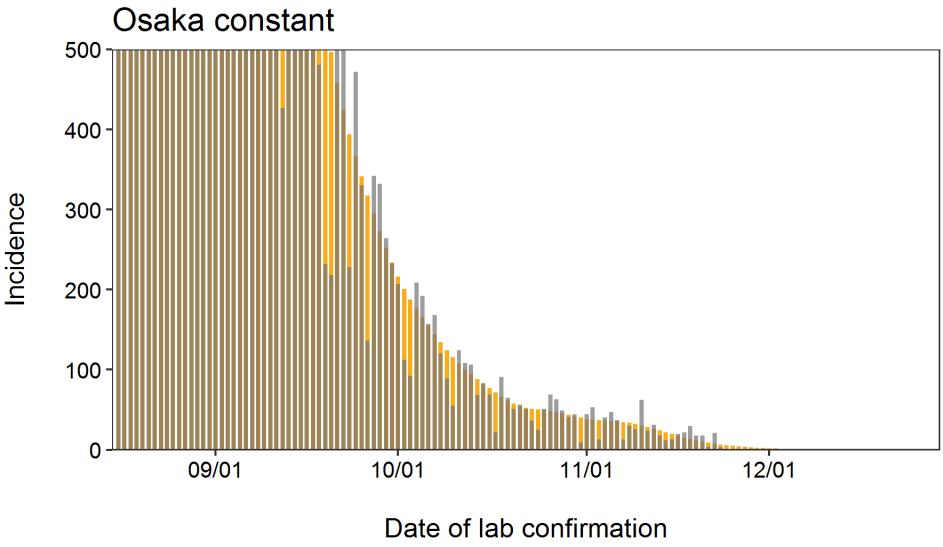






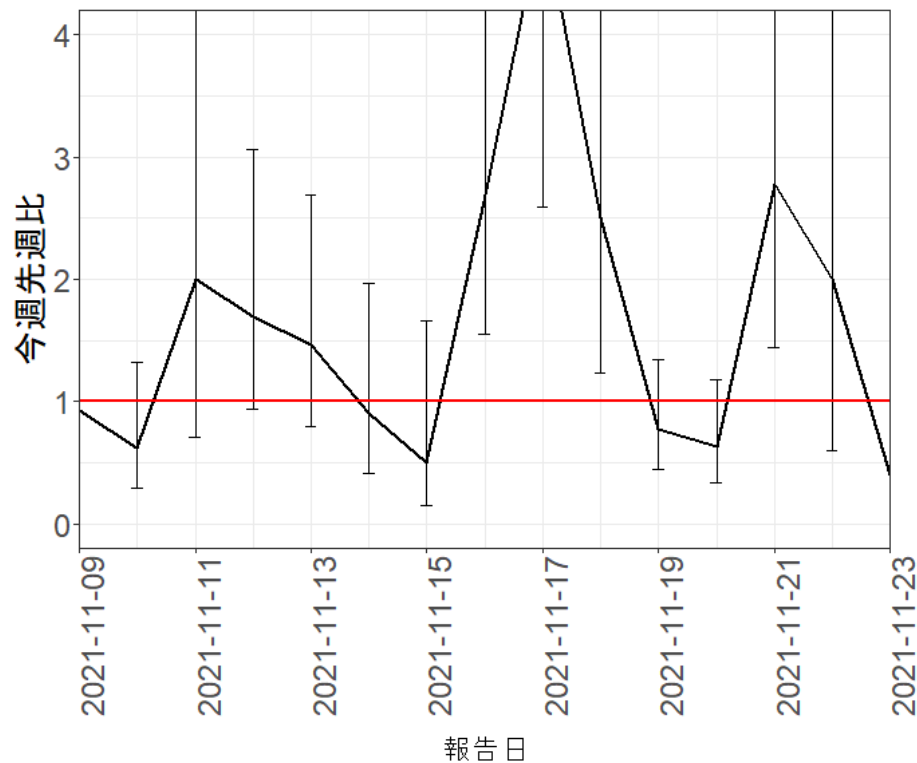






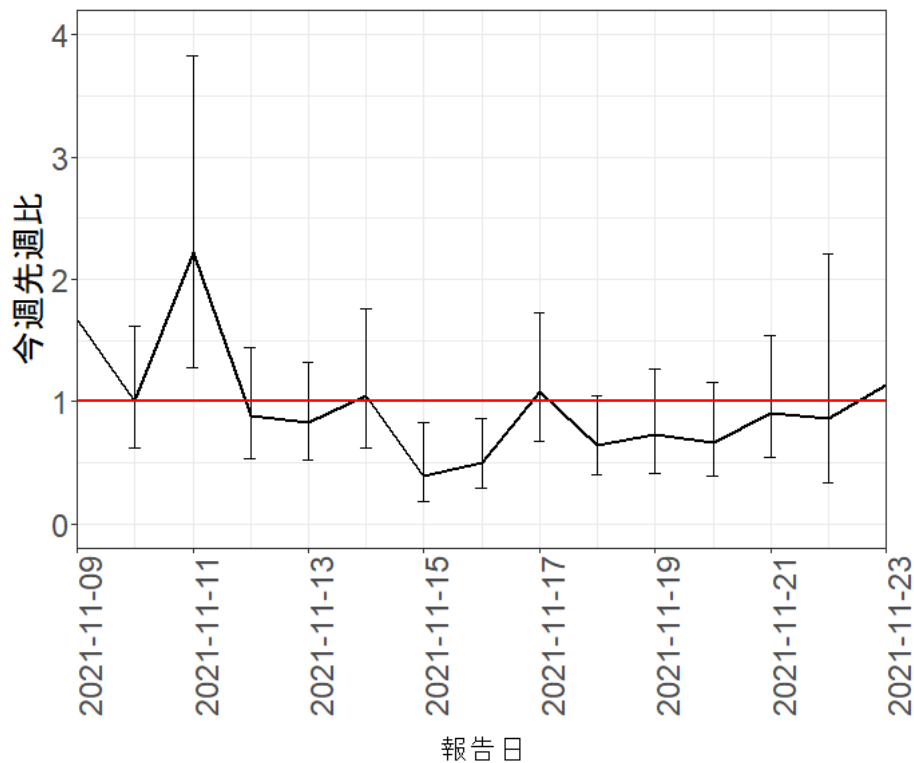
# 報告日別感染者数の同曜日の今週先週比

## 北海道

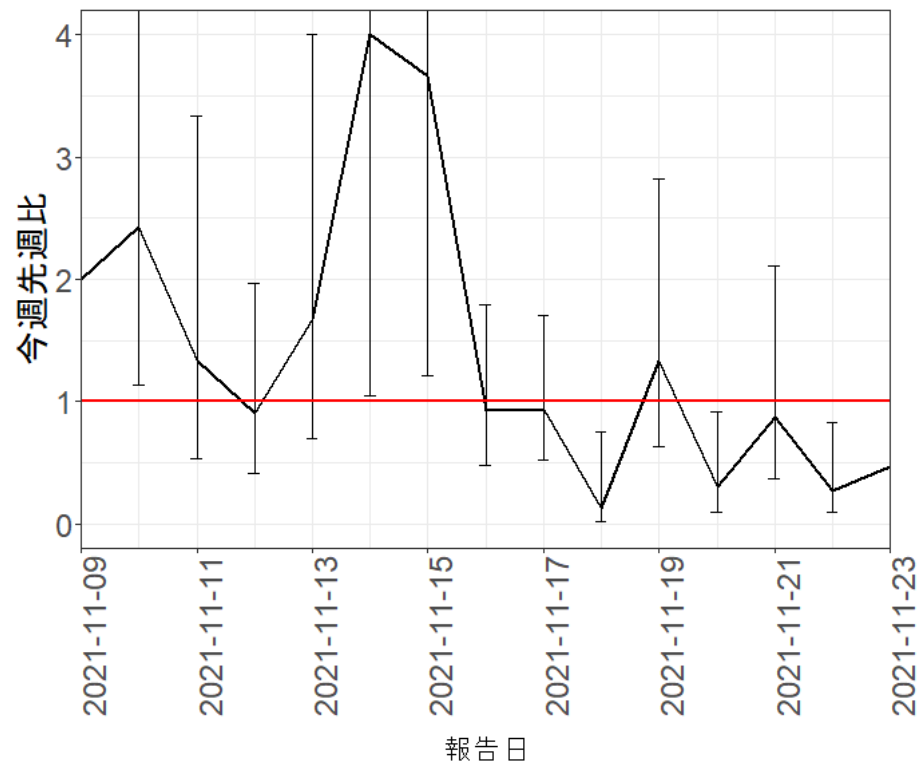


# 報告日別感染者数の同曜日の今週先週比

## 東京都



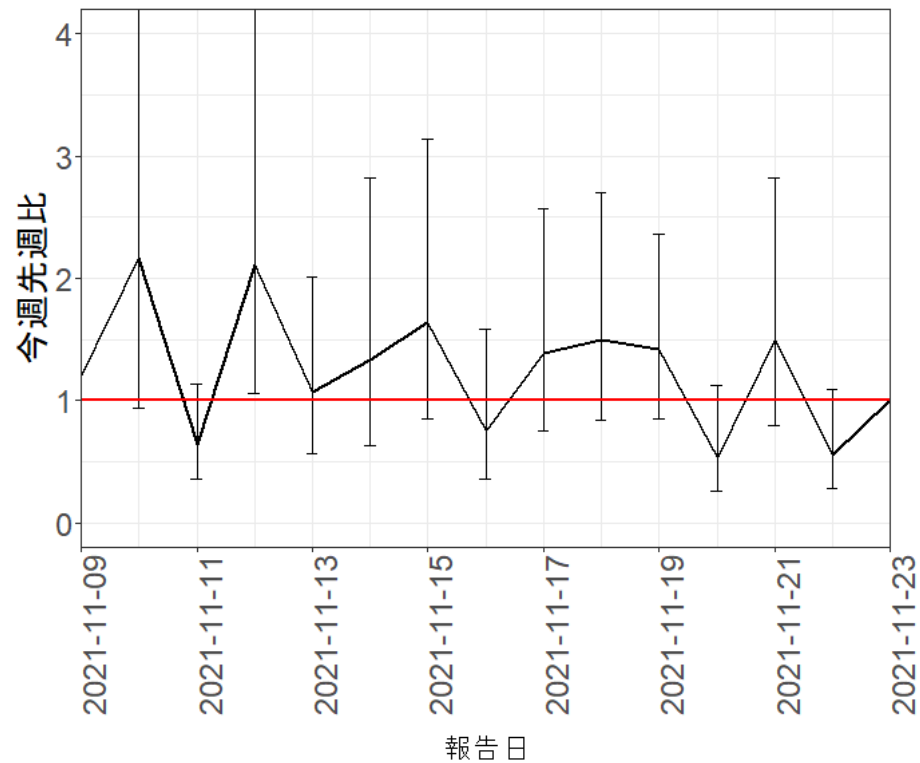
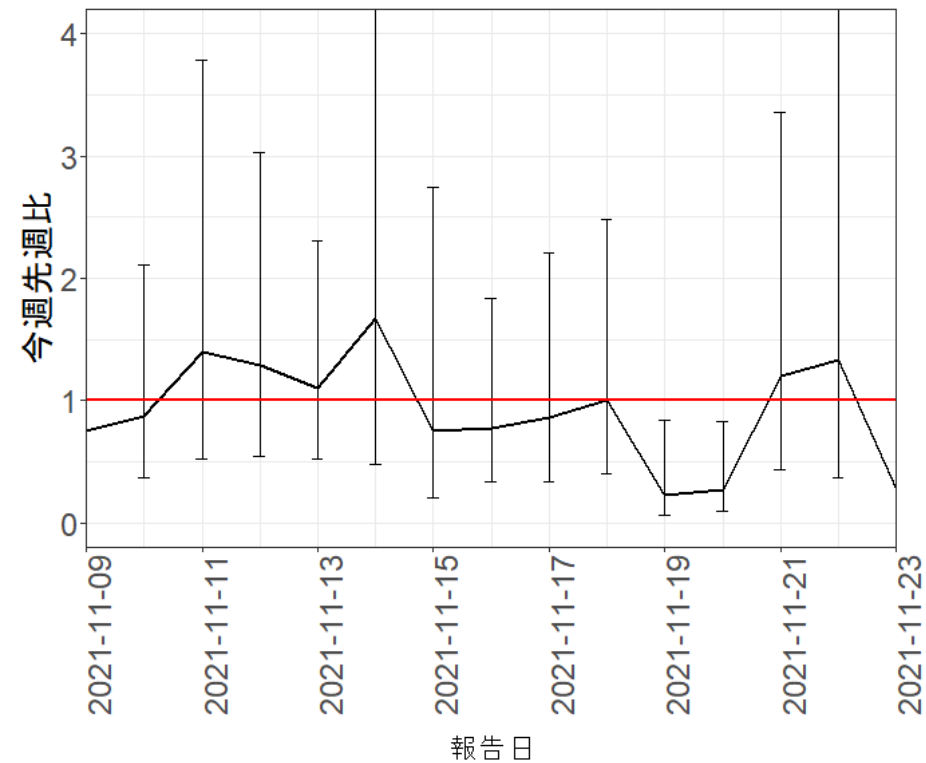
## 埼玉県



# 報告日別感染者数の同曜日の今週先週比

## 千葉県

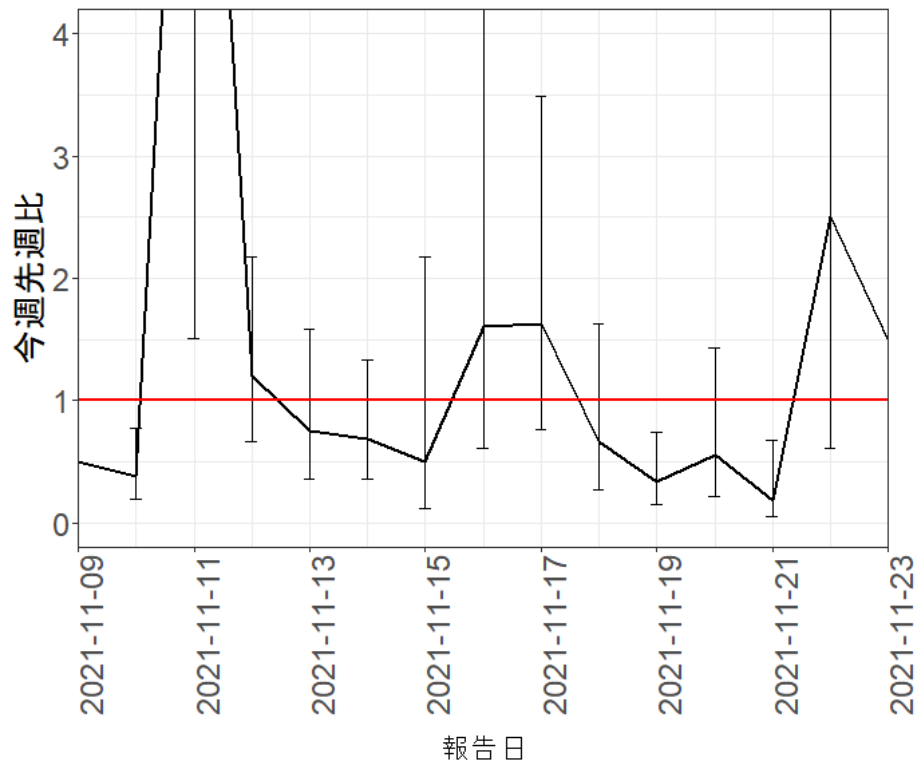
## 神奈川県



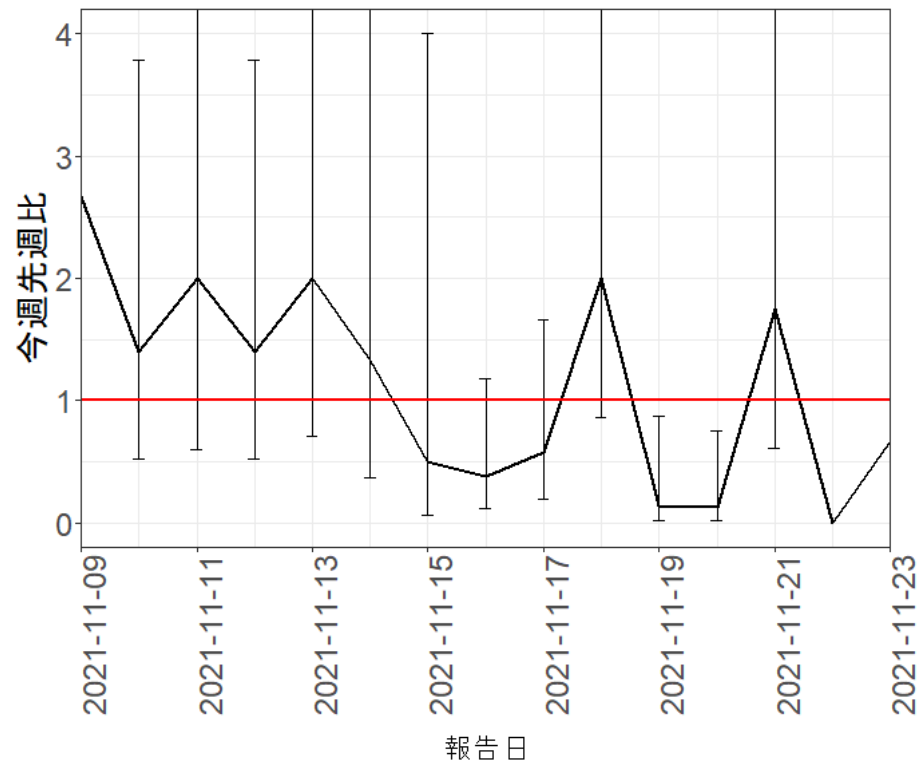


# 報告日別感染者数の同曜日の今週先週比

## 愛知県

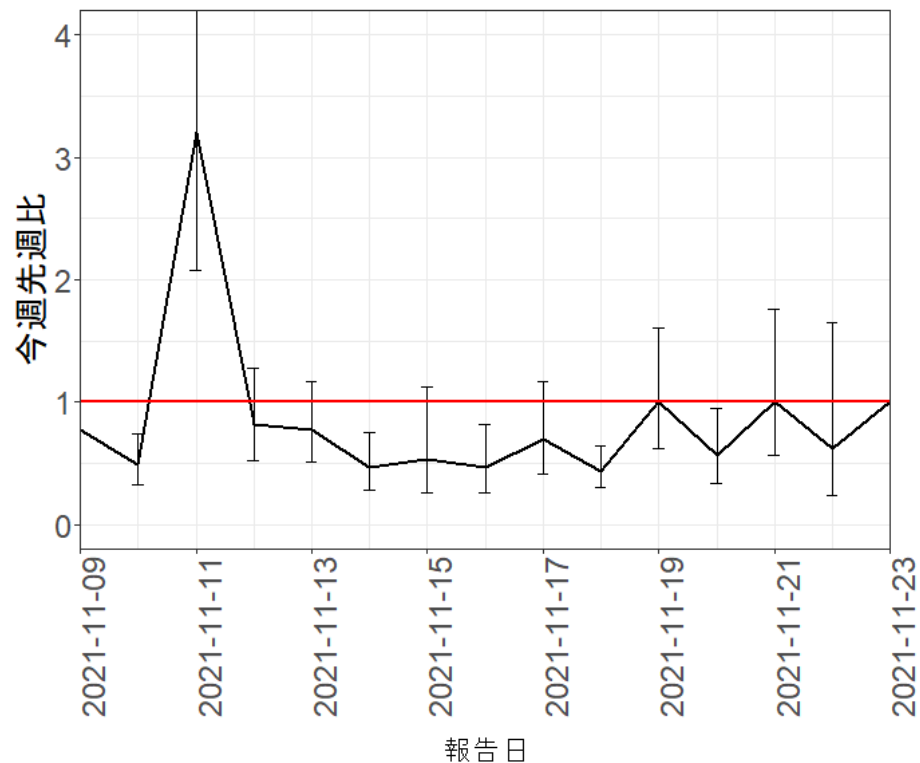


## 京都府

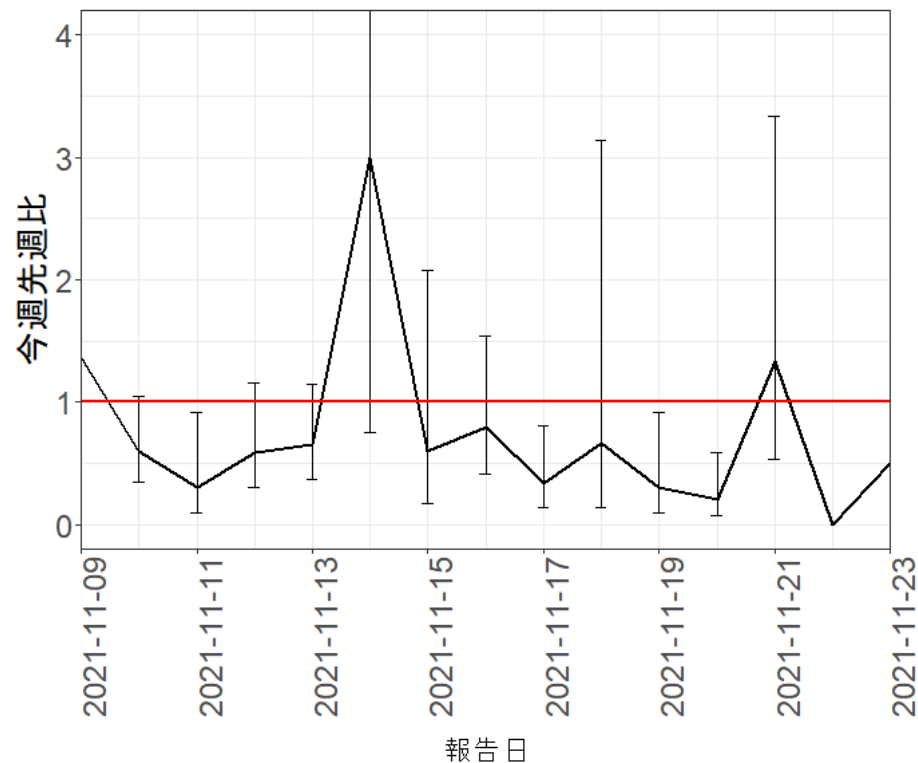


# 報告日別感染者数の同曜日の今週先週比

## 大阪府

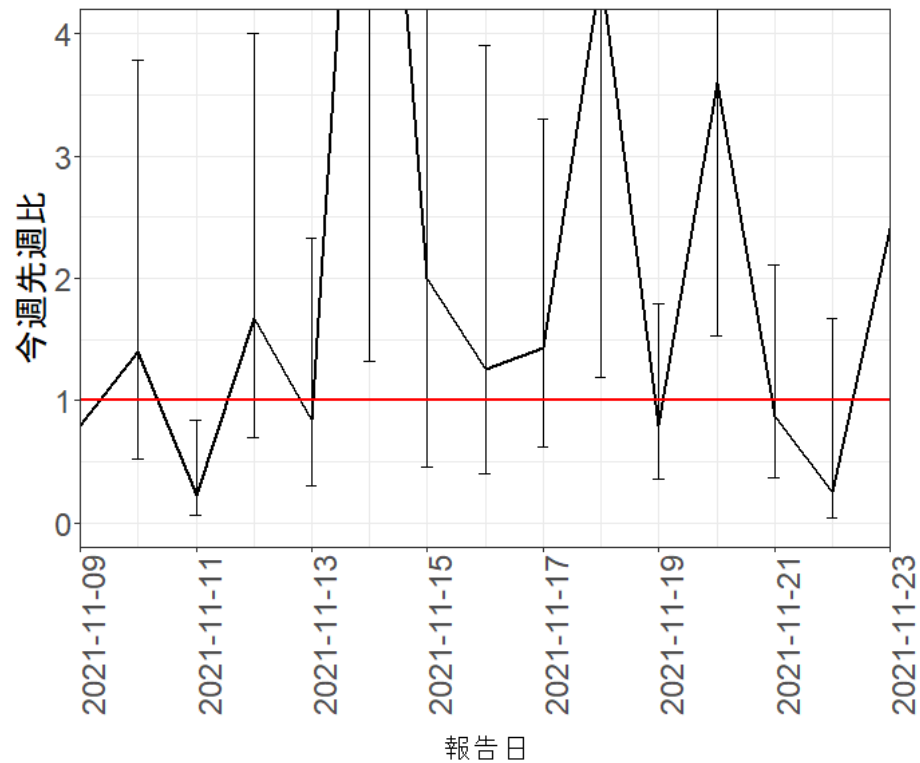


## 兵庫県

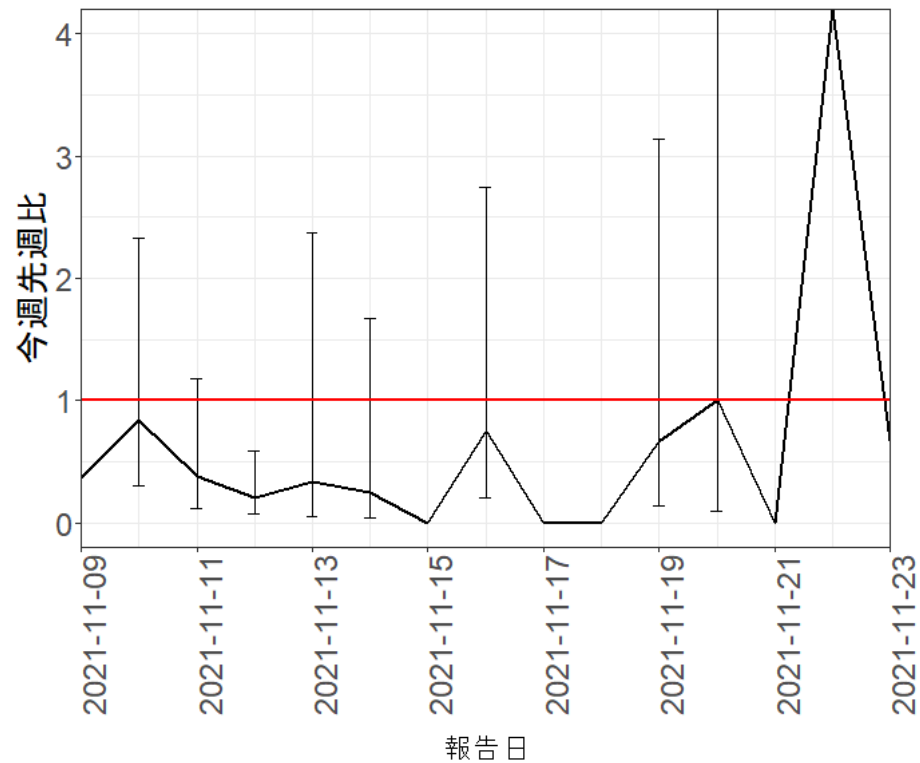


# 報告日別感染者数の同曜日の今週先週比

## 福岡県

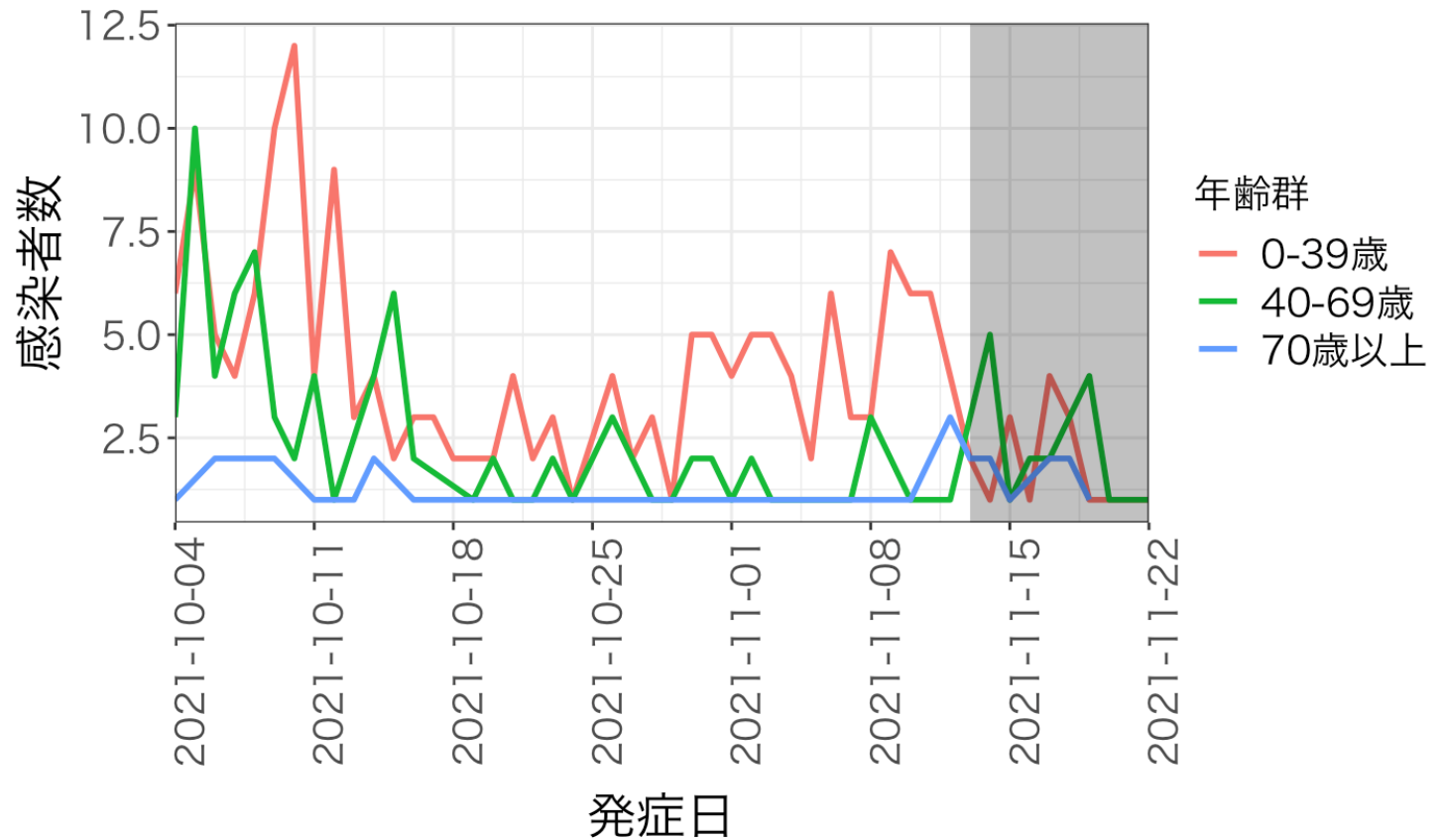


## 沖縄県



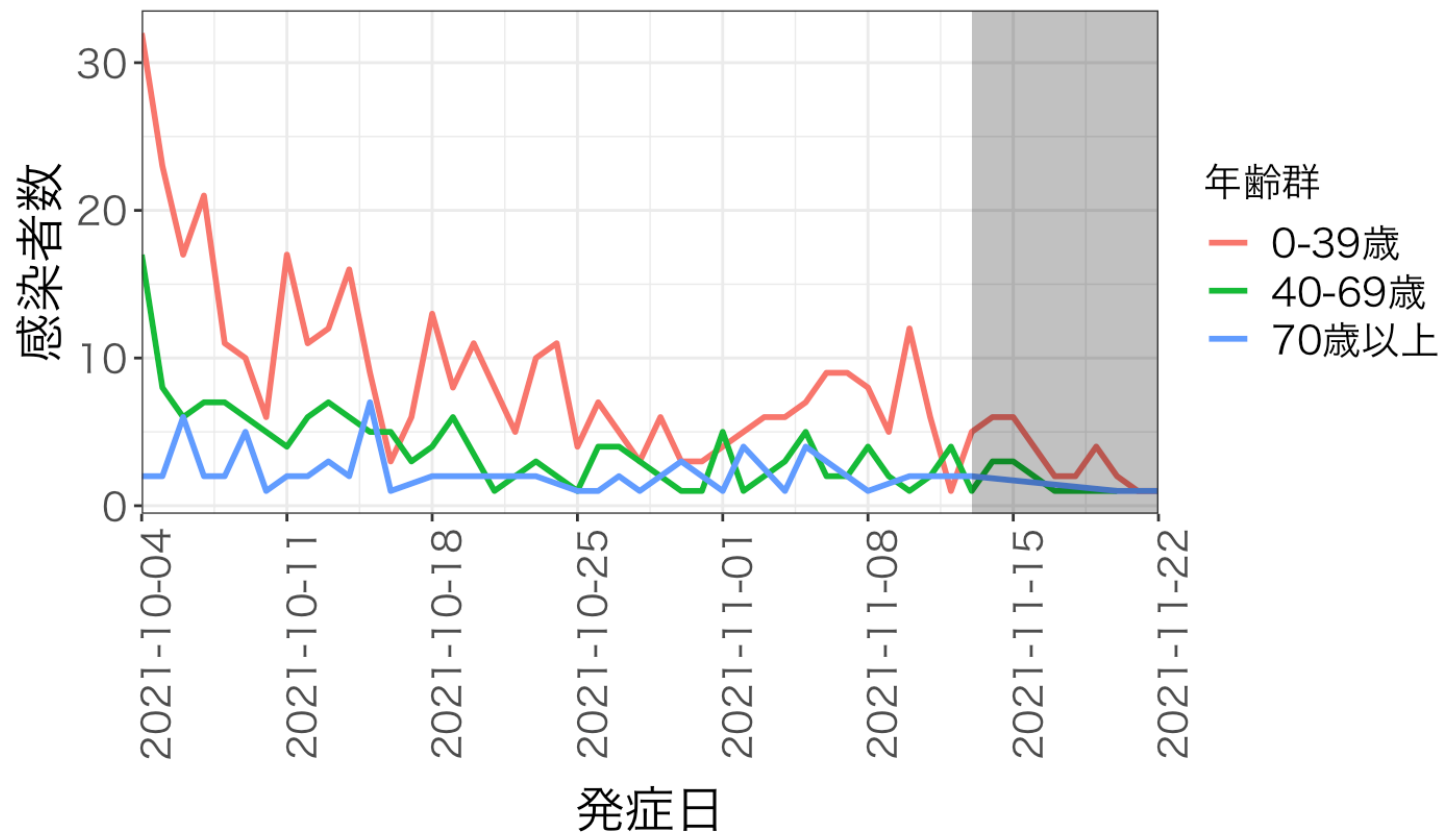
# 年齢群別発症日別感染者数

## 北海道



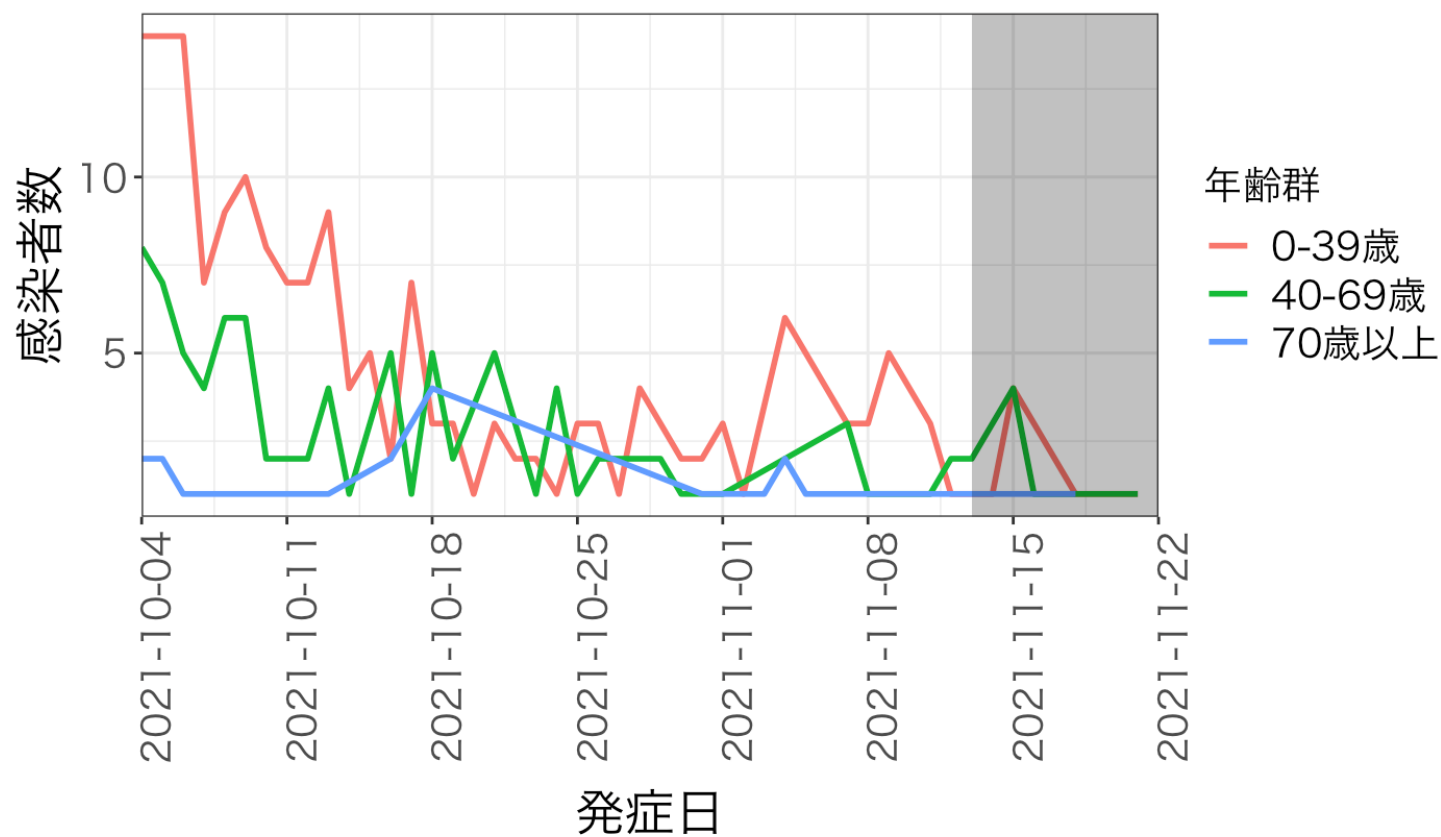
# 年齢群別発症日別感染者数

## 東京都



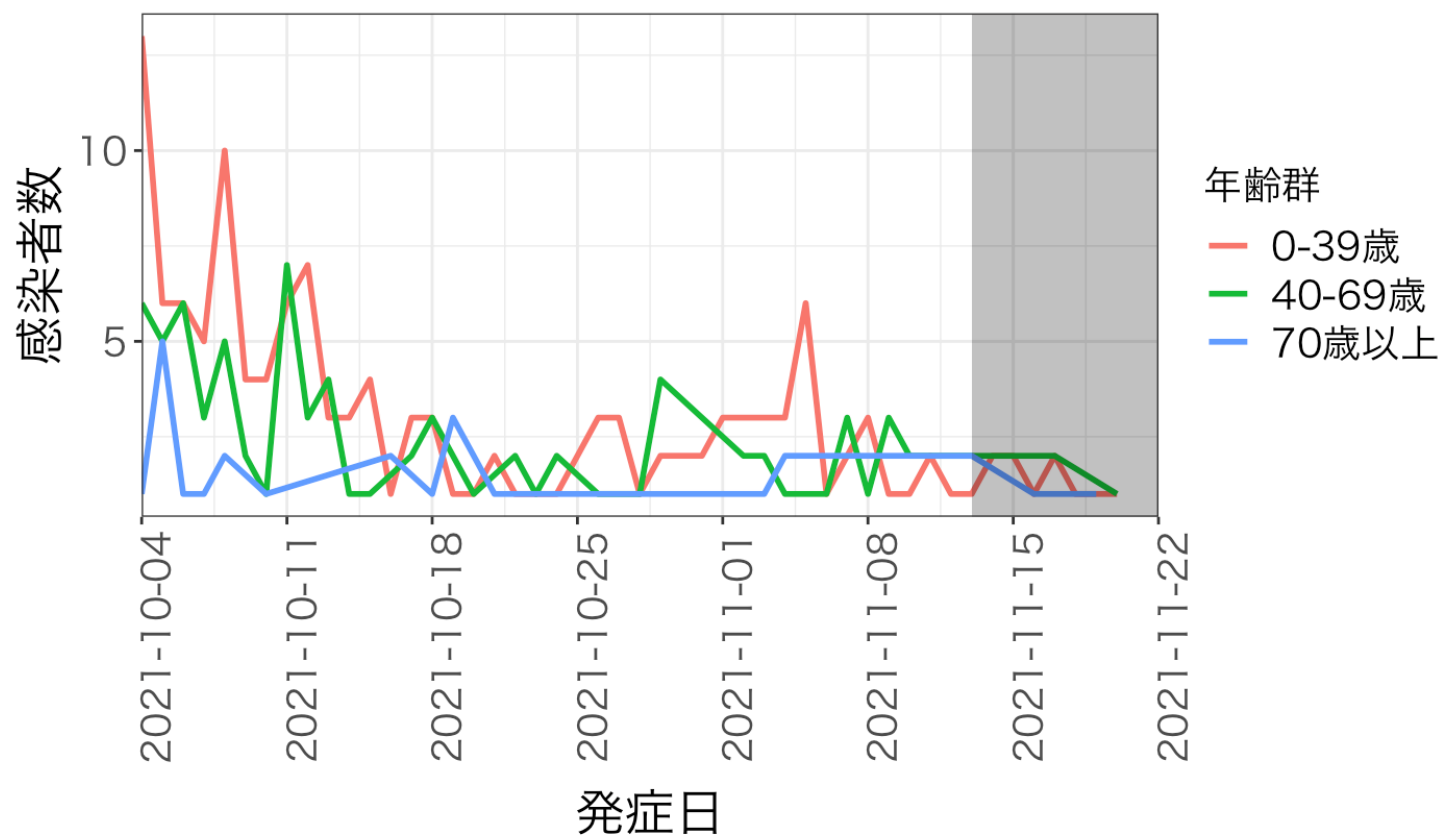
# 年齢群別発症日別感染者数

## 埼玉県



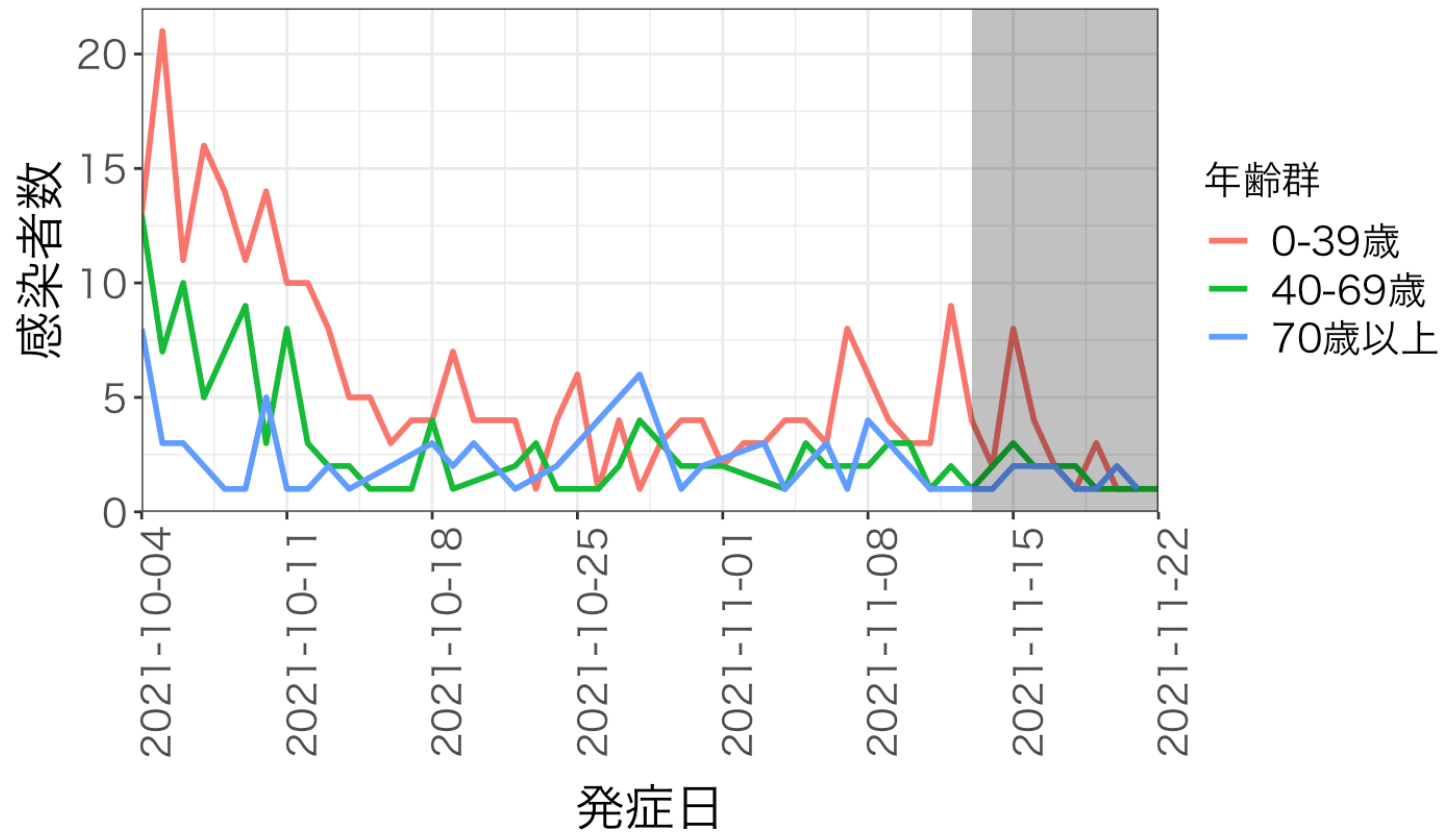
# 年齢群別発症日別感染者数

## 千葉県



# 年齢群別発症日別感染者数

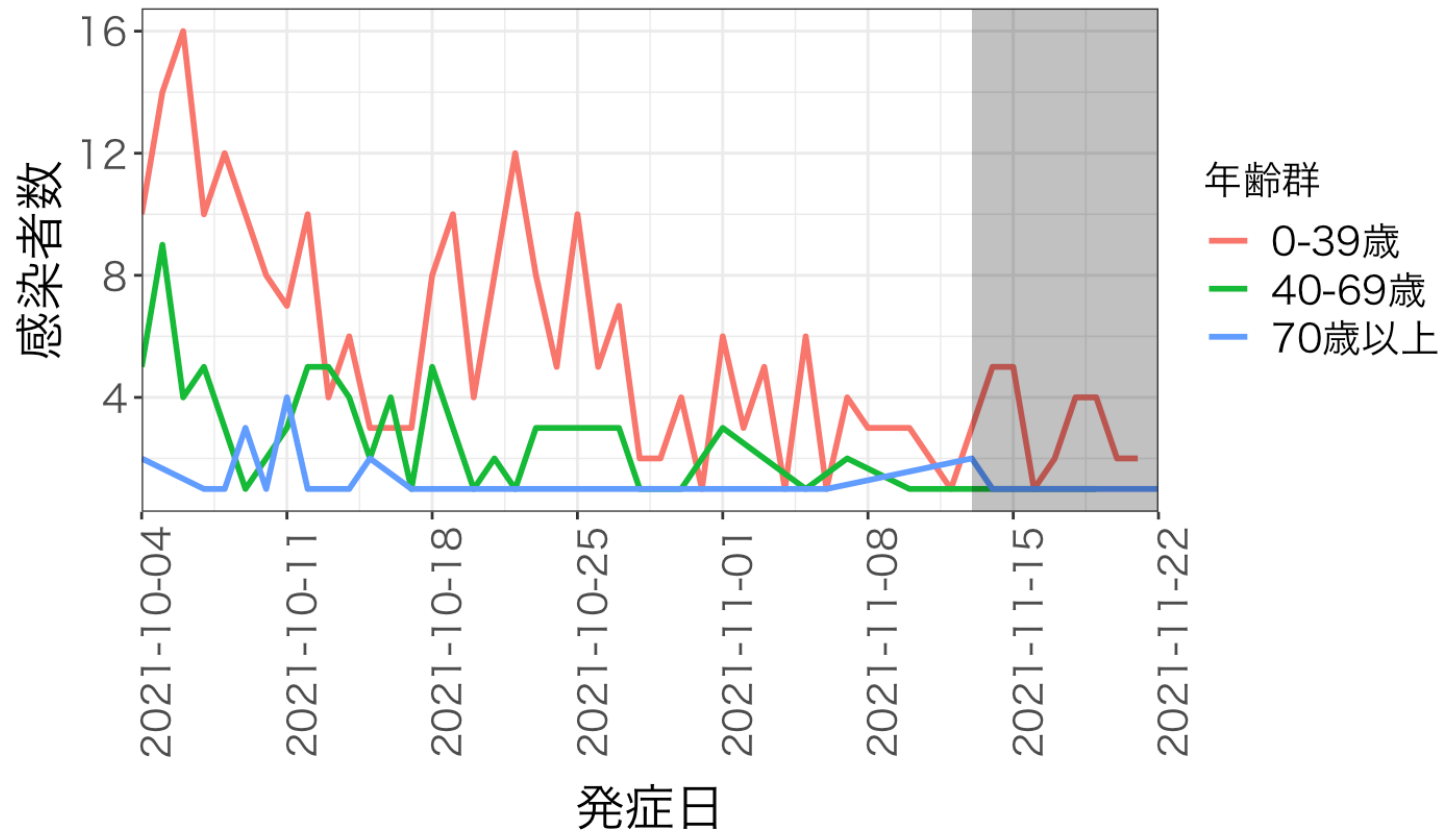
## 神奈川県





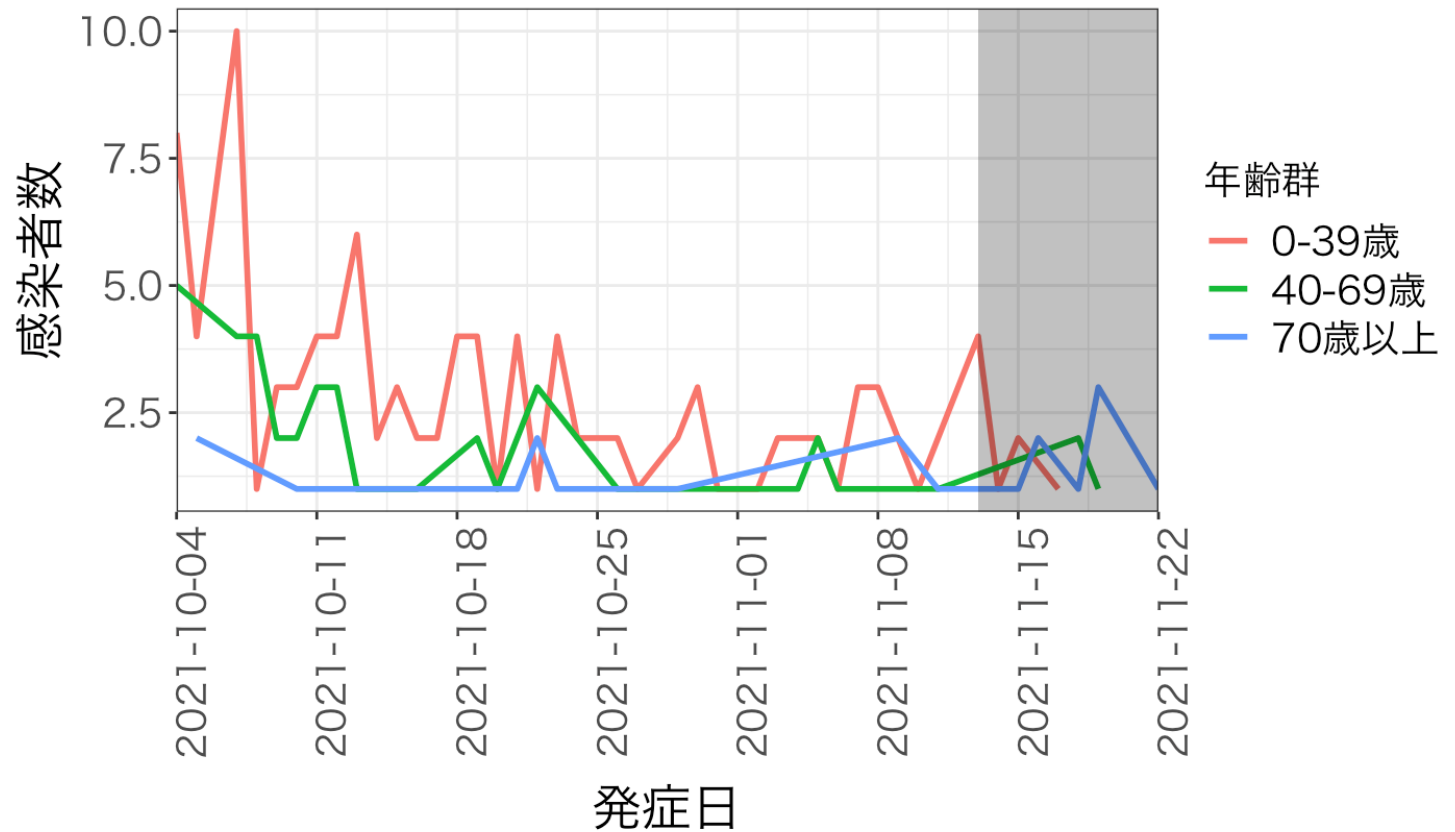
# 年齢群別発症日別感染者数

## 愛知県



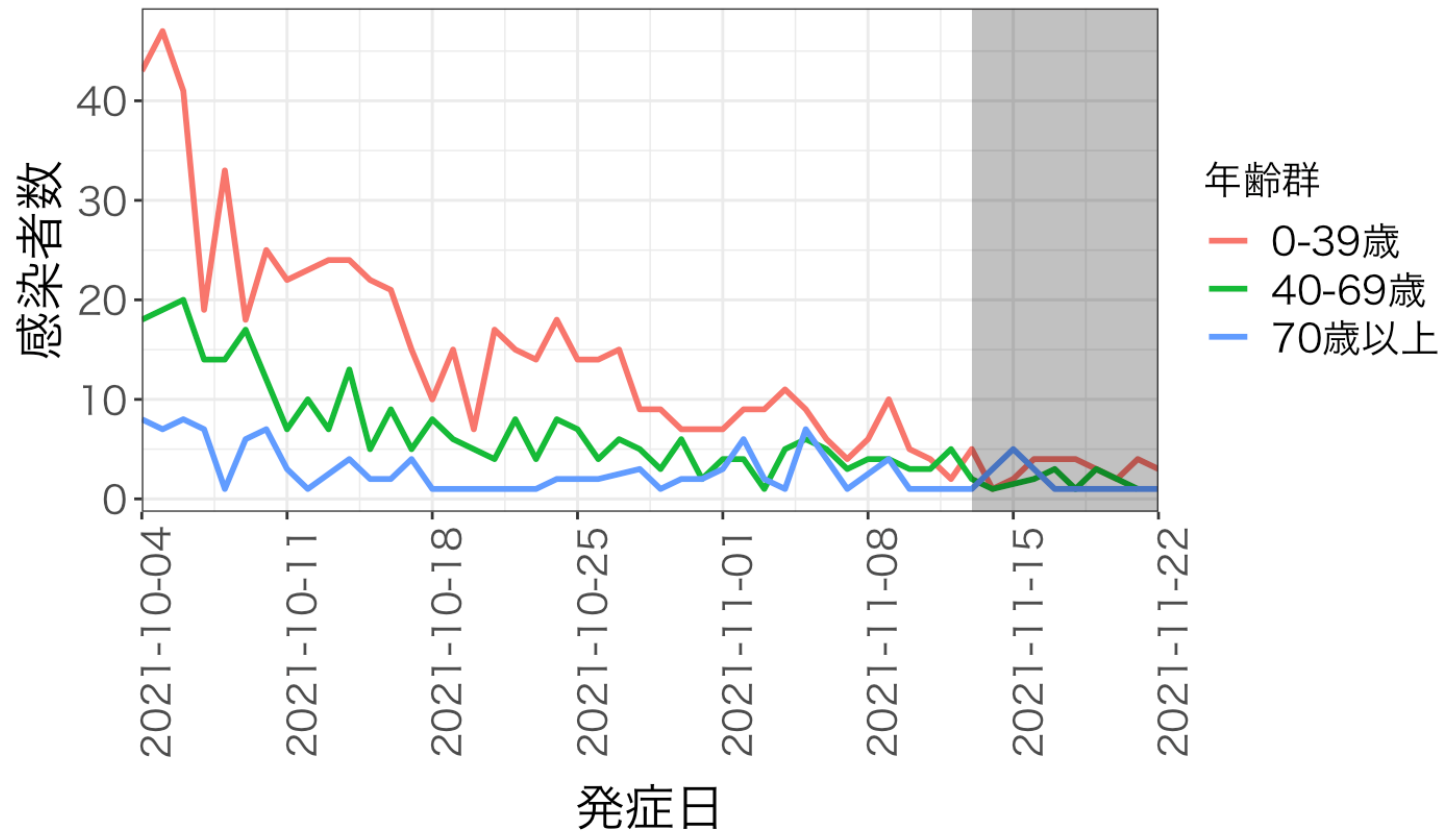
# 年齢群別発症日別感染者数

## 京都府



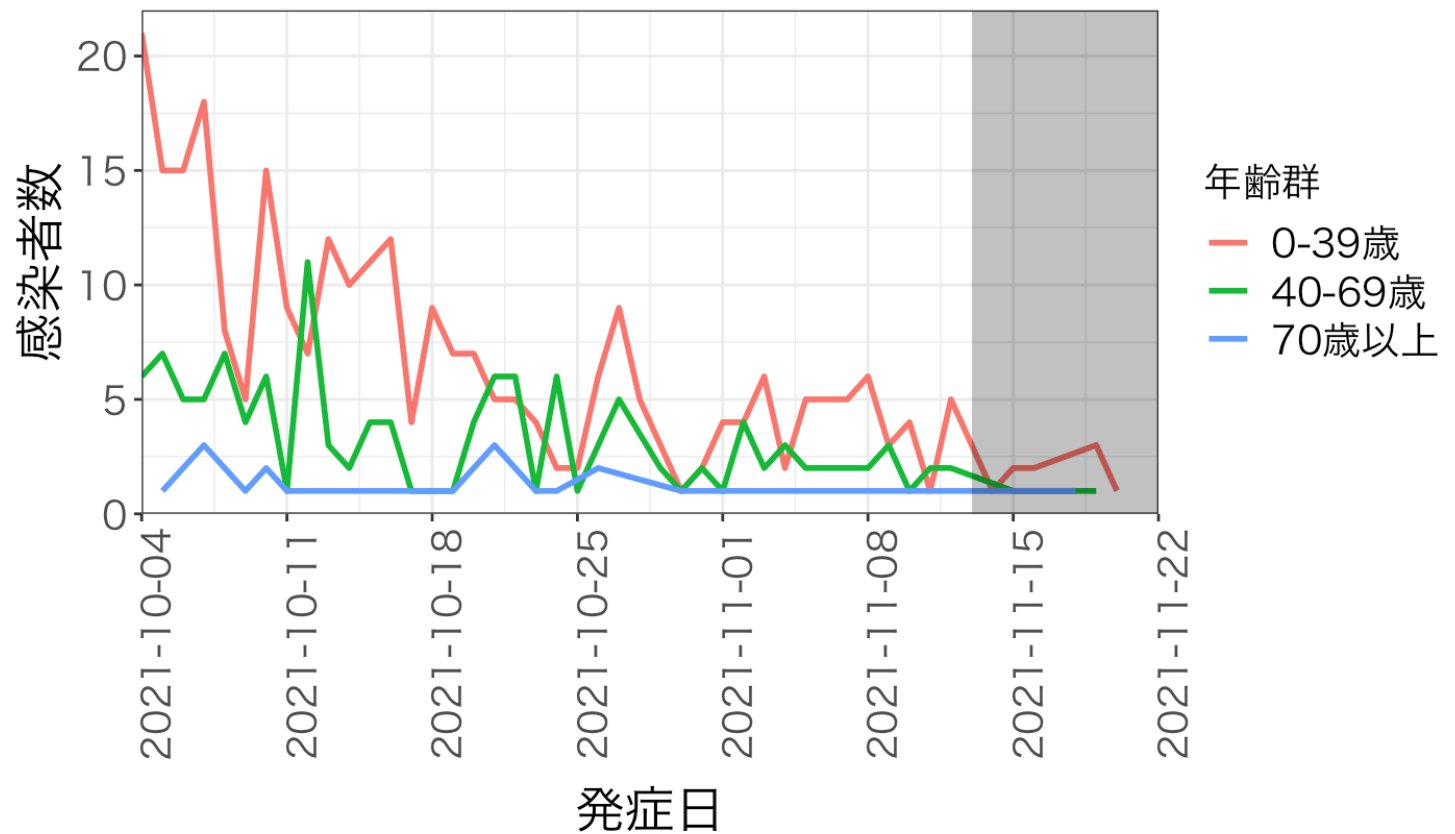
# 年齢群別発症日別感染者数

## 大阪府



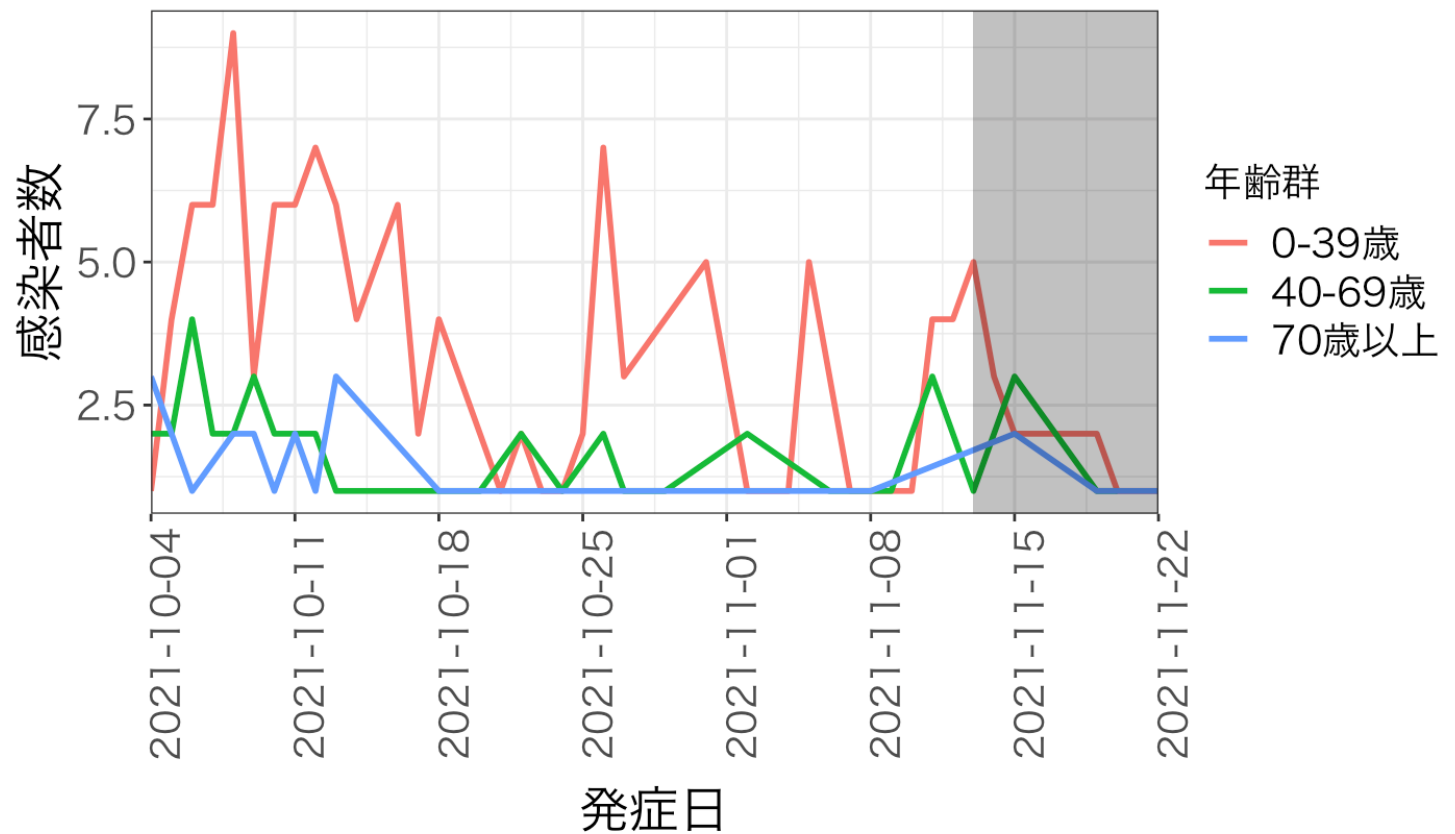
# 年齢群別発症日別感染者数

## 兵庫県



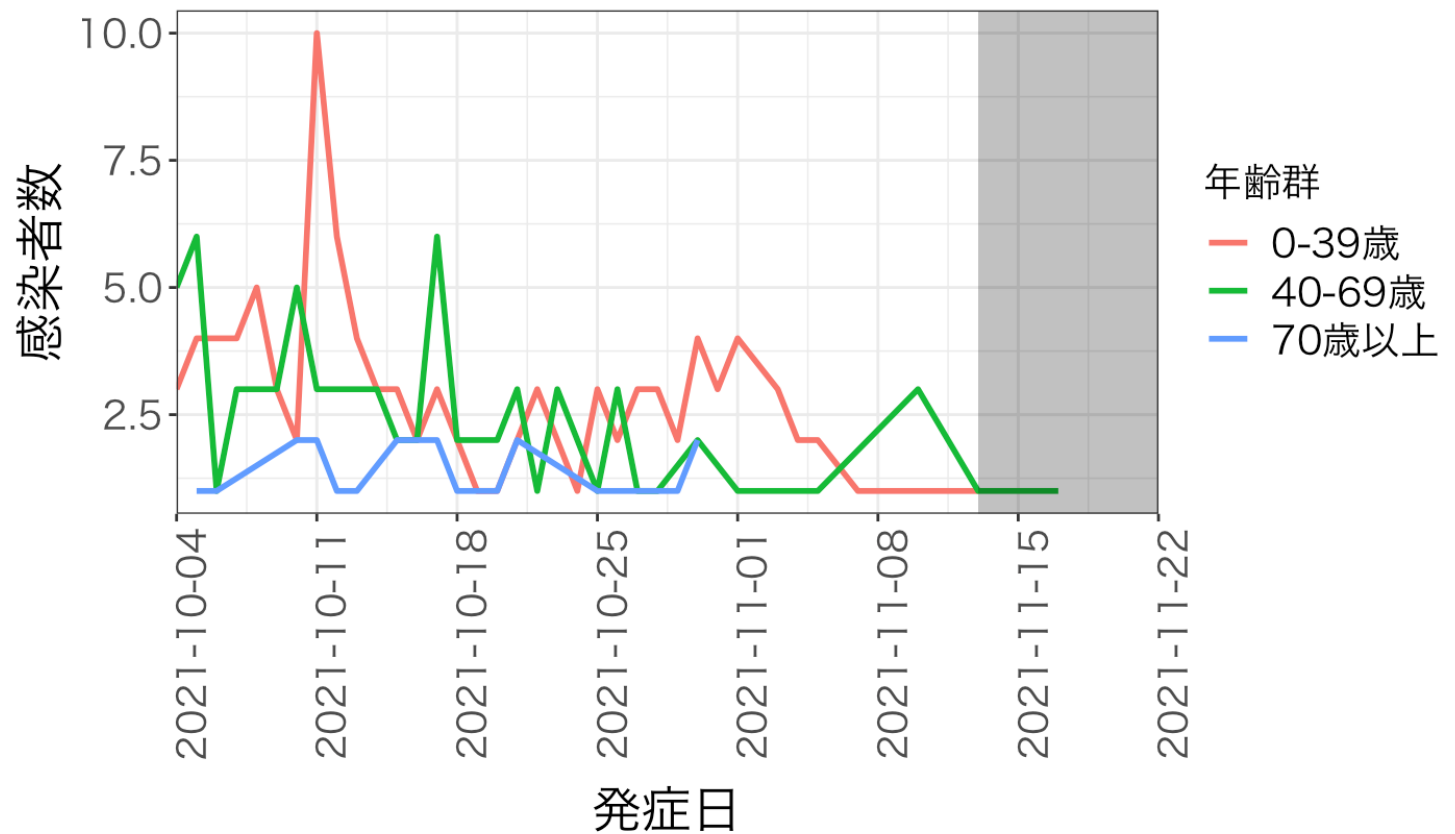
# 年齢群別発症日別感染者数

## 福岡県



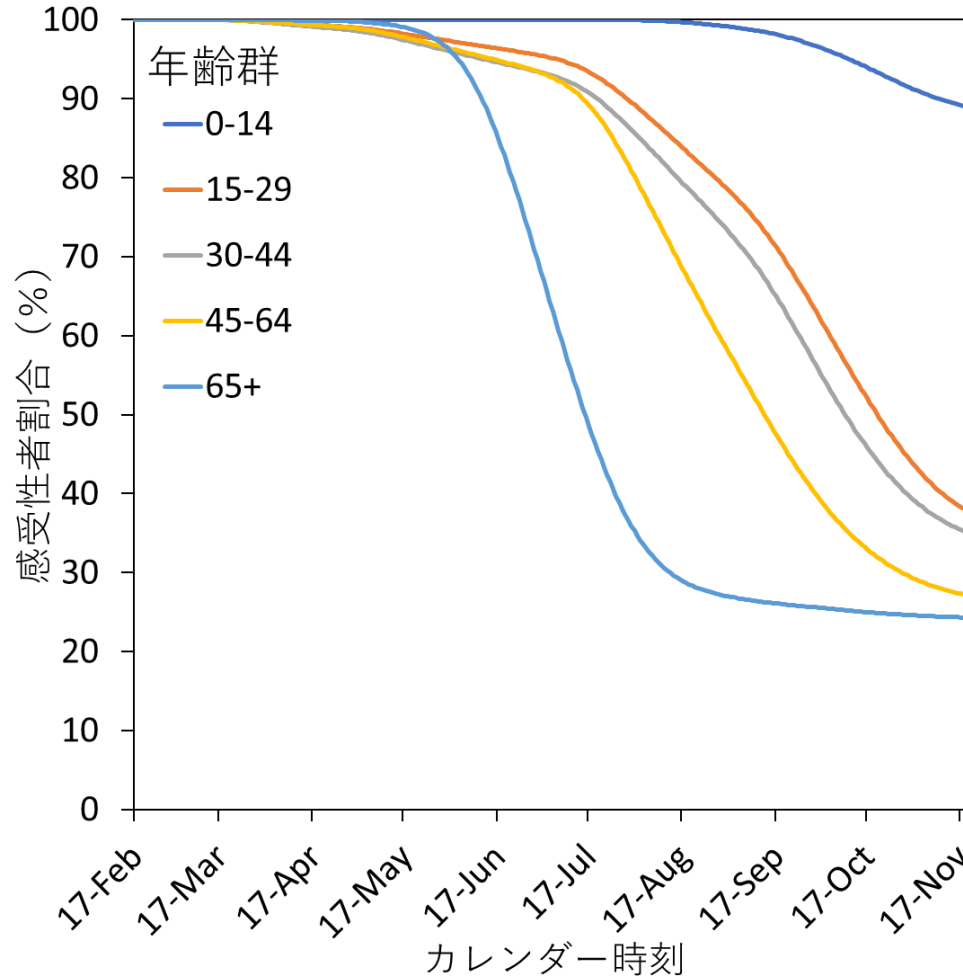
# 年齢群別発症日別感染者数

## 沖縄県

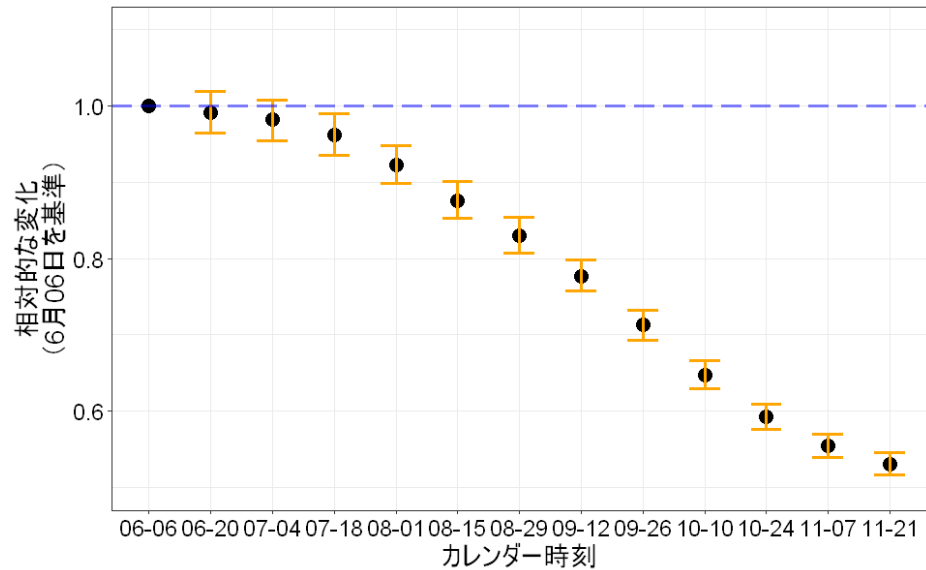
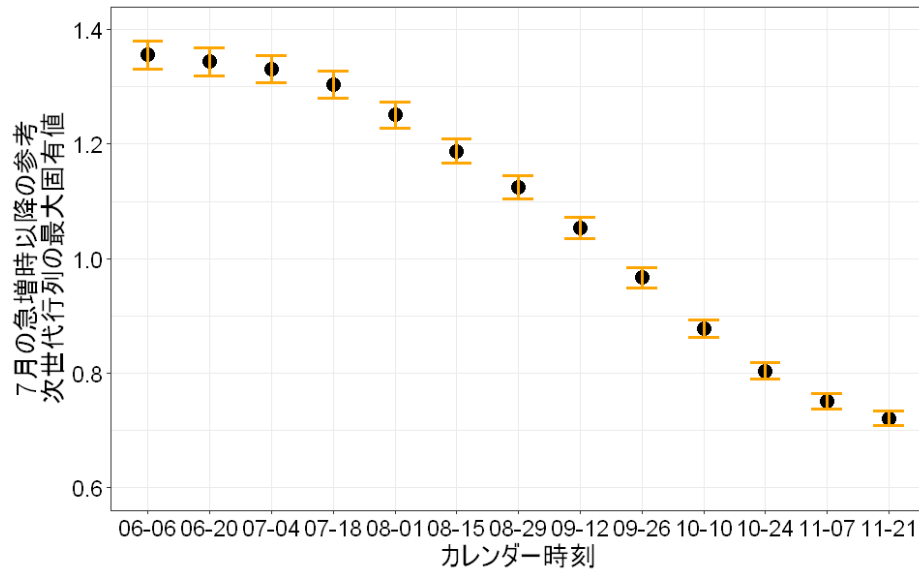


# デルタ株に対する年齢群別感受性者割合の推定 (11月21日時点)

- 11月21日までVRSへの報告遅れは11.1日（標準偏差：31.4）と推定
- 11月21日現在までの年齢群ごとの免疫保持者の推定方法や仮定は前回までの資料と同様



# ワクチン接種を加味した最大固有値の推移（次世代行列は第5波の東京都のデータから推定）



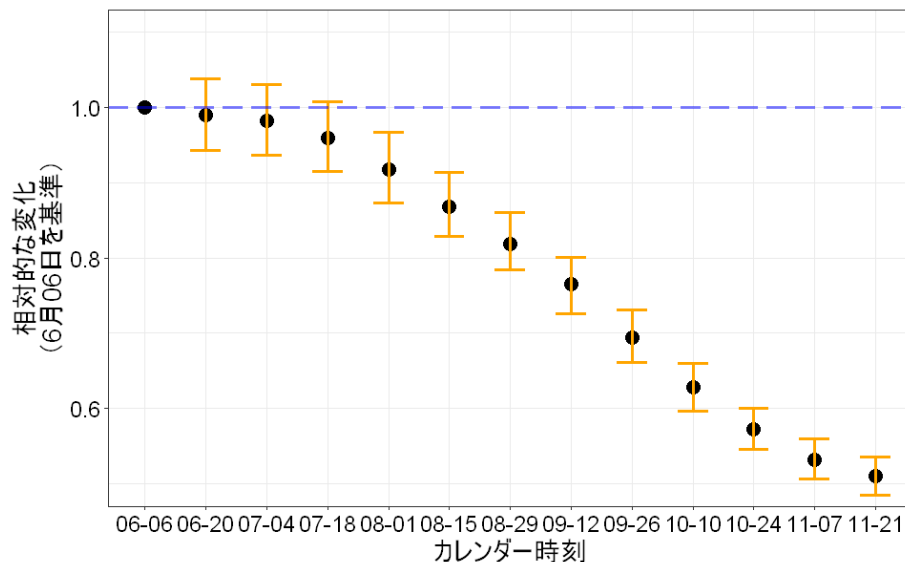
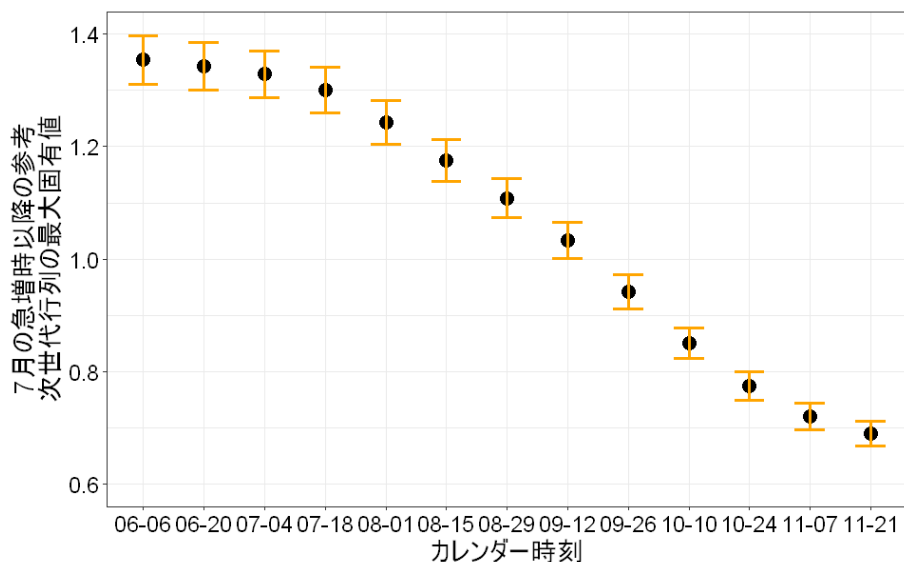
データ出典：HER-SYS、VRS、V-SYSデータ

感受性割合の推定方法は前スライド同様



参考：

ワクチン接種を加味した最大固有値の推移（次世代行列は第4波の大阪府のデータから推定）



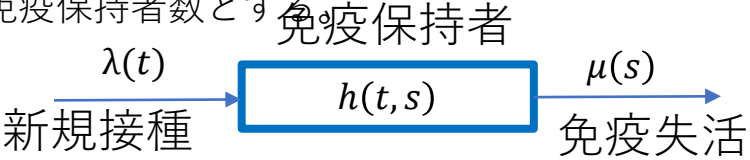
データ出典：HER-SYS、VRS、V-SYSデータ

感受性割合の推定方法は前スライド同様

# ワクチン効果の減弱を加味した免疫保持者割合の計算（暫定版）

方法：

イスラエル、英国、米国の報告[1-3]から新型コロナワクチンの効果とその減弱速度を下式によって推定。ここで、 $\lambda(t)$  をVRSとV-SYS（11月7日まで）から推定した「新規に」ワクチン2回目を時刻 $t$ に接種した数、 $h(t,s)$ をfully vaccinated（文献に合わせて、二回目の接種から7日もしくは14日後と定義）になってから $s$ 日経過した時刻 $t$ における免疫保持者の数、 $\mu(s)$ をfully vaccinatedになってから $s$ 日経過した時のワクチン効果の減弱ハザード、 $H(t)$ を時刻 $t$ における免疫保持者数とする。



McKendrick von Foerster  
Partial differential equation

$$\begin{cases} \left( \frac{\partial}{\partial t} + \frac{\partial}{\partial s} \right) h(t,s) = -\mu(s)h(t,s) \\ h(t,0) = \lambda(t) \end{cases}$$

Integration over characteristic line gives

$$h(t,s) = \lambda(t-s) \exp\left(-\int_0^s \mu(x) dx\right)$$

And the total number of immune at calendar time t, H(t) is

$$H(t) = \int_0^\infty \lambda(t-y) \exp\left(-\int_0^y \mu(x) dx\right) dy$$

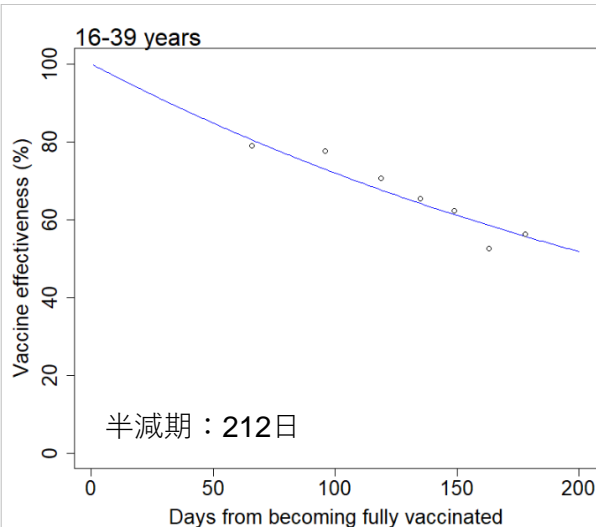
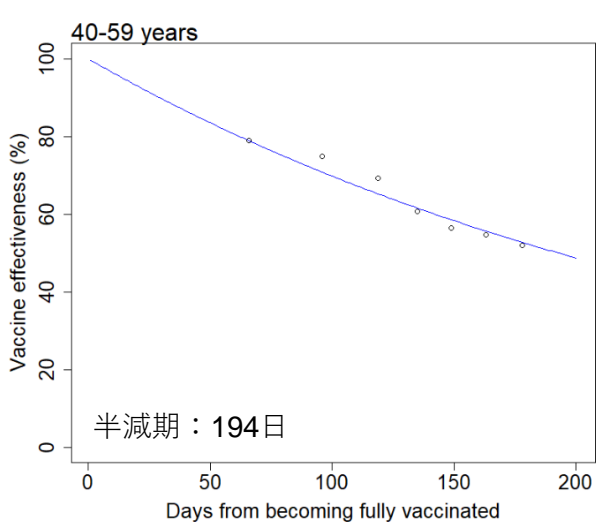
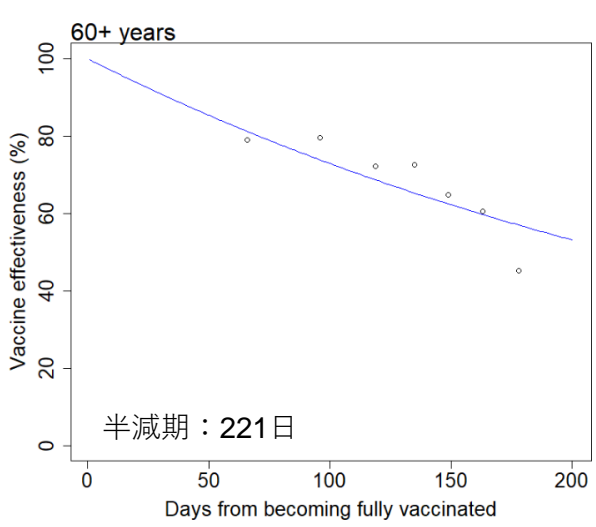
生物学的な真の減衰関数は不明であるから、ここでは、  
 $\mu(x) = (\text{定数}) (= \text{ワクチン効果が指数関数 } ae^{-r\tau} \text{ に従い減弱})$   
 $\mu(x) = (\text{指数関数的に加速}) (= \text{ワクチン効果がGompertz関数 } ae^{-r(e^{b\tau}-1)} \text{ に従い減弱})$   
 の2通りを想定して各国のデータ[1-3]に適合した。

[1] Goldberg et al. waning immunity after the BNT162b2 vaccine in Israel. 2021. NEJM.  
 [2] Andrews et al. Vaccine effectiveness and duration of protection of Comirnaty, Vaxzevria and Spikevax against mild and severe COVID-19 in the UK. Preprint. Available from <https://khub.net/documents/135939561/338928724/Vaccine+effectiveness+and+duration+of+protection+of+covid+vaccines+against+mild+and+severe+COVID-19+in+the+UK.pdf/10dcd99c-0441-0403-dfd8-11ba2c6f5801>  
 [3] Tarof et al. Effectiveness of mRNA BNT162b2 COVID-19 vaccine up to 6 months in a large integrated health system in the USA: a retrospective cohort study

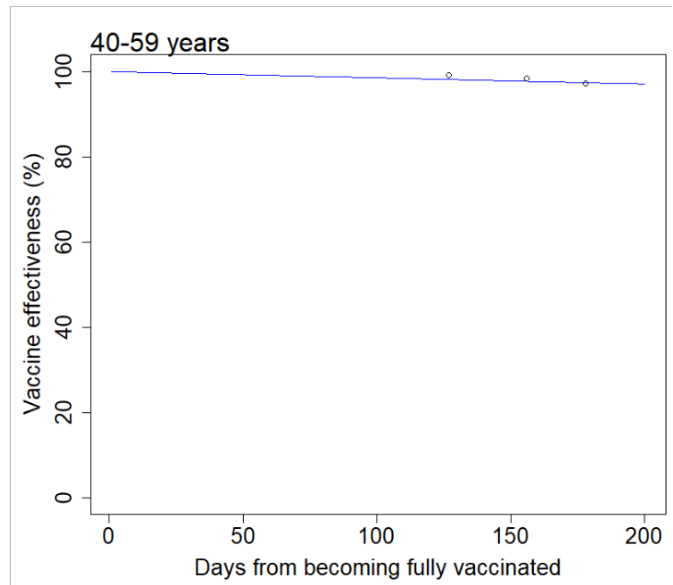
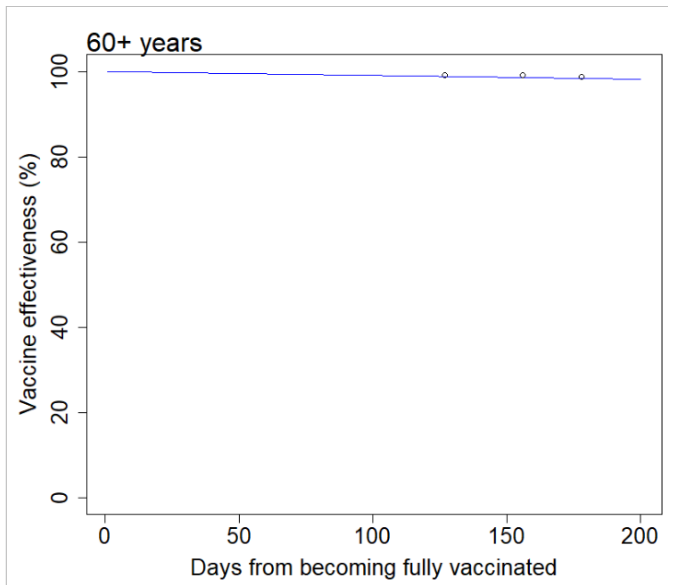
# イスラエルにおける観察データ（点）とMcKendrick方程式の適合

## ワクチン効果の減弱関数を $ae^{-\gamma t}$ とした場合

感染防御のワクチン効果（%）

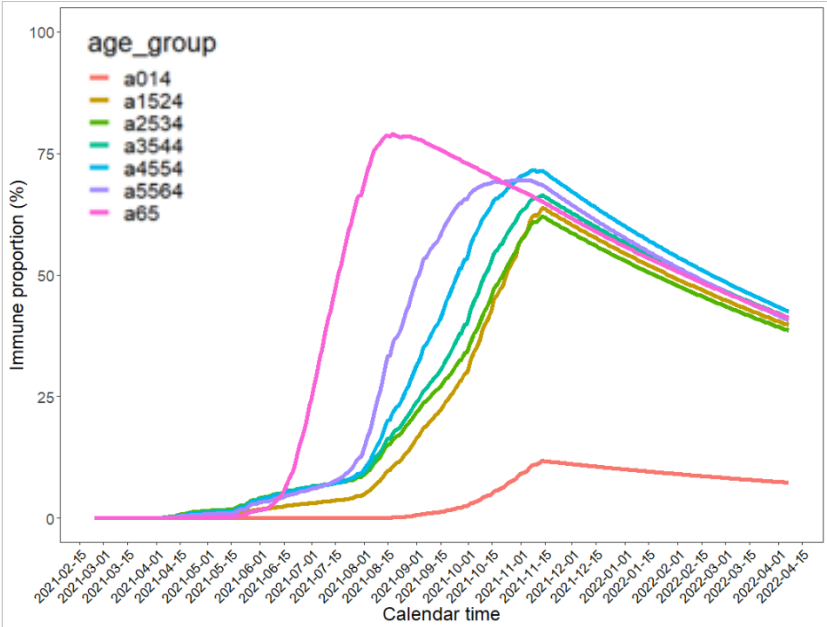


重症化防御のワクチン効果（%）

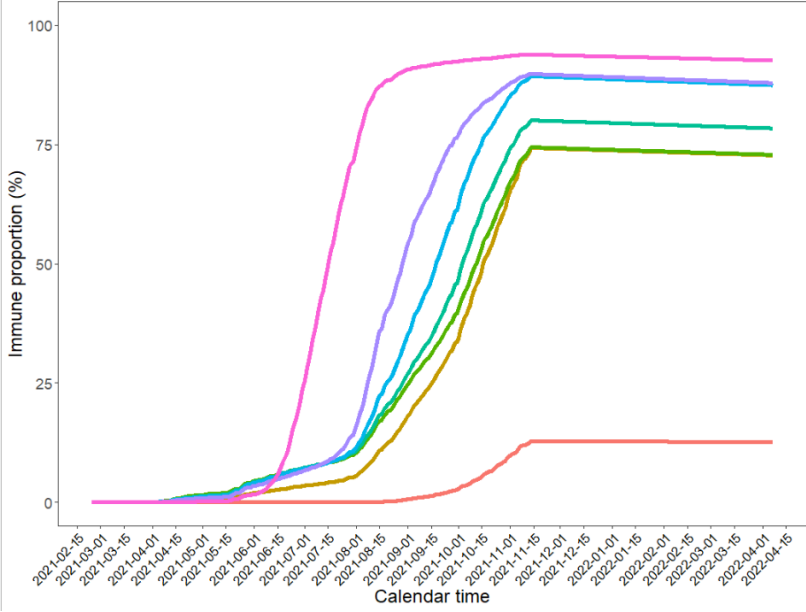


# イスラエルの観察データ + 指数分布に従う失活

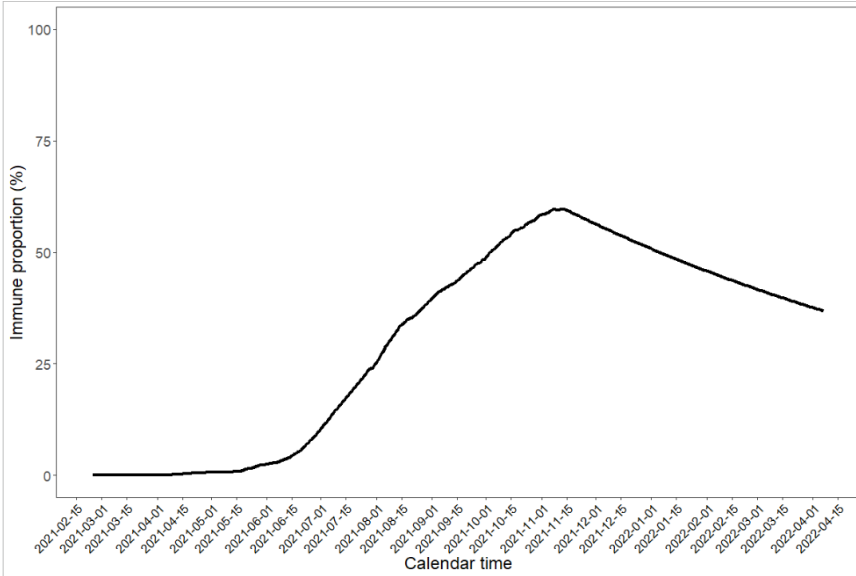
年齢群ごとの感染防御のワクチン効果 (%)



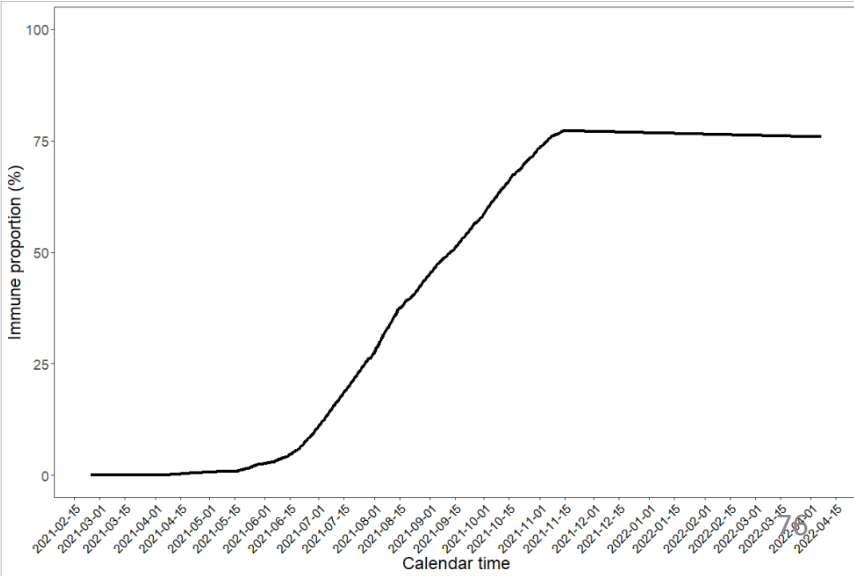
年齢群ごとの重症化防御のワクチン効果 (%)



人口全体の感染防御のワクチン効果 (%)



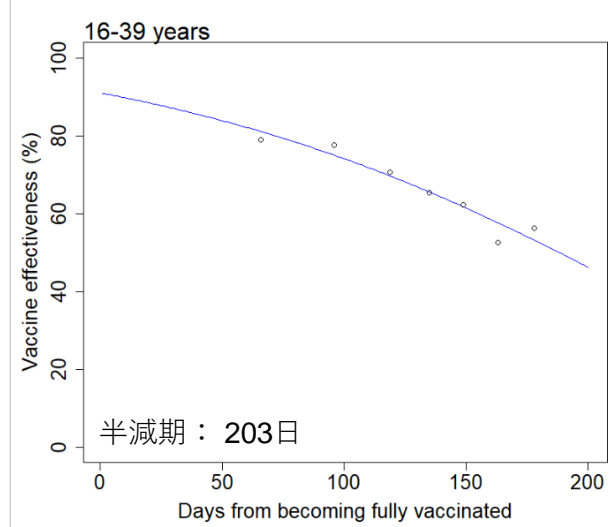
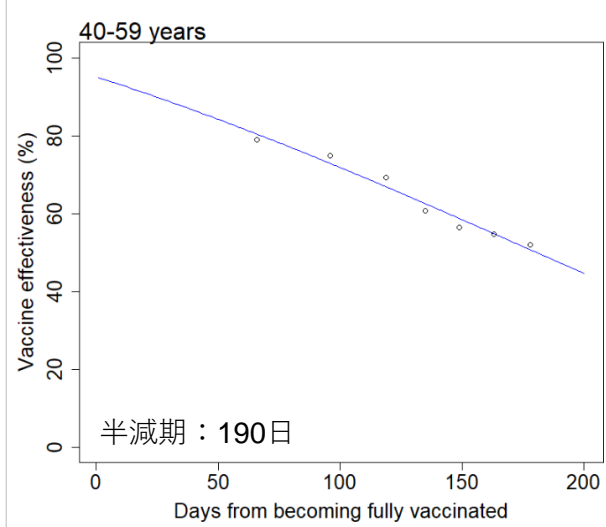
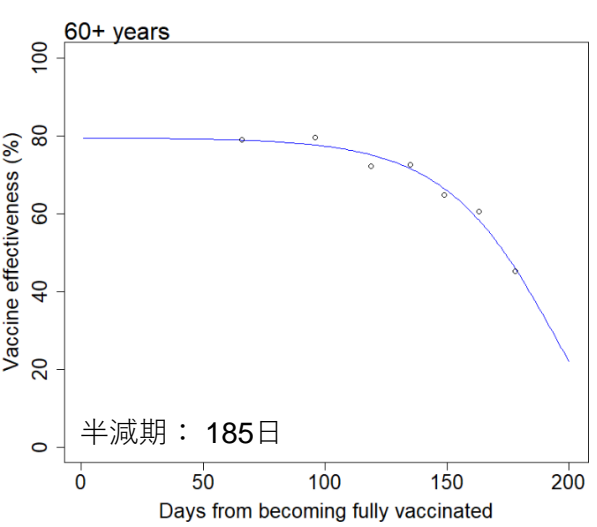
人口全体の重症化防御のワクチン効果 (%)



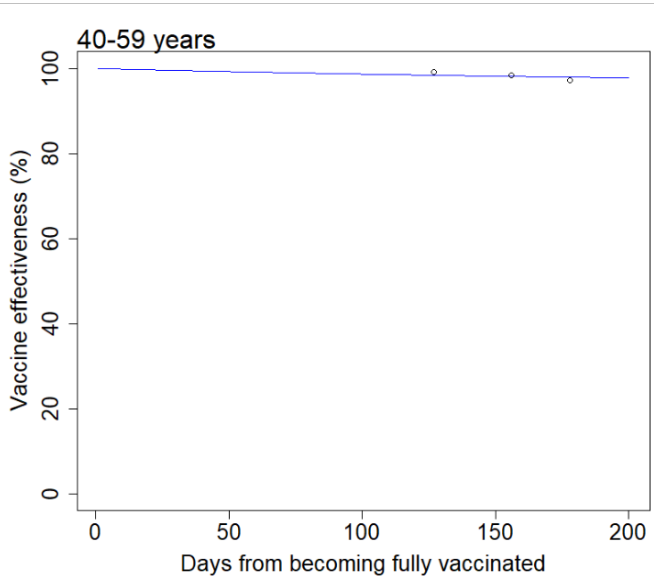
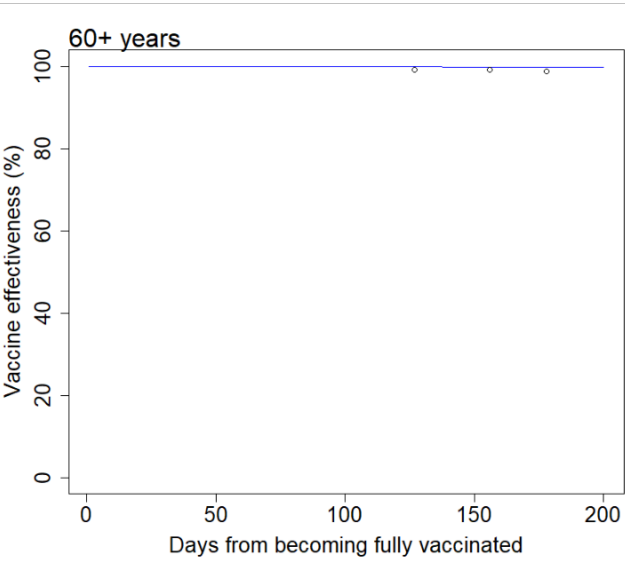
# イスラエルにおける観察データ（点）とMcKendrick方程式の適合（その（2））

ワクチン効果の減弱関数を  $ae^{-r(e^{bt}-1)}$  とした場合

感染防御のワクチン効果（%）

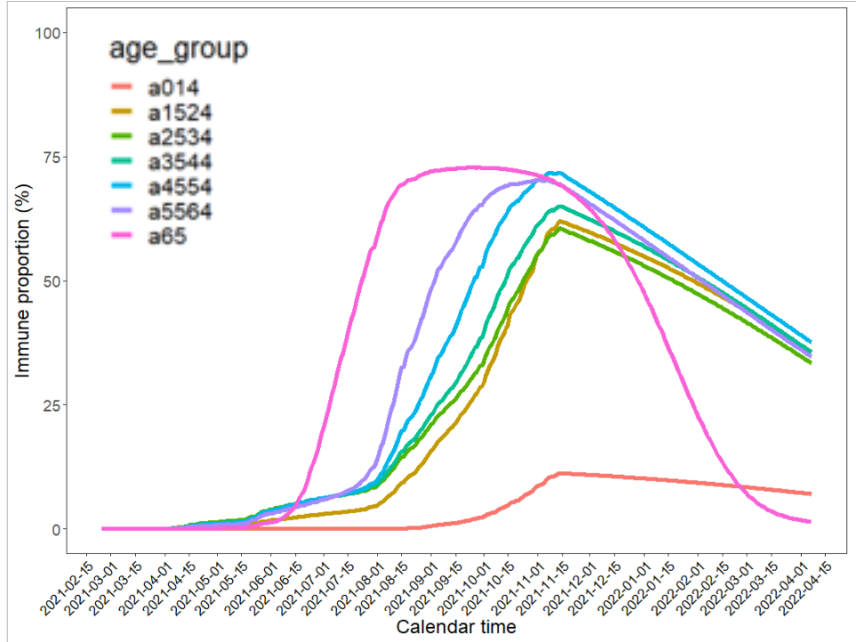


重症化防御のワクチン効果（%）

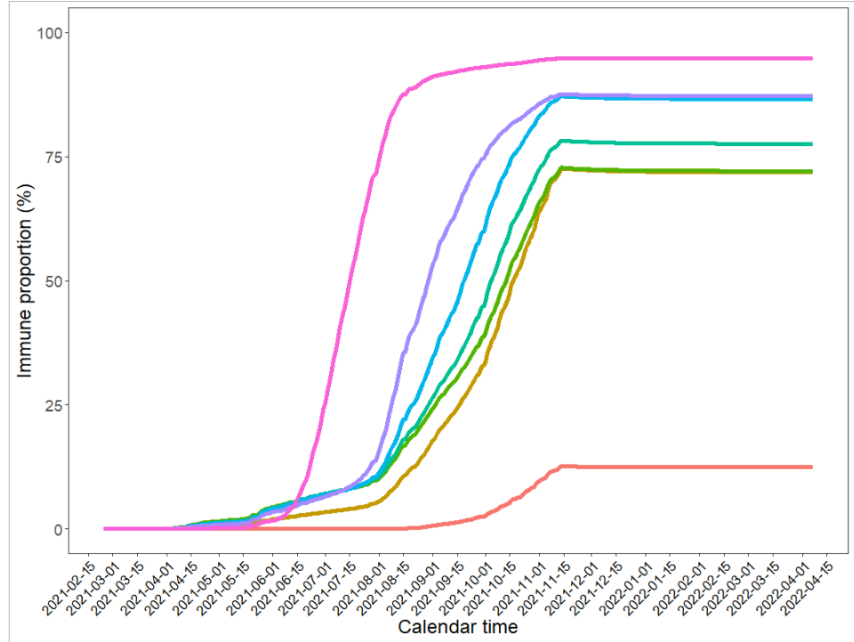


# イスラエルの観察データ + Gompertz則に従う失活

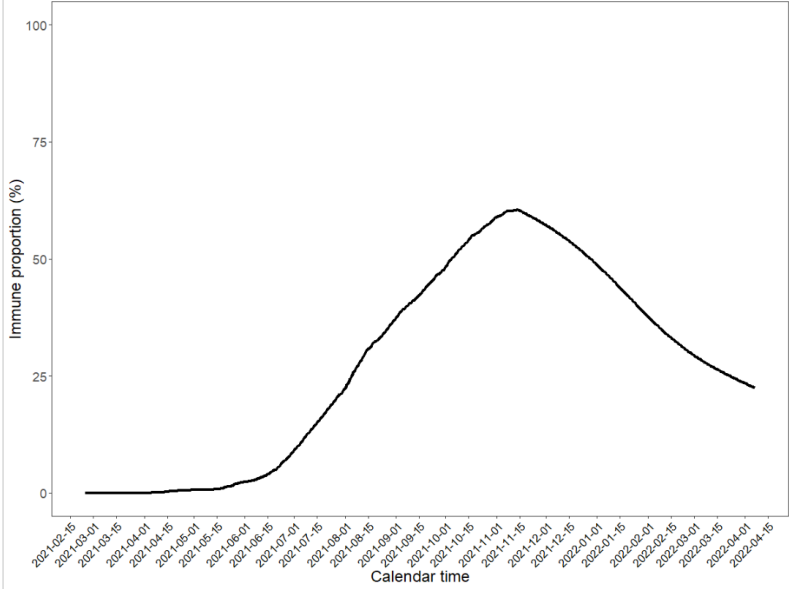
年齢群ごとの感染防御のワクチン効果 (%)



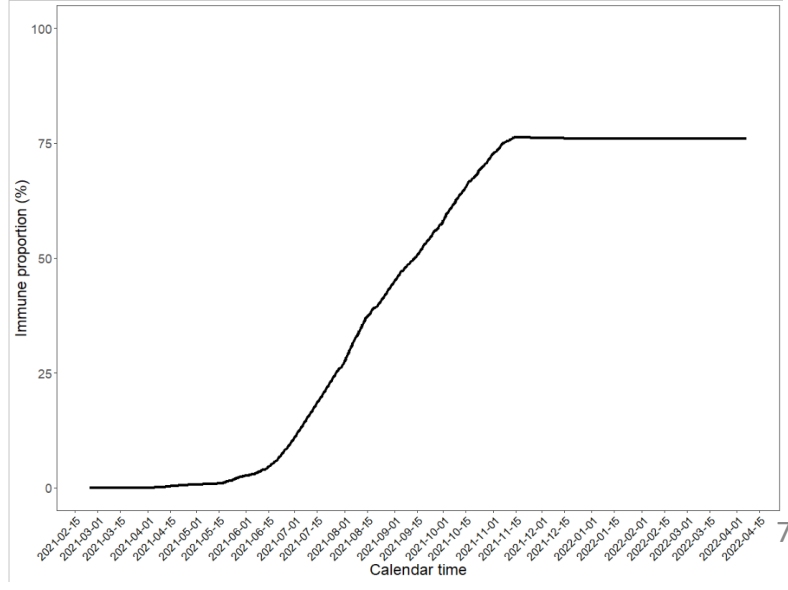
年齢群ごとの重症化防御のワクチン効果 (%)



人口全体の感染防御のワクチン効果 (%)



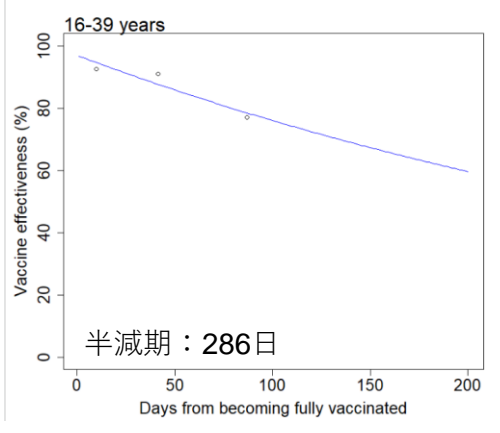
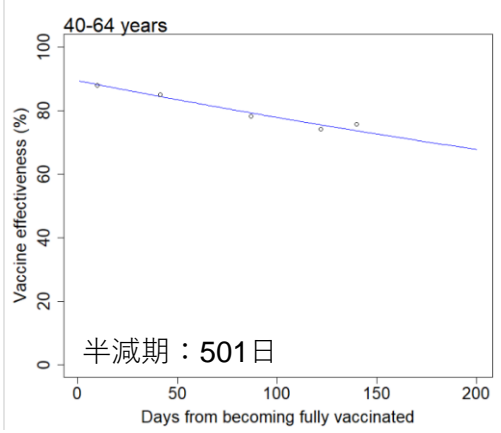
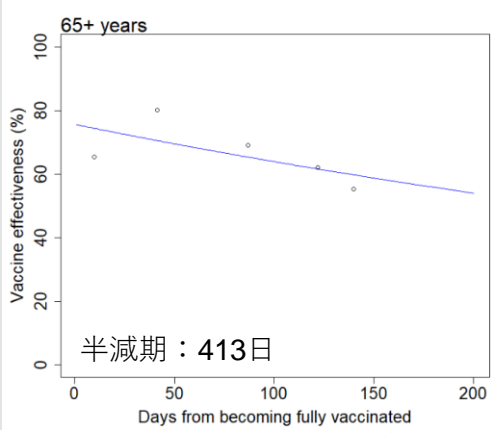
人口全体の重症化防御のワクチン効果 (%)



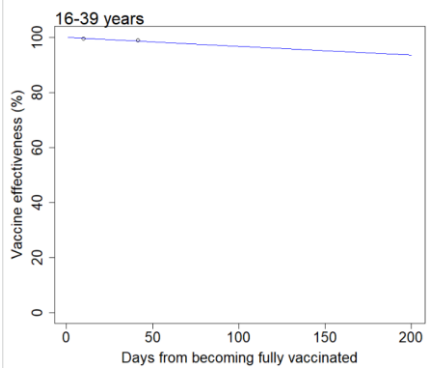
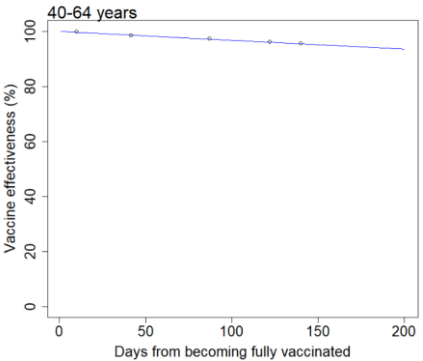
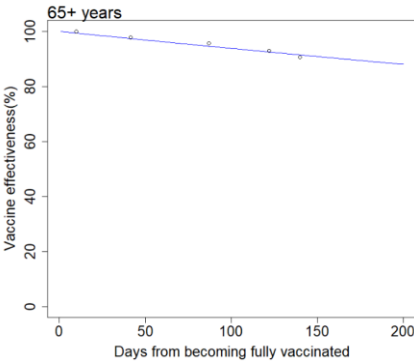
# 英国における観察データ（点）とMcKendrick方程式の適合

## ワクチン効果の減弱関数を $ae^{-\gamma t}$ とした場合

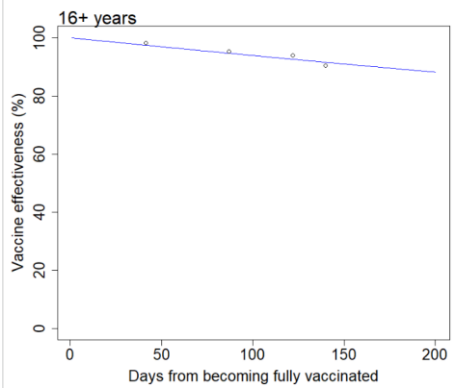
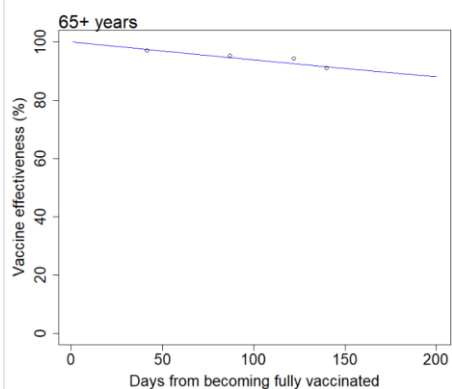
感染防御のワクチン効果（%）



重症化防御のワクチン効果（%）

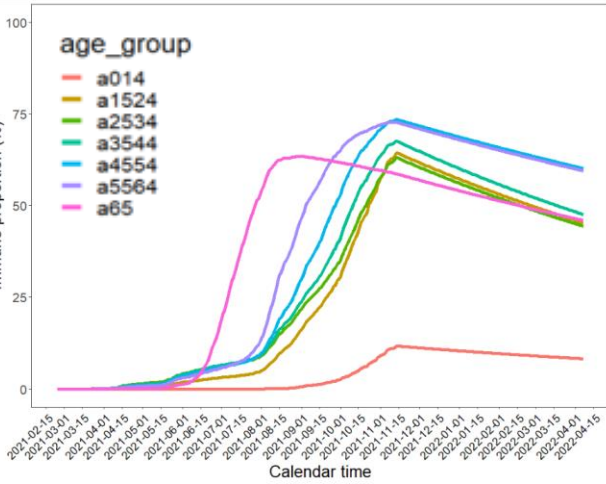


死亡防御のワクチン効果（%）

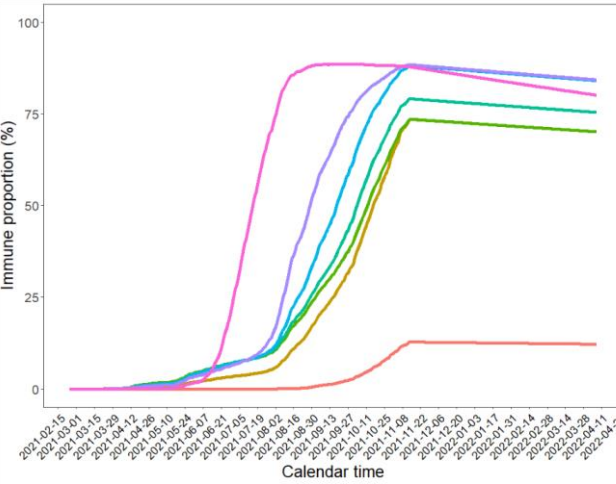


# 英国の観察データ + 指数分布に従う失活

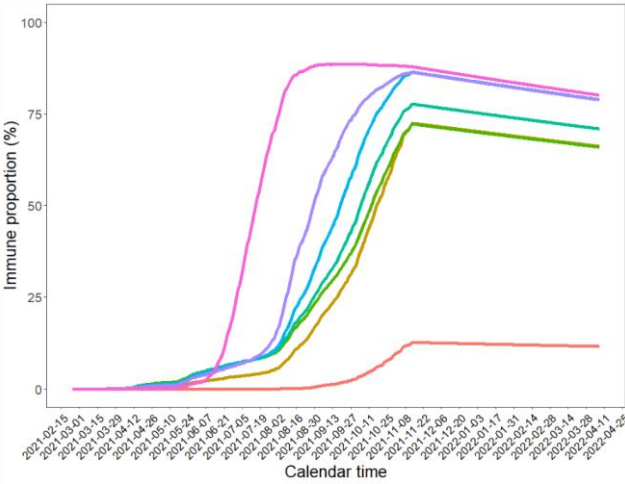
年齢群ごとの  
感染防御のワクチン効果 (%)



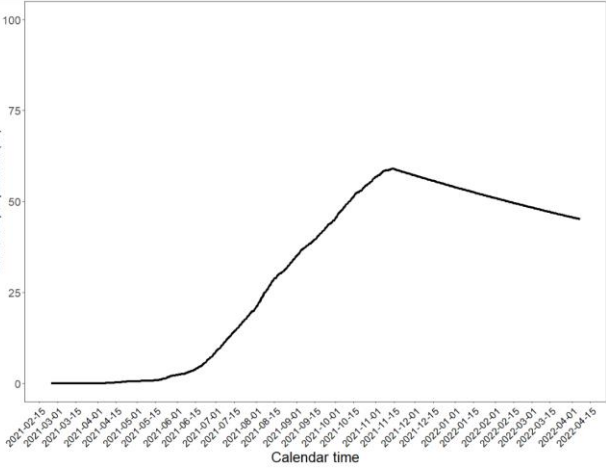
年齢群ごとの  
重症化 (入院) 防御のワクチン効果 (%)



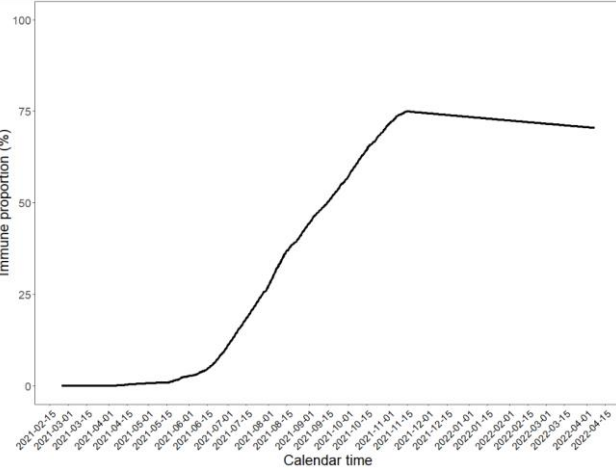
年齢群ごとの  
死亡防御のワクチン効果 (%)



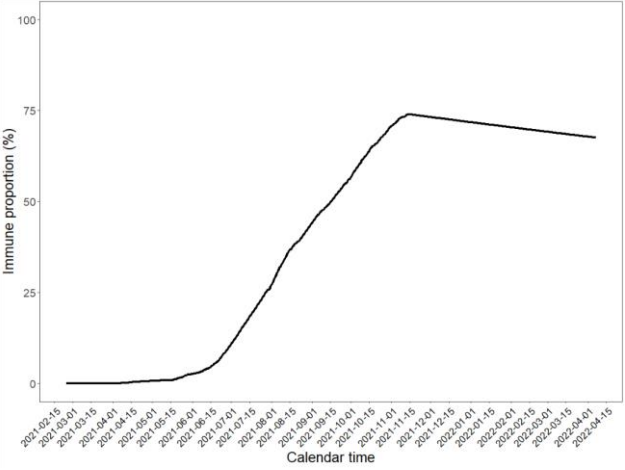
人口全体の  
感染防御のワクチン効果 (%)



人口全体の  
重症化 (入院) 防御のワクチン効果 (%)



人口全体の  
死亡防御のワクチン効果 (%)

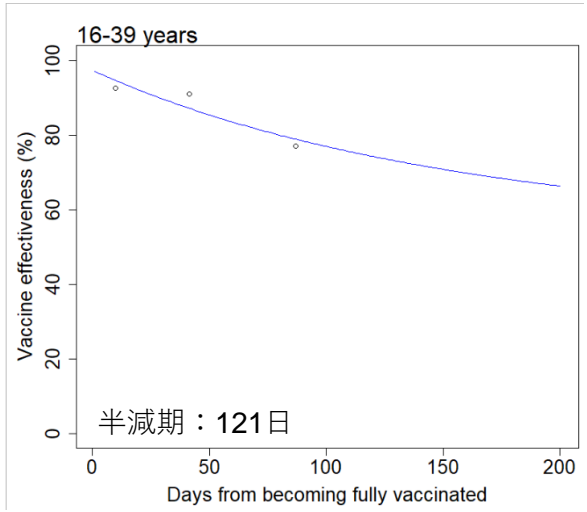
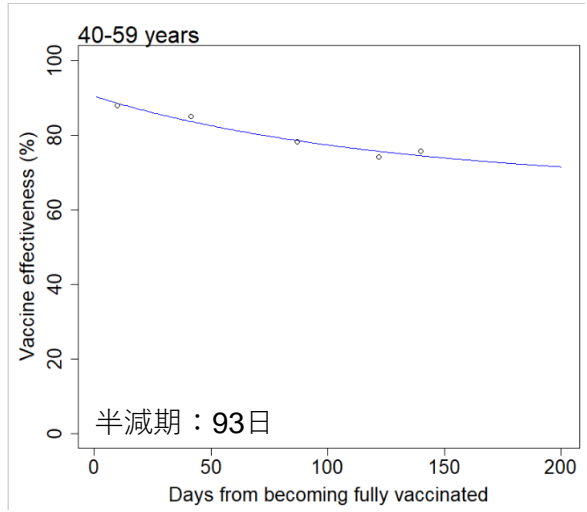
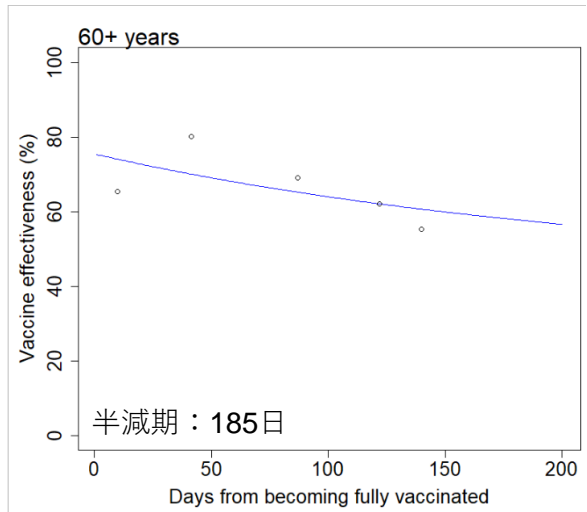




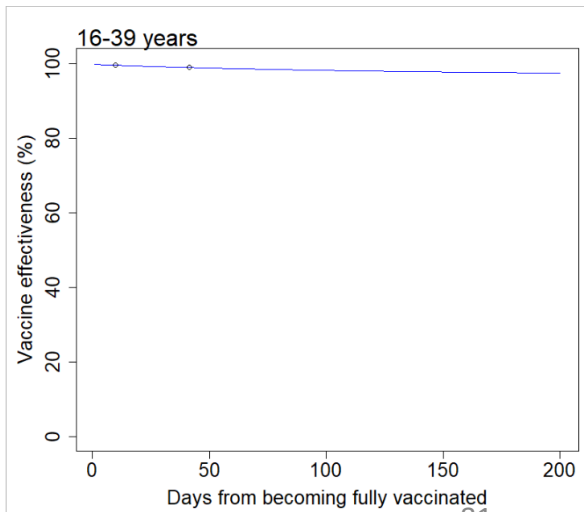
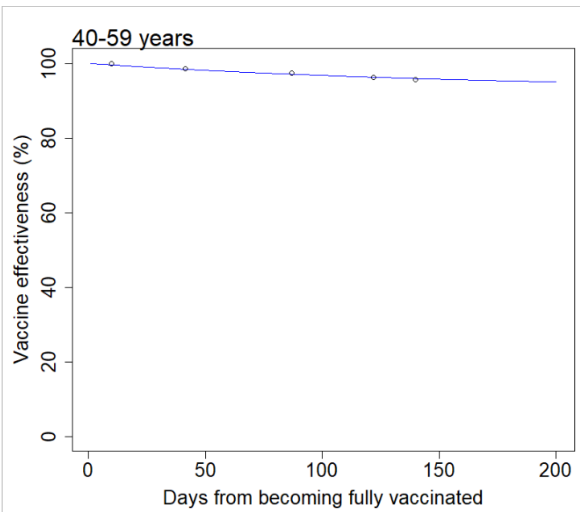
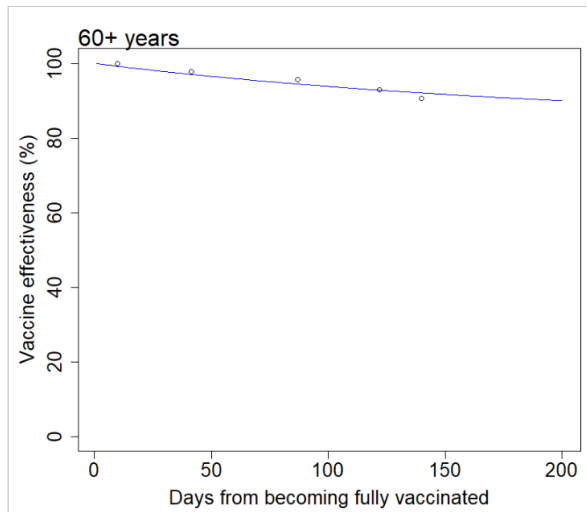
# 英国における観察データ（点）とMcKendrick方程式の適合（その（2））

## ワクチン効果の減弱関数を $ae^{-r(e^{bt}-1)}$ とした場合

感染防御のワクチン効果（%）

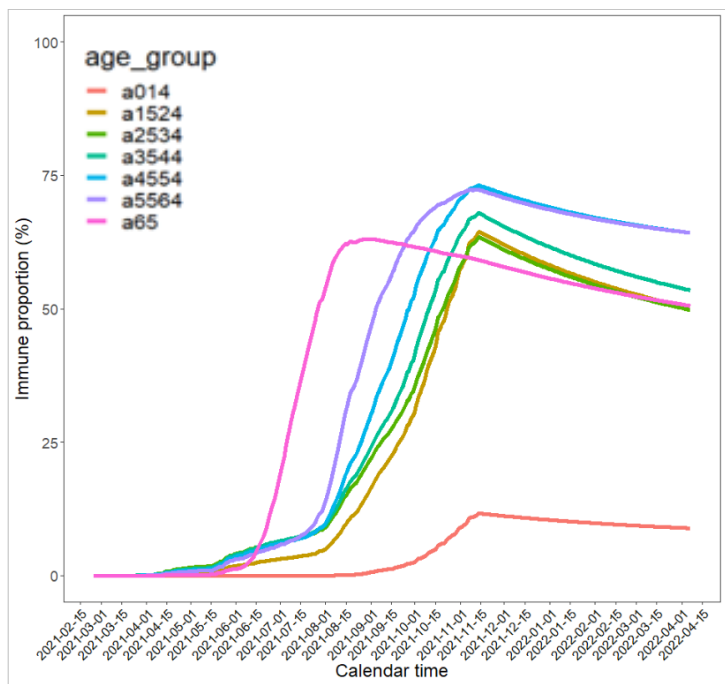


重症化防御のワクチン効果（%）

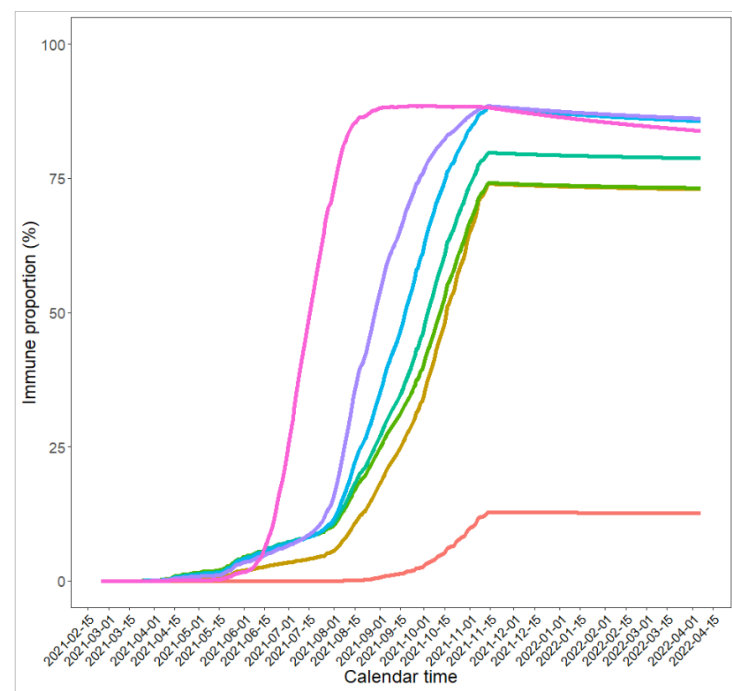


# 英国の観察データ + Gompertz則に従う失活

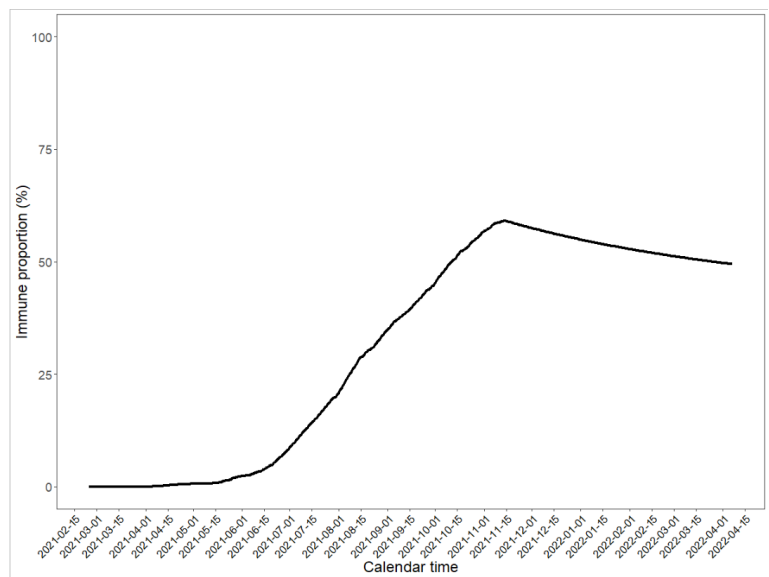
年齢群ごとの感染防御のワクチン効果 (%)



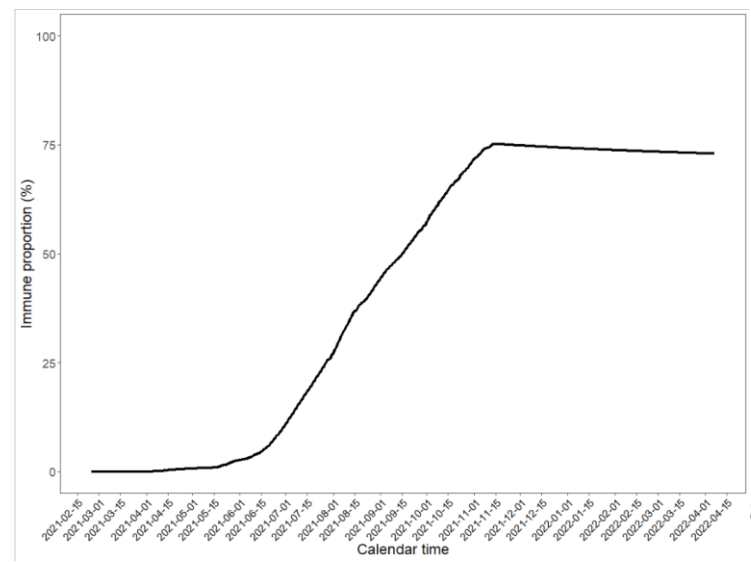
年齢群ごとの重症化（入院）防御のワクチン効果 (%)



人口全体の感染防御のワクチン効果 (%)



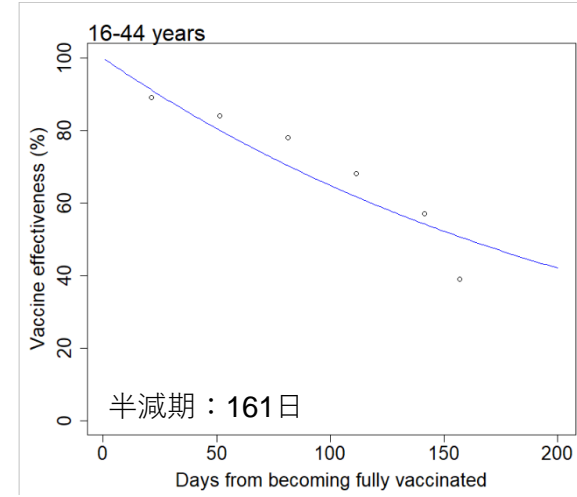
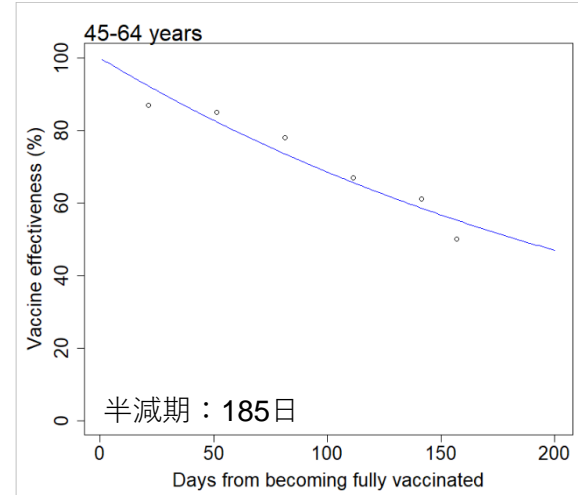
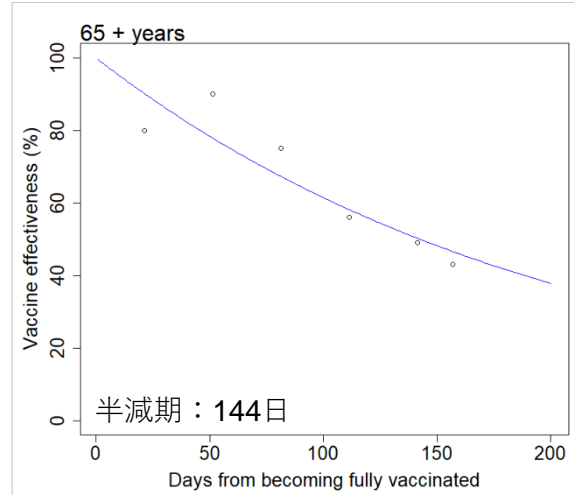
人口全体の重症化（入院）防御のワクチン効果 (%)



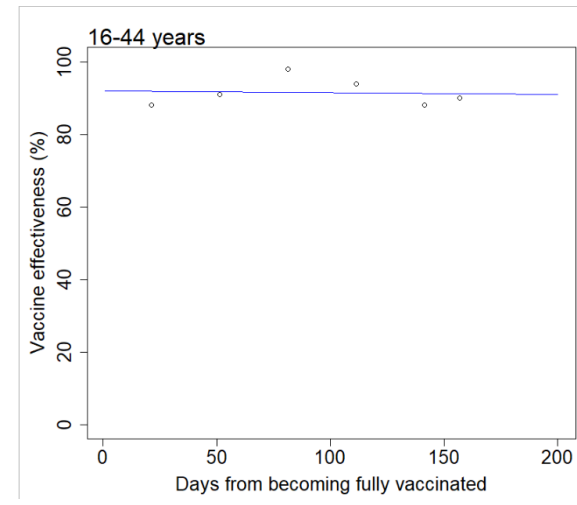
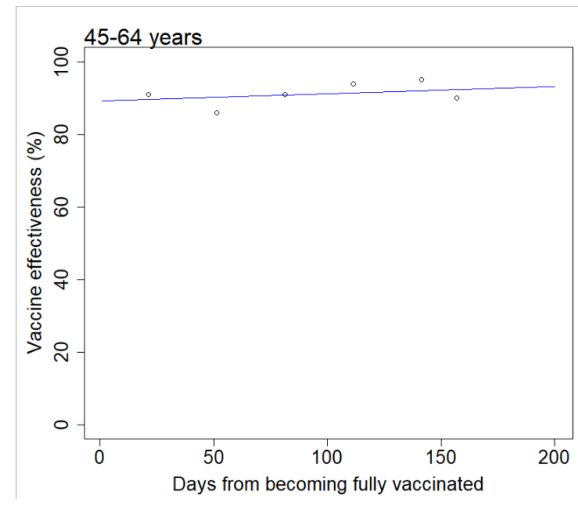
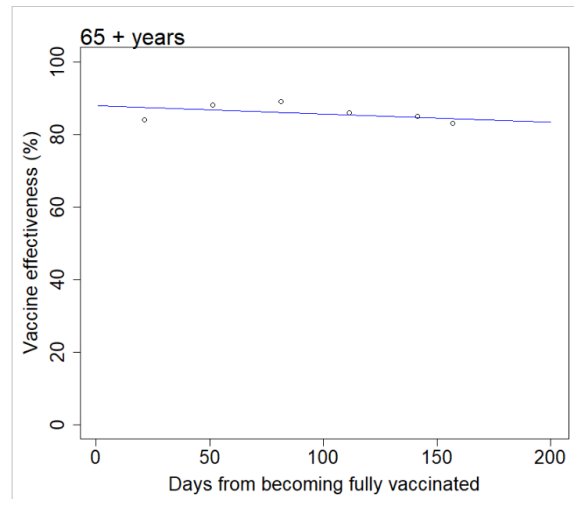
# 米国における観察データ（点）とMcKendrick方程式の適合

## ワクチン効果の減弱関数を $ae^{-\gamma t}$ とした場合

### 感染防御のワクチン効果（%）



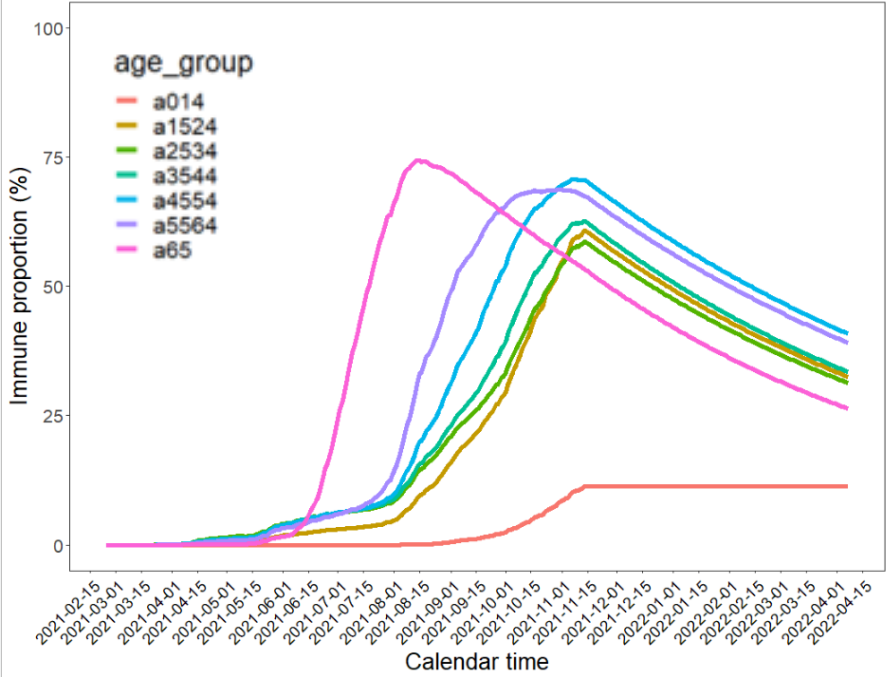
### 重症化防御のワクチン効果（%）



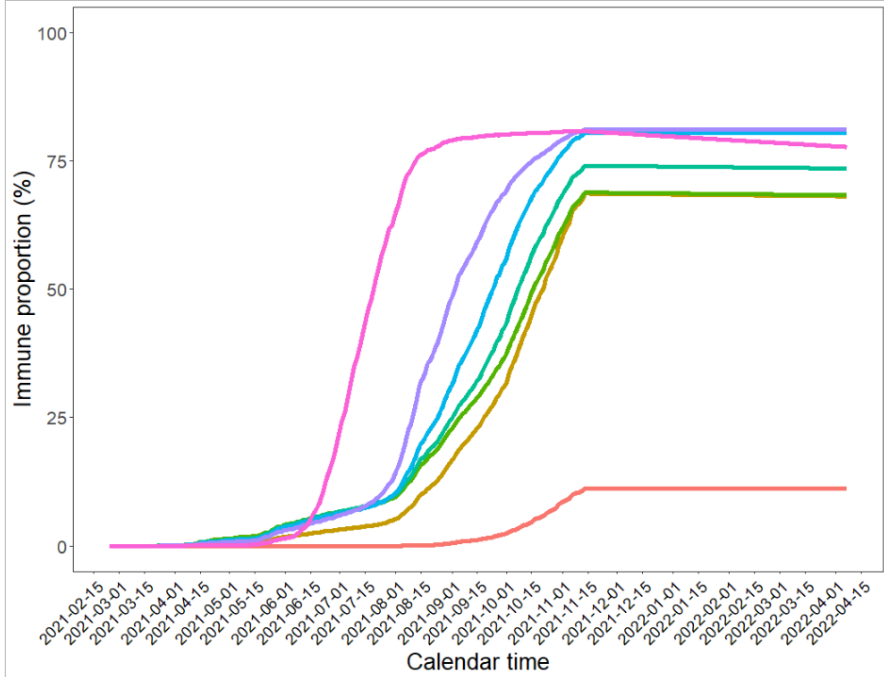
※ワクチン効果が上昇すると推定された場合（45-64歳の重症化防御ワクチン効果）、fully vaccinated になったときの推定値が時刻に依存せず持続すると仮定して次スライドの免疫保持者割合を推定した。

# 米国の観察データ + 指数分布に従う失活

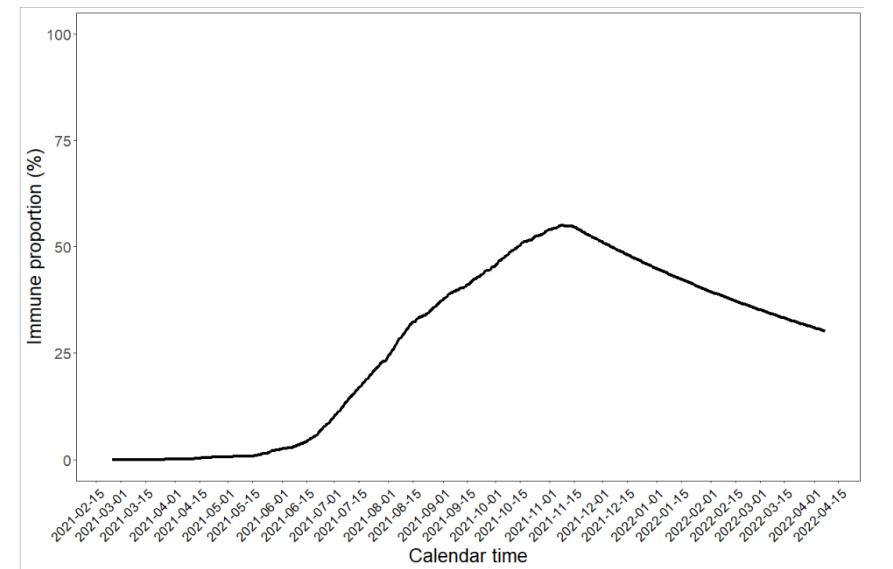
年齢群ごとの感染防御のワクチン効果 (%)



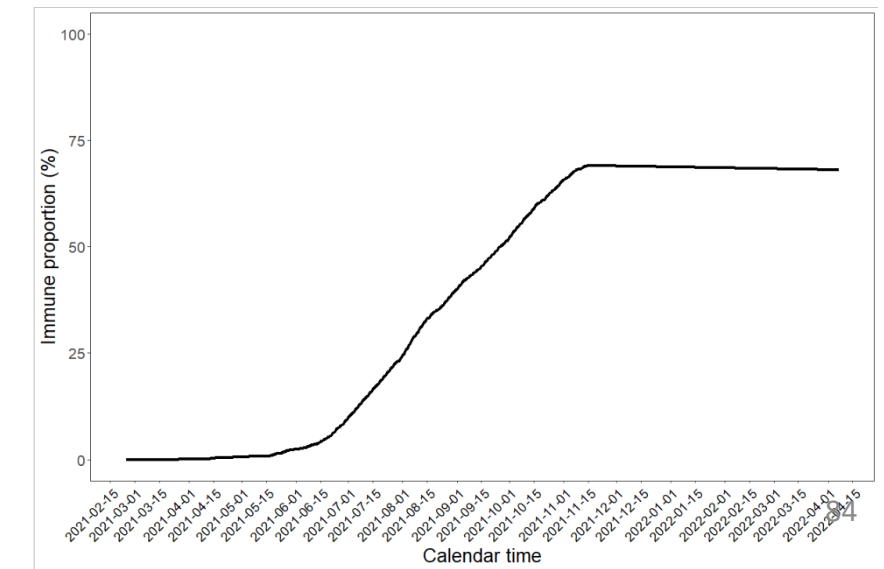
年齢群ごとの重症化防御のワクチン効果 (%)



人口全体の感染防御のワクチン効果 (%)



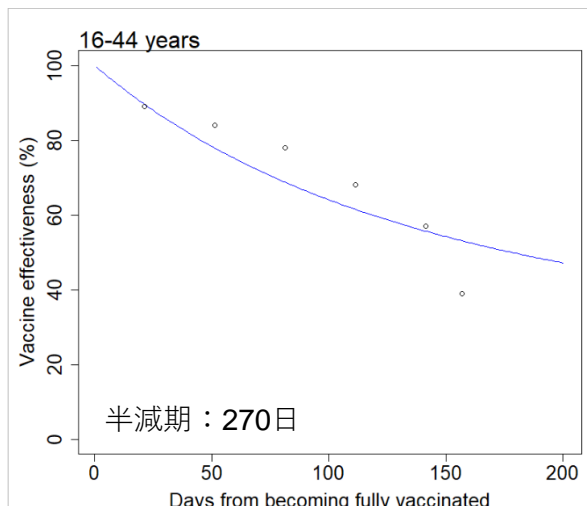
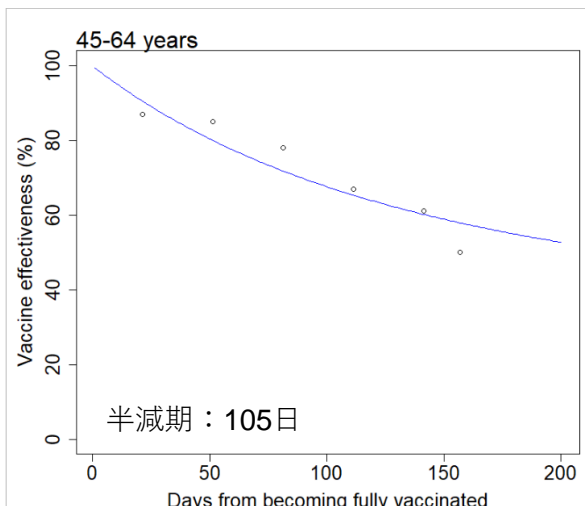
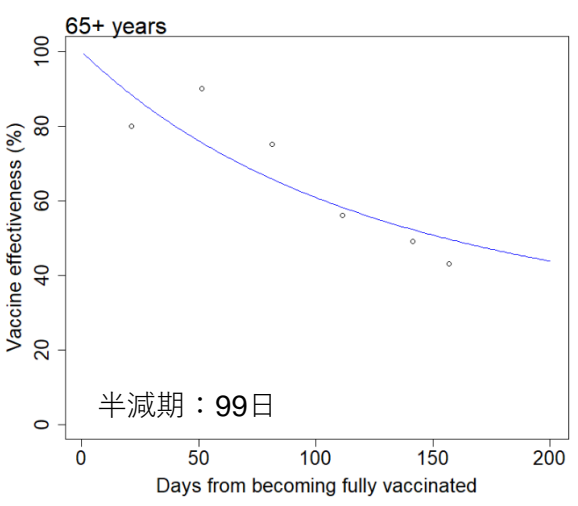
人口全体の重症化防御のワクチン効果 (%)



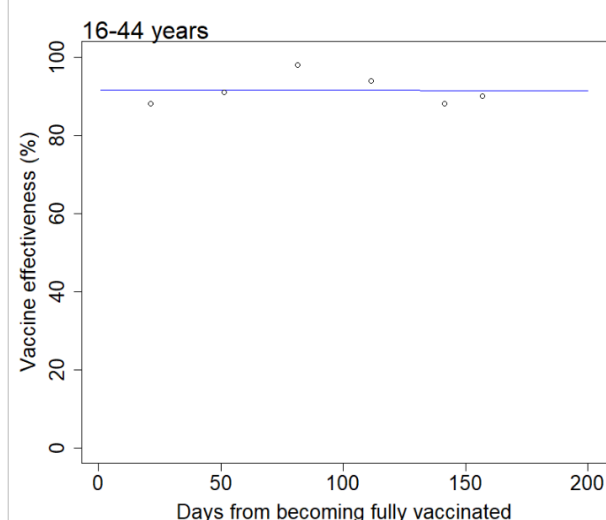
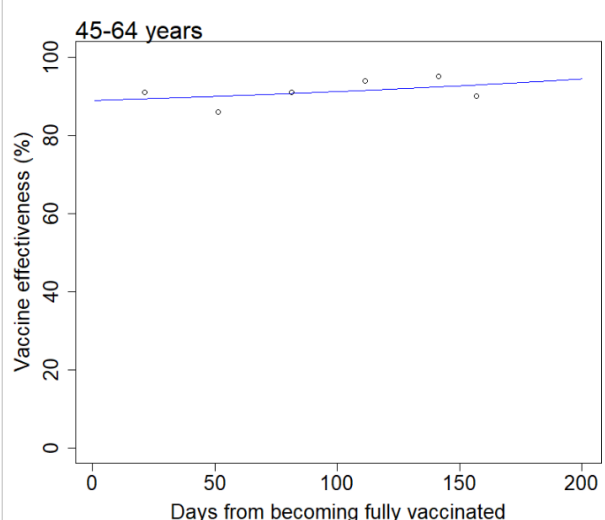
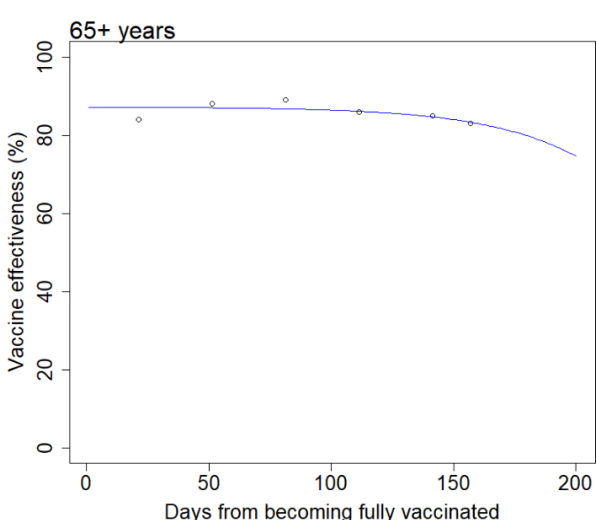
# 米国における観察データ（点）とMcKendrick方程式の適合（その（2））

## ワクチン効果の減弱関数を $ae^{-r(e^{bt}-1)}$ とした場合

感染防御のワクチン効果（%）



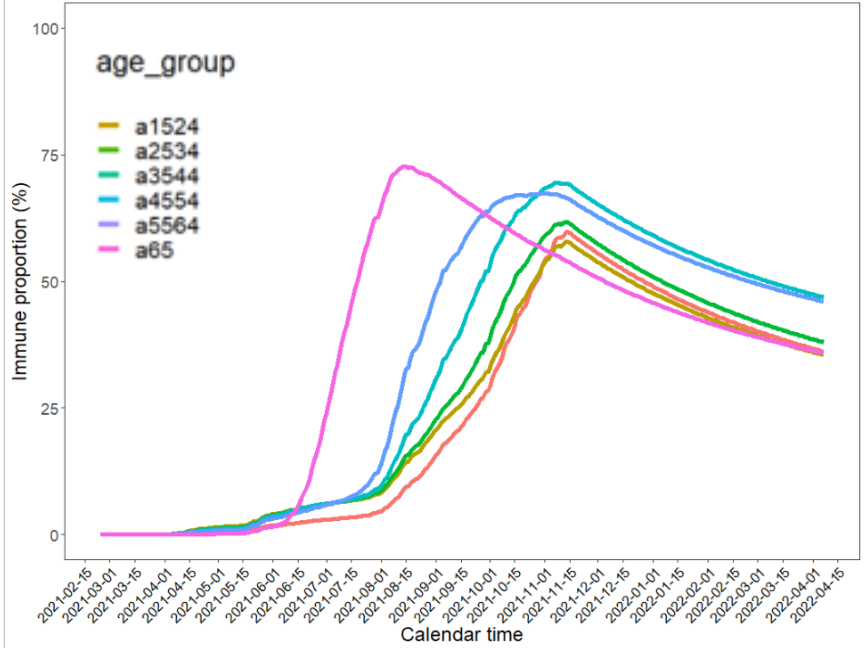
重症化防御のワクチン効果（%）



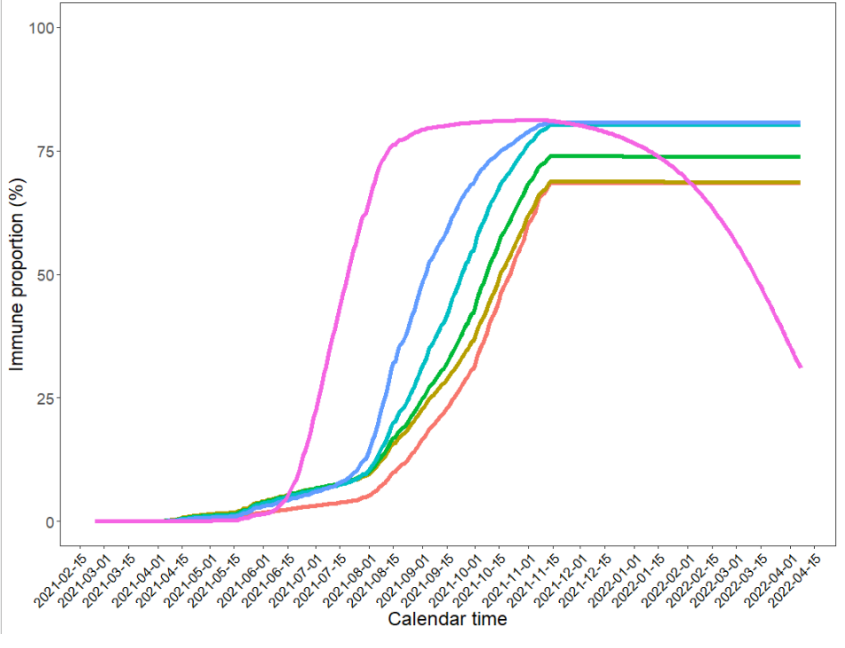
※ワクチン効果が上昇すると推定された場合（重症化で45-64歳）、fully vaccinated になったときの推定値が時刻に依存せず持続すると仮定して次スライドの免疫保持者割合を推定した。

# 米国の観察データ + Gompertz則に従う失活

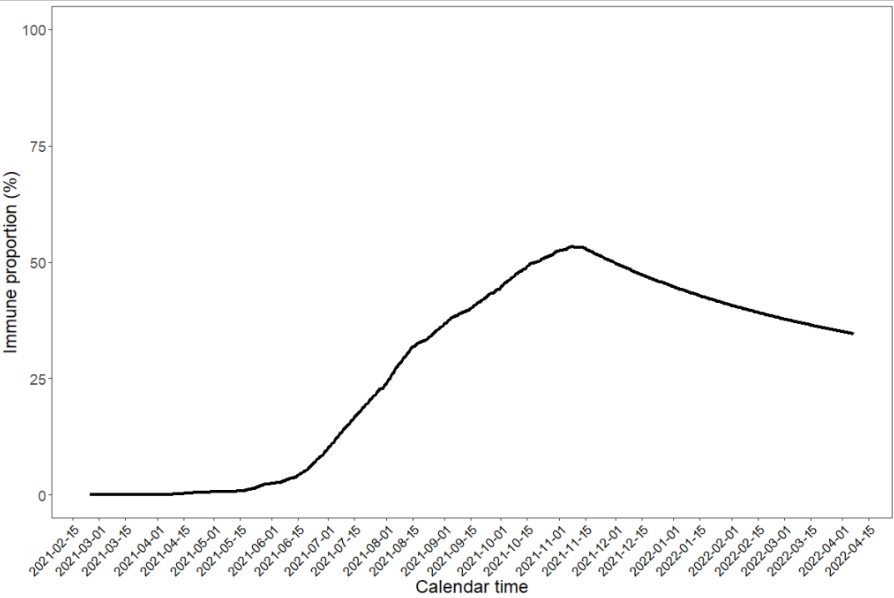
年齢群ごとの感染防御のワクチン効果 (%)



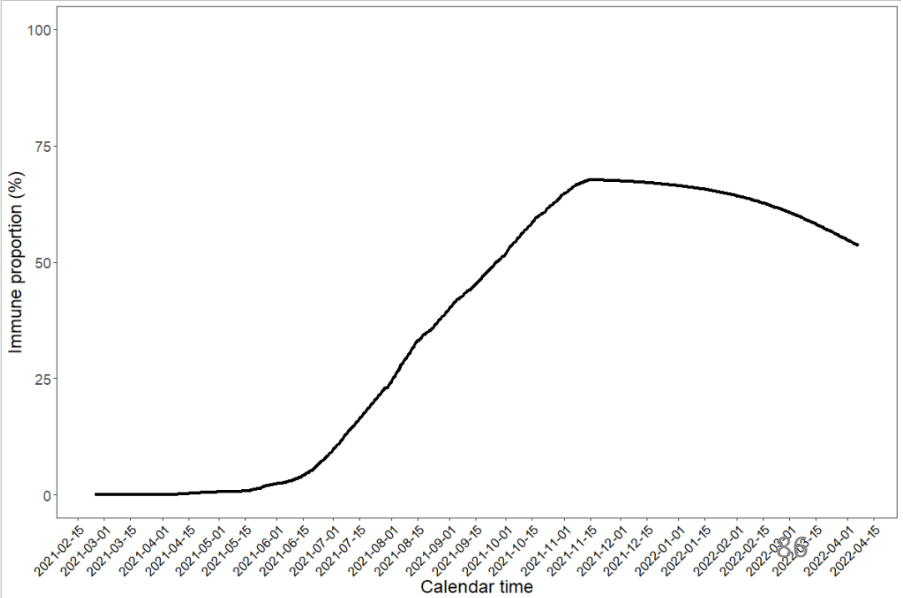
年齢群ごとの重症化防御のワクチン効果 (%)



人口全体の感染防御のワクチン効果 (%)



人口全体の重症化防御のワクチン効果 (%)



## Discussion: 免疫保持者割合の計算（暫定版）

○感染予防効果は接種後6-12か月で既に減衰が見られる。

イスラエル、米国、英国のそれぞれで報告されている減衰速度が異なり、信頼区間も広くて未だ不確実性が高い。いずれも元データではVEの減少として報告されている。差異を説明し得る間接的効果と予防接種者・未接種者それぞれのワクチン前後での接触率の変化に関する情報が得られていない。

○重症化予防効果、死亡予防効果の減衰の程度は、感染予防効果よりも長く持続する。3か国で明確な著減は見られていない。

○ここまでの最長観察データはイスラエルの1年間程度であり、それよりも長期間の動態は未だ直接的に観察されておらずわからない。今後の観察継続を要する。

○3回目接種は、こういったデータを基に、更なる数値計算をして要検討。今回提示のデータのみを基にしても、2回目接種後8か月が良いのかは判断できない。

（アウトカム・Exitのビジョンについて要議論）

例1. 「第6波をできるだけ防ぎたい」「この冬の直近の感染者を少なくしたい」ならば、理論的には2目接種後の期間を短くすれば短くするほど良い

例2. 他方、早く打ちすぎると「第7波、第8波の頃にまたワクチン由来免疫が失われる」というようなことが起こり得ます。

# Establishment types of clusters

- Additional annotation of establishment type was done for each cluster records

## Given data

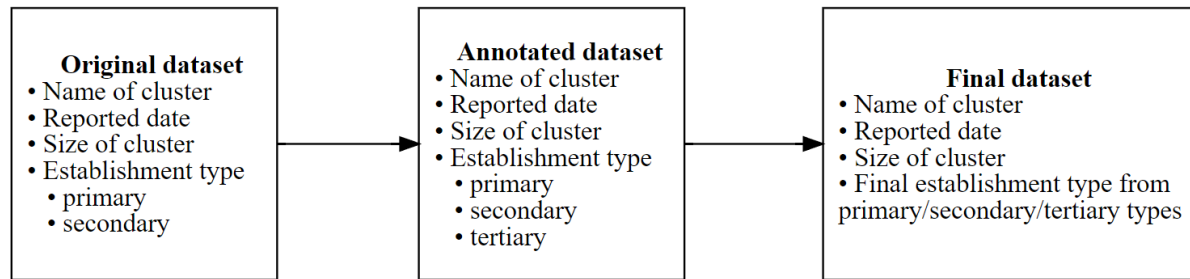
Establishment type (primary)	Establishment type (secondary)
<ul style="list-style-type: none"> <li>• Eating and drinking establishments</li> <li>• Health institute</li> <li>• Welfare facility</li> <li>• Enterprise etc.</li> <li>• School/Educational Institution etc.</li> <li>• Sports facility etc.</li> <li>• Others</li> </ul>	<ul style="list-style-type: none"> <li>• Eating and drinking establishments</li> <li>• Eating and drinking establishments with Karaoke facility</li> <li>• Hospital</li> <li>• Clinic</li> <li>• School/Educational Institution</li> <li>• Cram school</li> <li>• Enterprise</li> <li>• Public Office</li> <li>• Elderly care facility</li> <li>• Welfare facility for persons with disabilities</li> <li>• Child welfare facility</li> <li>• Club with live music</li> <li>• Meal or barbeque with several people at home</li> <li>• Theater</li> <li>• Sports facility</li> <li>• Sports team</li> <li>• Beauty Salon/Barber</li> <li>• Others</li> </ul>

## Additionally annotated

Establishment type (tertiary)
<ul style="list-style-type: none"> <li>• Restaurant</li> <li>• Alcohol serving eating and drinking establishment</li> <li>• Serviced entertaining bars and escort clubs</li> <li>• Meal with several people</li> <li>• Kindergarten</li> <li>• Certified centers of Early Childhood Education and Care</li> <li>• Elementary school</li> <li>• Middle school</li> <li>• High school</li> <li>• University</li> <li>• Junior college</li> <li>• Local government office</li> <li>• Local government affiliated institution</li> <li>• Clinic</li> <li>• Dental clinic</li> <li>• Fire station</li> <li>• Fire academy</li> <li>• Police station</li> <li>• Police school</li> <li>• Sports facility</li> <li>• Various sports activities</li> </ul> <p style="text-align: right;">etc.</p>



# Process of data annotation



# Annotation of establishment types for each cluster records (1)

Category	Establishment type	Additional annotation	Aggregation criteria
Recreational facilities	Theater	None	<ul style="list-style-type: none"> <li>Establishment type (secondary): "Theater"</li> </ul>
	Eating and drinking establishments with Karaoke facility	None	<ul style="list-style-type: none"> <li>Establishment type (secondary): "Eating and drinking establishments with Karaoke facility"</li> </ul>
	Sports facility	<ul style="list-style-type: none"> <li>Classified records with establishment type (secondary) "Sports facility" into "Sports facility" and "Various sports"</li> </ul>	<ul style="list-style-type: none"> <li>Establishment type (tertiary): "Sports facility"</li> </ul>
	Beauty salon/Barber	None	<ul style="list-style-type: none"> <li>Establishment type (secondary): "Beauty salon/Barber"</li> </ul>
Welfare facility	Elderly care facility	None	<ul style="list-style-type: none"> <li>Establishment type (secondary): "Elderly care facility"</li> </ul>
	Welfare facility for persons with disabilities	None	<ul style="list-style-type: none"> <li>Establishment type (secondary): "Welfare facility for persons with disabilities"</li> </ul>
Health institute	Hospital	None	<ul style="list-style-type: none"> <li>Establishment type (secondary): "Hospital"</li> </ul>
	Clinic	<ul style="list-style-type: none"> <li>Classified records with establishment type (secondary) "Clinic" into "Clinic" and "Dental Clinic"</li> </ul>	<ul style="list-style-type: none"> <li>Establishment type (tertiary): "Clinic"</li> </ul>
	Dental Clinic		<ul style="list-style-type: none"> <li>Establishment type (tertiary): "Dental Clinic"</li> </ul>
Eating and drinking establishments	Restaurant	<ul style="list-style-type: none"> <li>Classified records with establishment type (secondary) "Eating and drinking establishments" into "Alcohol serving eating and drinking establishment" ("AL"), "Serviced entertaining bars and escort clubs" ("SV") and "Restaurant" ("RST")</li> <li>AL and SV: Information obtained from search engines was used when its type was unidentifiable from cluster names.</li> <li>AL: Bars, Izakaya, etc.</li> <li>SV: Clubs, Lounges, Hostess bars ("Kyabakura"), Pilipino pubs, Snack bars, etc.</li> <li>RST: All records within establishment type (secondary) "Eating and drinking establishments" that were not classified as AL or SV</li> <li>Clusters reported as "meal with several people" (会食) were not included in either establishment types.</li> </ul>	<ul style="list-style-type: none"> <li>Establishment type (tertiary): "Restaurant"</li> </ul>
	Alcohol serving eating and drinking establishment		<ul style="list-style-type: none"> <li>Establishment type (tertiary): "Alcohol serving eating and drinking establishment"</li> </ul>
	Serviced entertaining bars and escort clubs		<ul style="list-style-type: none"> <li>Establishment type (tertiary): Serviced entertaining bars and escort clubs</li> </ul>

# Annotation of establishment types for each cluster records (2)

Category	Establishment type	Additional annotation	Aggregation criteria
Public Office	Local government office	<ul style="list-style-type: none"> <li>Classified records with establishment type (secondary) "public office" into "local government office", "local government affiliated institution", "police station", "fire station", etc.</li> <li>Local government office: Records that could be identified as clusters that occurred at main local government building. Affiliated institutions of local government (i.e. public water agency, civil engineering office) were excluded.</li> </ul>	<ul style="list-style-type: none"> <li>Establishment type (tertiary): Local government office</li> </ul>
	Police station		<ul style="list-style-type: none"> <li>Establishment type (tertiary): Police station</li> <li>Police school excluded</li> </ul>
	Fire station		<ul style="list-style-type: none"> <li>Establishment type (tertiary): Fire station</li> <li>Fire academy excluded</li> </ul>
School/ Educational Institution	Elementary school	<ul style="list-style-type: none"> <li>Classified records with establishment type (secondary) "School/Educational Institution" into "Kindergarten", "Certified centers of Early Childhood Education and Care", Elementary school", "Middle school", "High school", "University", and "Unidentifiable schools".</li> </ul>	<ul style="list-style-type: none"> <li>Establishment type (tertiary): Elementary school</li> </ul>
	Middle school		<ul style="list-style-type: none"> <li>Establishment type (tertiary): Middle school</li> </ul>
	High school		<ul style="list-style-type: none"> <li>Establishment type (tertiary): High school</li> </ul>
	University		<ul style="list-style-type: none"> <li>Establishment type (tertiary): University</li> </ul>
	Kindergarten		<ul style="list-style-type: none"> <li>Establishment type (tertiary): Kindergarten</li> </ul>
	Child welfare facility	None	<ul style="list-style-type: none"> <li>Establishment type (secondary): Child welfare facility</li> <li>Establishment type (tertiary) : Certified centers of Early Childhood Education and Care</li> </ul>
	Cram school	None	<ul style="list-style-type: none"> <li>Establishment type (secondary) : Cram school</li> </ul>

# each establishment type (1)

- "Event" which represents fundamental unit of usage was defined for each establishment types

Category	Establishment type	Definition of an event	Type of Users	Average number of users per event $\bar{u}_x$	Breakdown of Days	Number of days where events occur $d_x$ (13 months)	Number of facilities $f_x$	Duration per event $t_x$ (Hours)
Recreational facilities	Theater <sup>1</sup>	Attend a performance	Audiences <sup>1</sup>	341.2	Number of sessions during data range	46,986 (Sessions)	4,814	3.0
	Eating and drinking establishments with Karaoke facility	Visit stores/facilities	Users	248.6	Number of days during data range	395 (Days)	25,110	2.5
	Sports facility			30.8	Number of days during data range excluding weekends and holidays	268 (Days)	71,271	1.5
	Beauty salon/Barber			11.43	Number of days during data range excluding Mondays and holidays	327 (Days)	371,688	1.0
Welfare facility	Elderly care facility	Stay for a night	Residents/ Users	32.2	Number of days during data range	395 (Days)	28,352	16.0
	Welfare facility for persons with disabilities			27.5			5,636	
Health institute	Hospital	Stay for a night	Inpatients	165.8	Number of days during data range	395 (Days)	8,300	16.0
	Clinic	Visit a doctor	Outpatients	44.1	Number of days during data range excluding Wednesdays and holidays	323 (Days)	102,616	0.5
	Dental clinic	Visit a doctor	Outpatients	19.7	Number of days during data range excluding Thursdays and holidays	326 (Days)	68,500	1.0
Eating and drinking establishments	Restaurant	Visit stores	Users	127.4	Number of days during data range excluding Wednesdays and holidays	323 (Days)	1,279,784	1.0
	Alcohol serving eating and drinking establishment			42.9			264,359	2.0
	Serviced entertaining bars and escort clubs			57.0			61,857	2.0

Note:

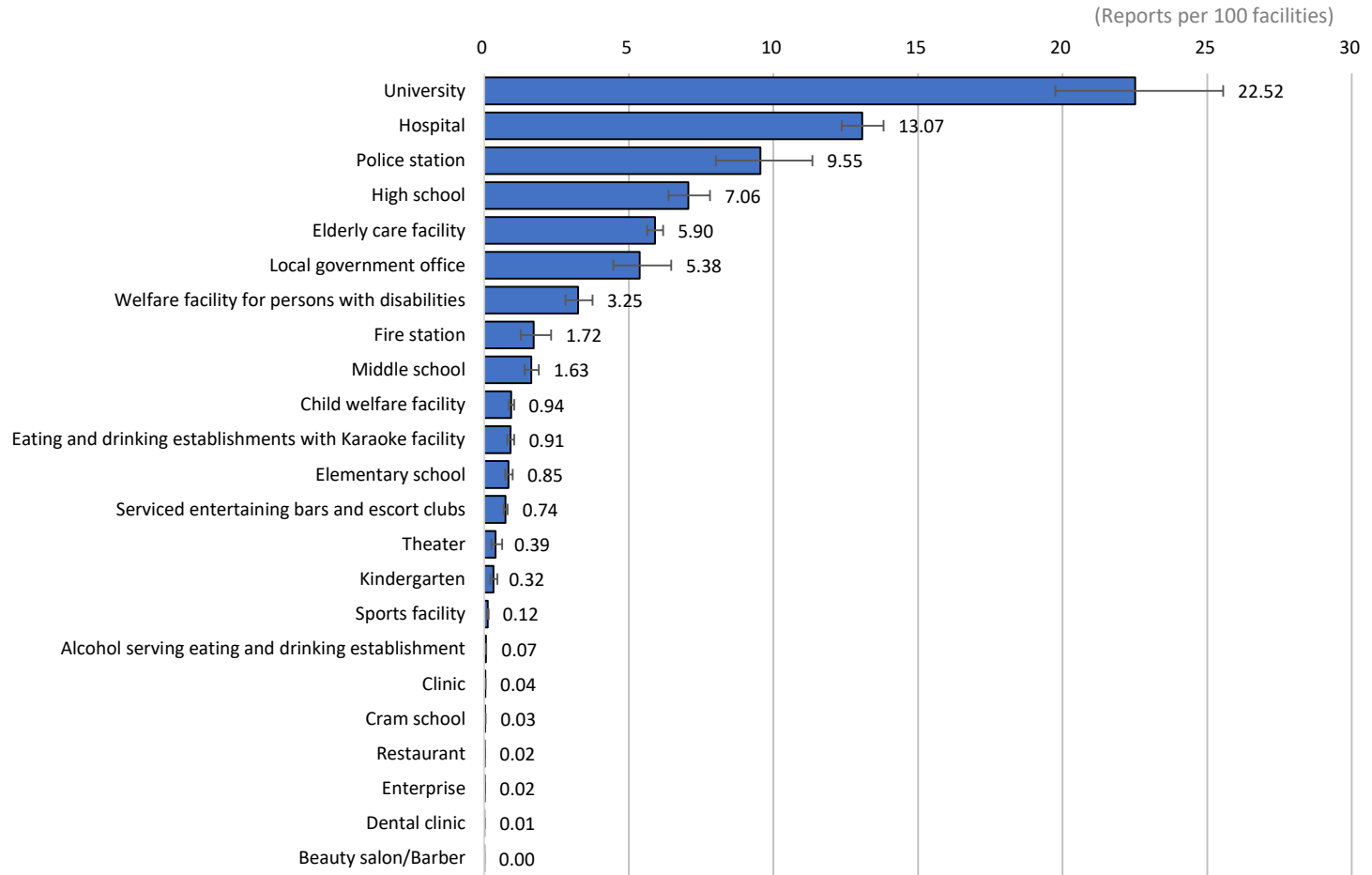
<sup>1</sup> Within theater clusters, infected people were mostly performers and staffs. Infections in audiences were rarely reported. Parameters specific to performers and staffs are required to execute more rigid risk assessment.

# each establishment type (2)

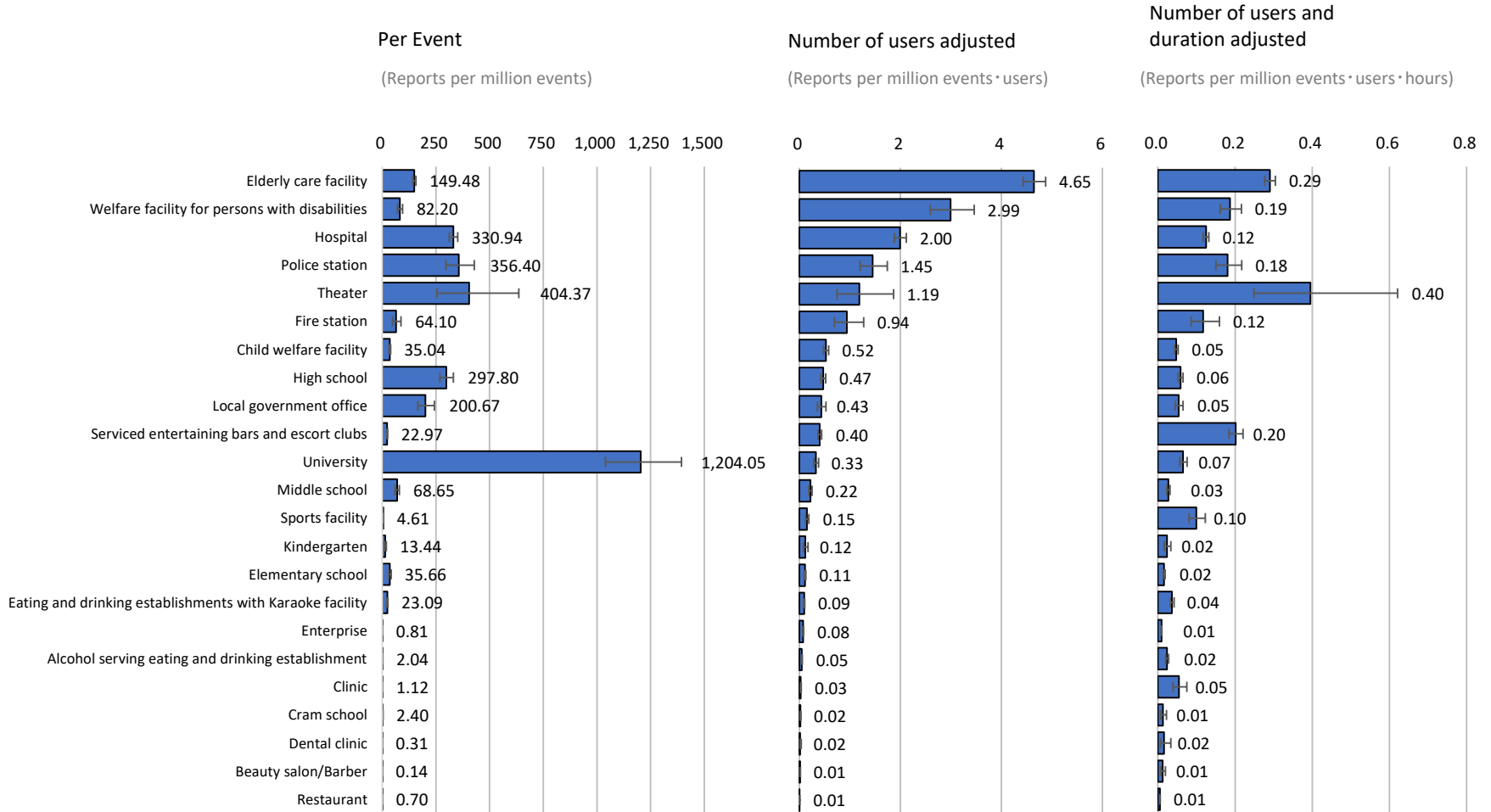
- "Event" which represents fundamental unit of usage was defined for each establishment types

Category	Establishment type	Definition of an event	Type of Users	Average number of users per event $\bar{u}_x$	Breakdown of Days	Number of days where events occur $d_x$ (13 months)	Number of facilities $f_x$	Duration per event $t_x$ (Hours)	
Public Office and Enterprises	Local government office	Work for a day	Staffs	464.2	Number of days during data range excluding weekends and holidays	268 (Days)	1,971	8.0	
	Police station			246.2			1,204		
	Fire station			68.2			2,445		
	Enterprise			10.6			5,340,783		7.8
Educational Institution	Elementary school	Attend for a day	Students	322.7	Number of days during data range excluding weekends, holidays, summer vacation, winter vacation, and spring vacation	237 (Days)	19,525	7.0	
	Middle school			316.6			10,142	8.0	
	High school			634.4			4,874	8.0	
	University			3,667.4			187 (Days)	795	5.0
	Kindergarten			114.5			237 (Days)	9,421	5.0
	Child welfare facility			66.8			268 (Days)	44,616	11.0
	Cram school	Attend classes for a day		122.8	Average weekly average attendance frequency * number of month during data range	125 (Days)	46,734	1.5	

- Number of cluster reports by establishment type (2020/06 - 2021/06)

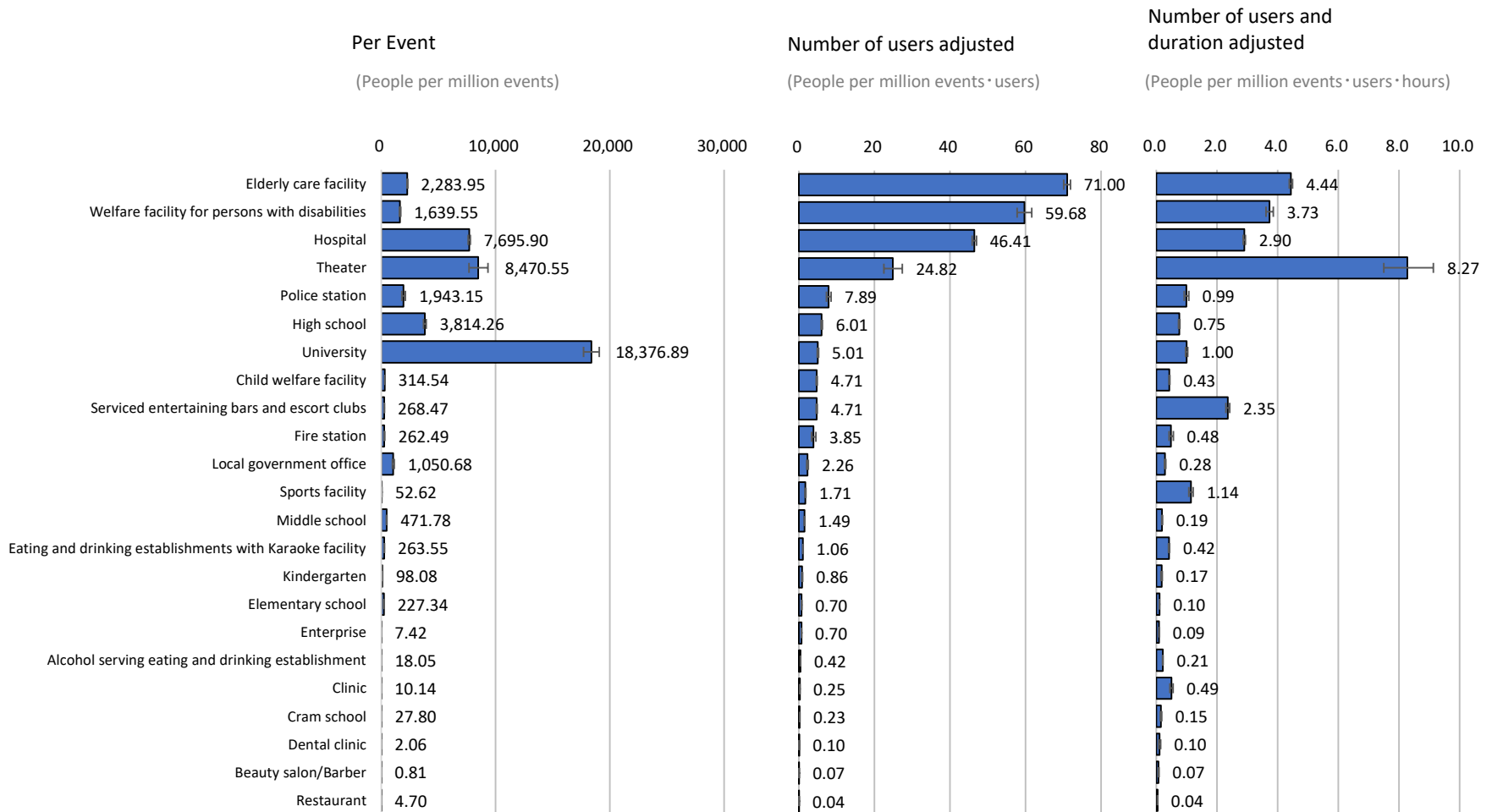


- Number of cluster reports per event (2020/06 - 2021/06)



Note  
<sup>1</sup> For theater, total number of sessions (46,986) was as "total number of event" in the calculation.

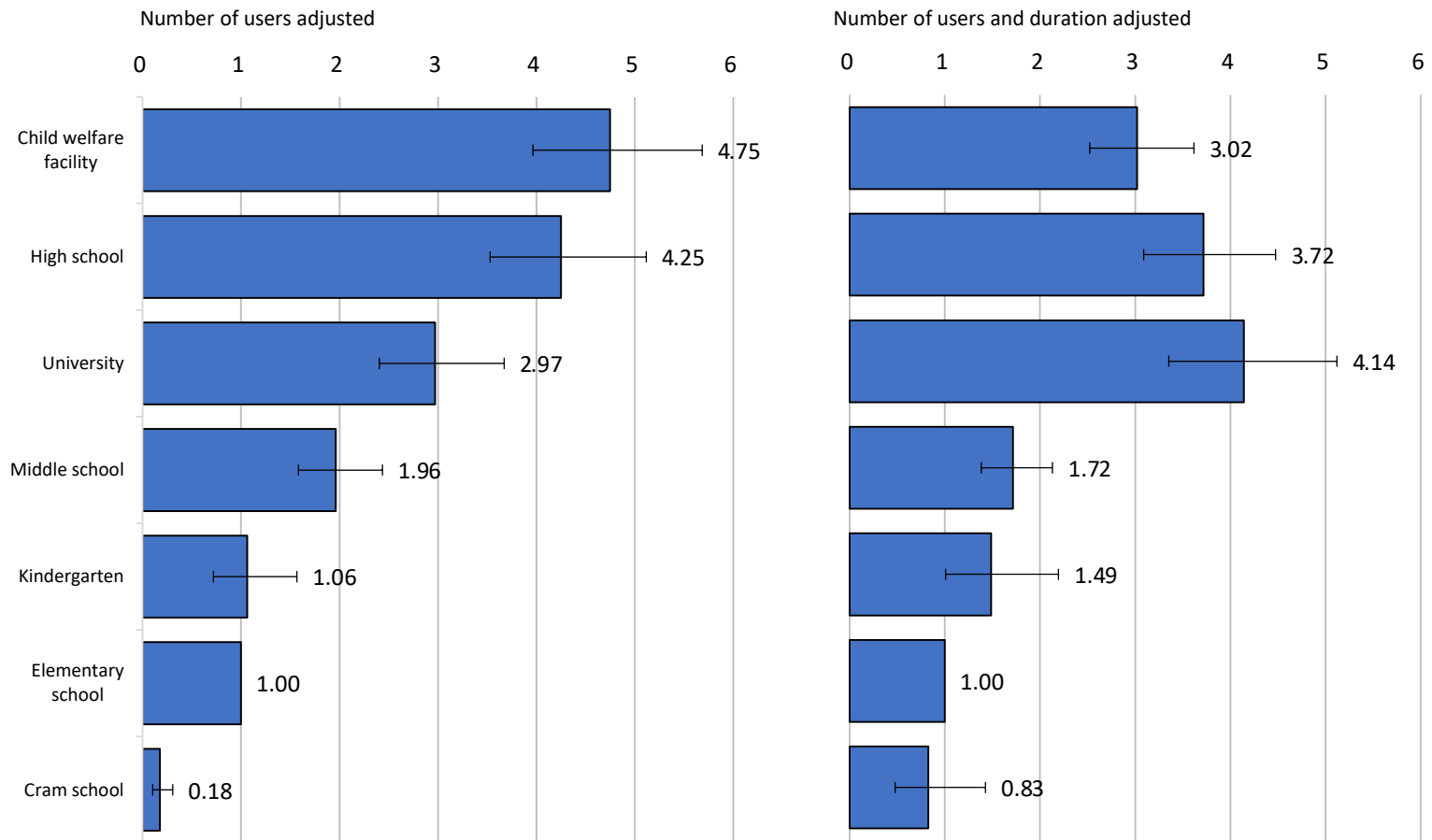
- Cluster size per event (2020/06 - 2021/06)



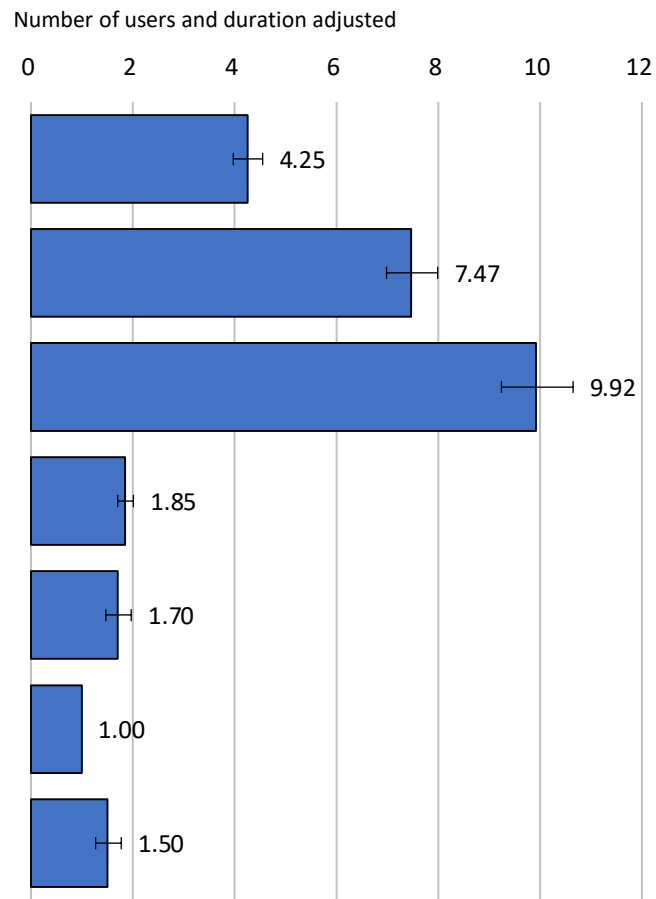
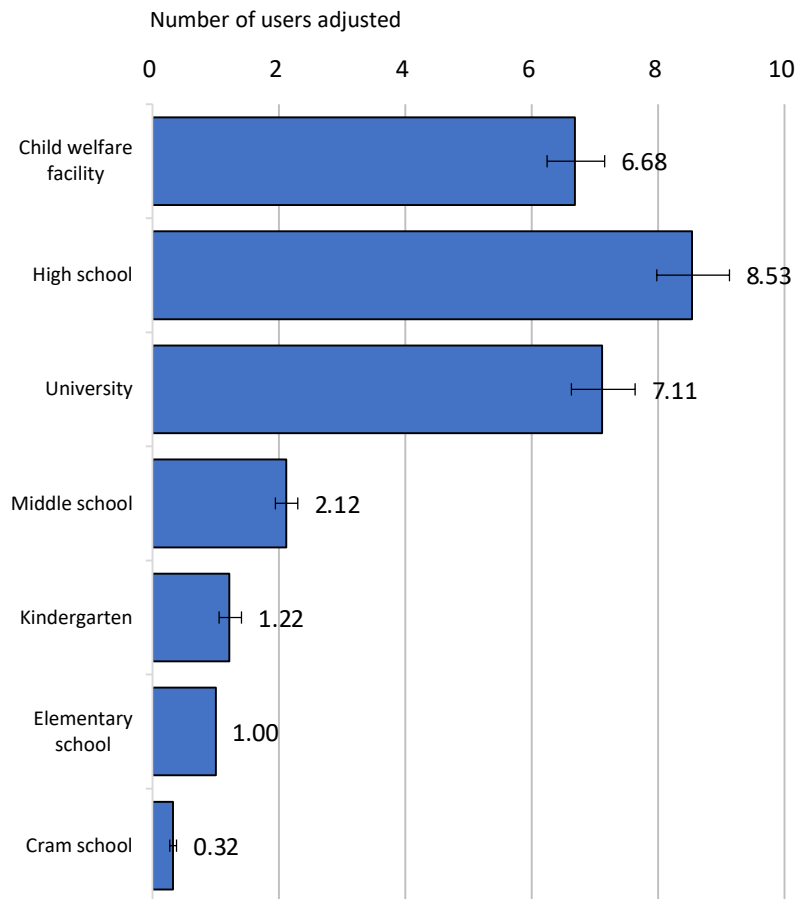
Note  
<sup>1</sup> For theater, total number of sessions (46,986) was as "total number of event" in the calculation.



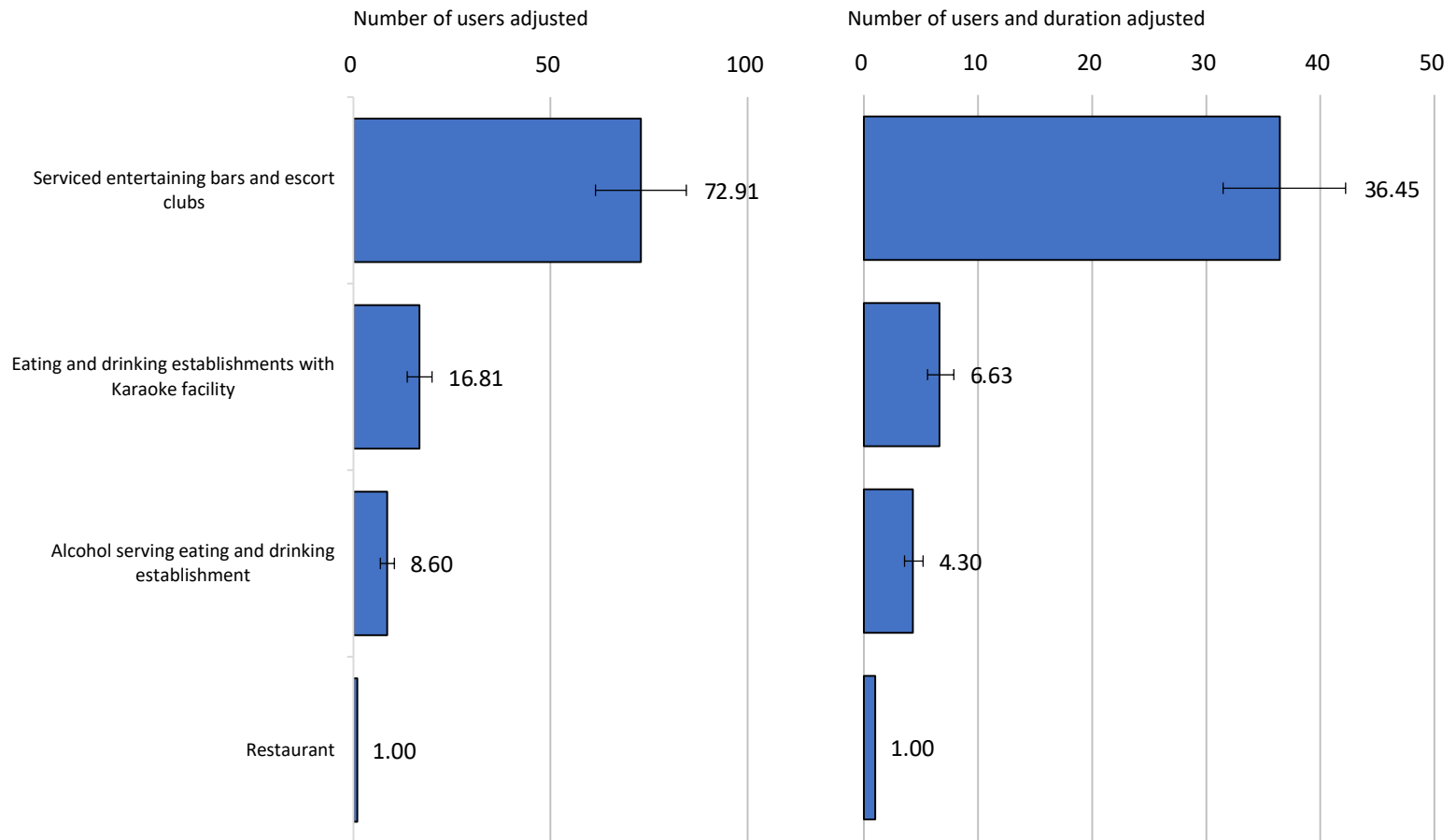
- Odds ratio of number of cluster reports per event at educational occasions
- (Elementary School = 1)



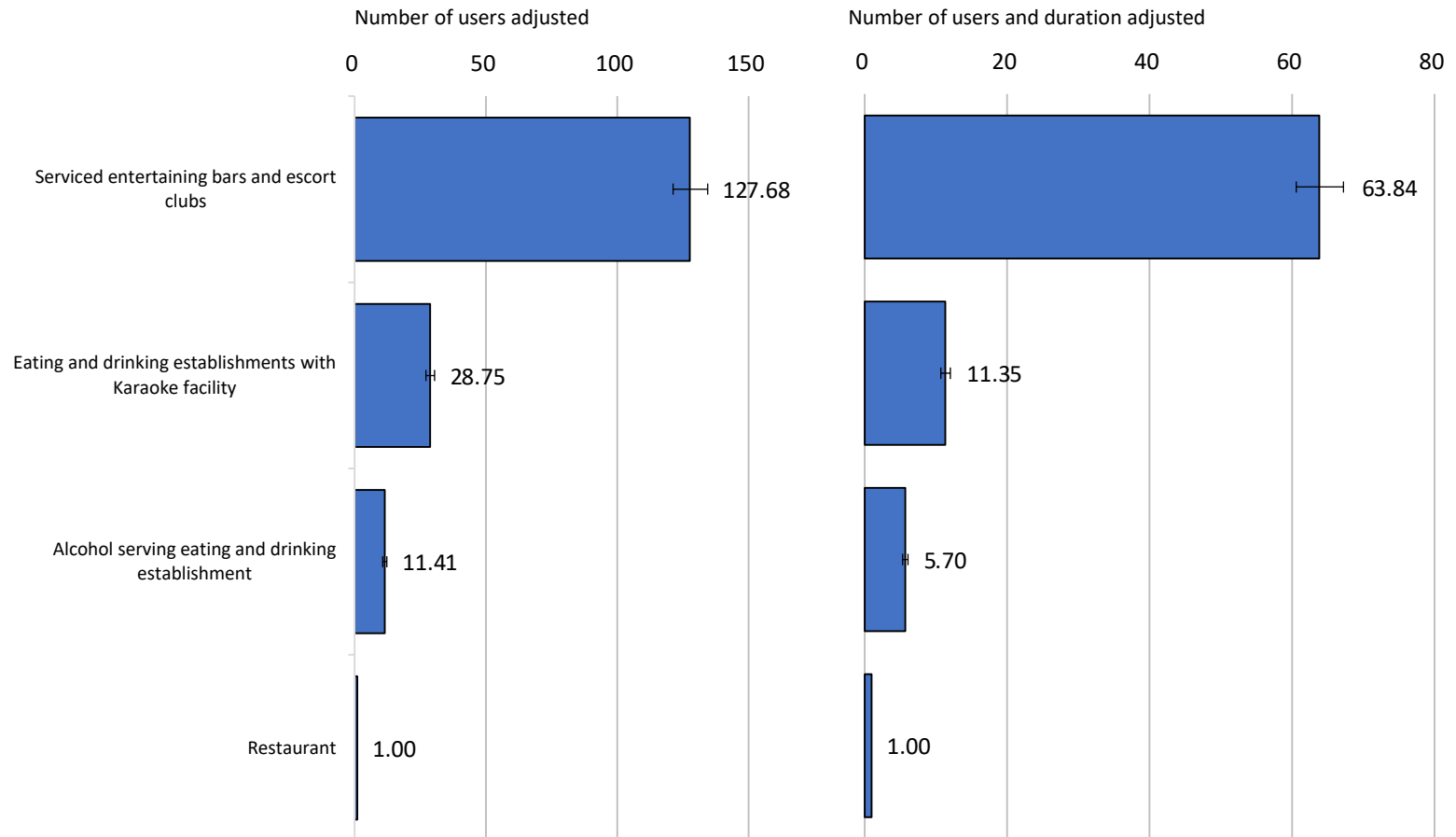
- Odds ratio of cluster size per event at educational occasions
- (Elementary School = 1)



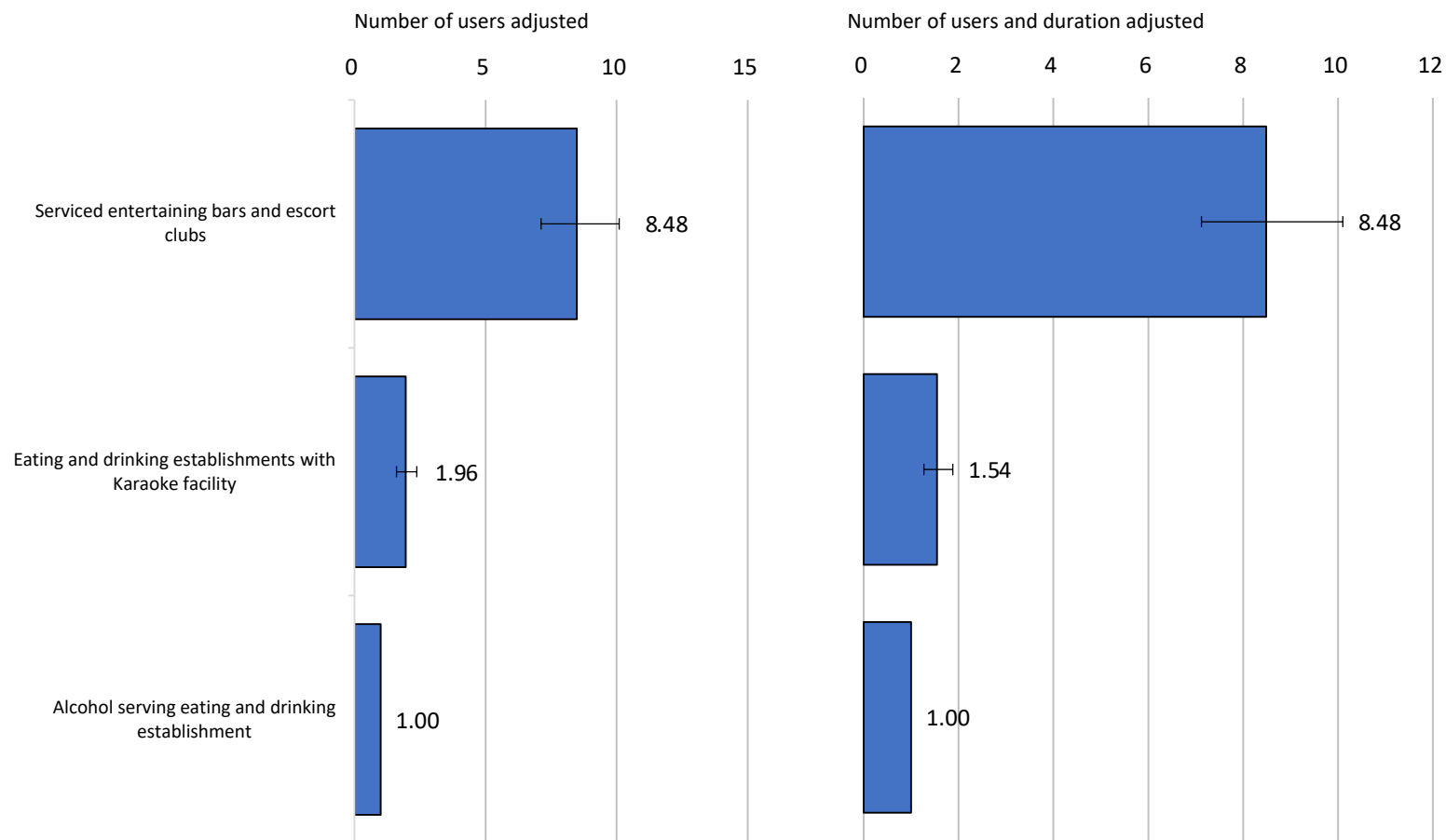
- Odds ratio of number of cluster reports per event at dining occasions
- (Restaurant = 1)



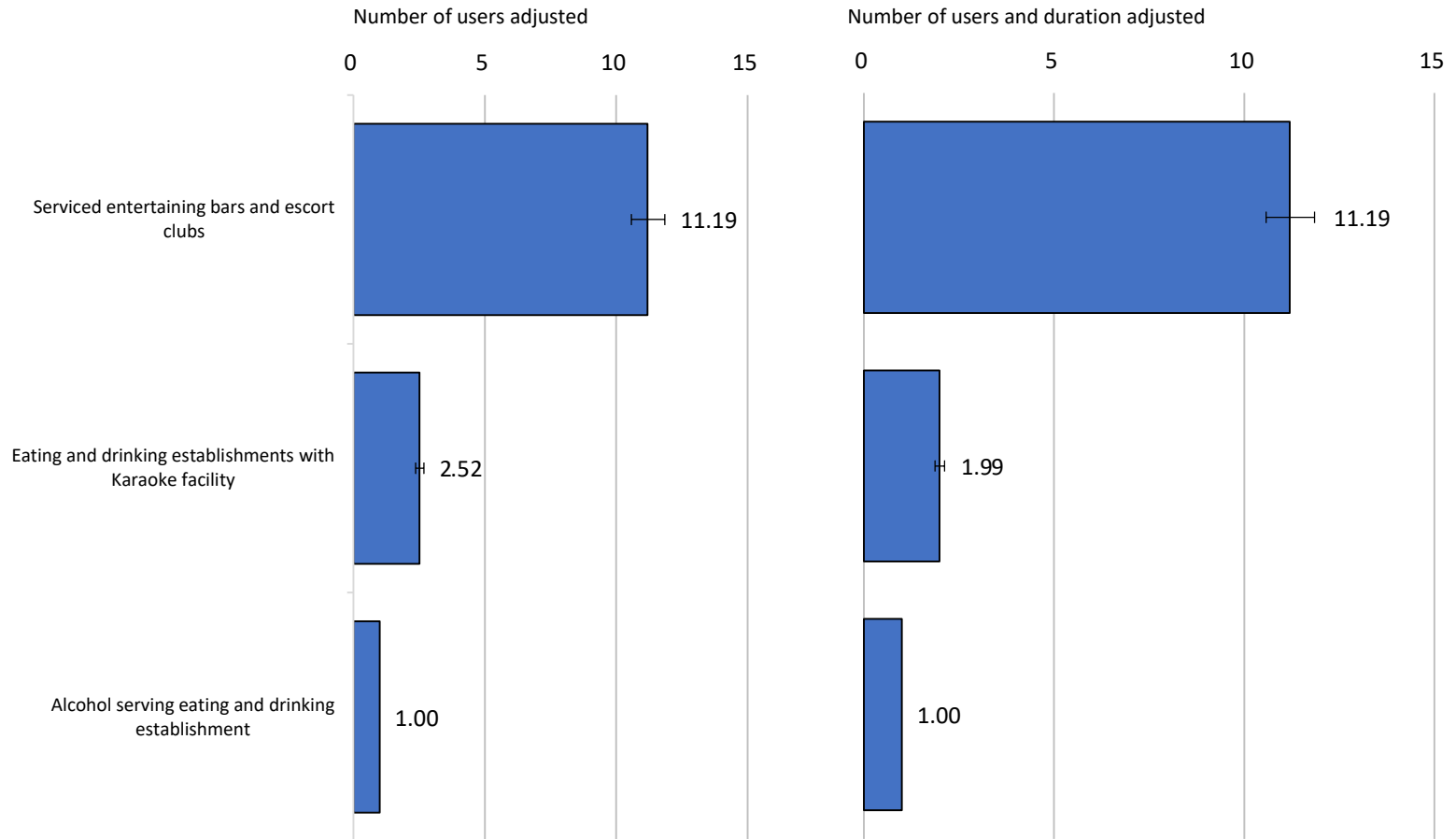
- Odds ratio of cluster size per event at dining occasions
- (Restaurant = 1)



- Odds ratio of number of cluster reports per event at dining occasions with alcohol
- (Alcohol serving eating and drinking establishment = 1)



- Odds ratio of cluster size per event at dining occasions with alcohol
- (Alcohol serving eating and drinking establishment = 1)



# Discussion

## Theaters

- Within theater clusters, most of the infected people were performers and staffs. Only few reports indicate infections in audiences.
- Parameters specific to performers and staffs are required to execute more rigid risk assessment.

## Universities

- Within university clusters, 46.4% (83 out of 179 reports) were identifiable as sports-related (i.e., athletic clubs and extracurricular activities.)
  - Clusters that were not explicitly identifiable as "sports-related" could substantially be related to athletic clubs or extracurricular activities involving sports.
  - Only 0.56% (1 out of 179 reports) explicitly noted that cluster infection occurred within the classroom/during classes.
- The risk index for the act of participating in classes at universities could substantially be lower. (Needs detailed data and analysis to be determined.)

## High schools

- Within high school clusters,
  - 8.1% (28 out of 344 reports) were identifiable as sports-related (i.e., athletic club).
  - Separately, 8.7% (30 out of 344 reports) were identifiable as extracurricular activities-related, of which details are unknown.

## Schools

- Within all cluster reports of schools, 18.1% (195 out of 1077 reports) were reports which its school type were unknown/unidentifiable and were excluded from analysis.

## Public Offices (Police stations/Fire stations/Local government office)

- Clusters which occurred at the public offices are more likely to be covered in media. (media bias)
  - This may be causing the reported rate of clusters to be higher than other establishment types, resulting in the increase of risk indexes.

## Eating and Drinking establishments

- "Serviced entertaining bars and escort clubs" only include businesses registered under Entertainment Business Act. (e.g., hostess bars and night clubs)
- "Alcohol serving eating and drinking establishments" only include businesses registered as "late night alcohol serving eating and drinking establishments" (e.g., "Izakaya" and bars)
- "Restaurants" include all facilities registered as "restaurants business" and "coffee shop business" but "serviced entertaining bars and escort clubs" and "alcohol serving eating and drinking establishments."
- Clusters reported as "meal with several people" (会食) were not included in either establishment types

## Restaurants

- Within restaurant clusters, only 14.1% (41 out of 291 reports) were identifiable as "regular meal purpose" when judged by reported cluster names.

## Eating and Drinking establishments with Karaoke facility

- Within Karaoke clusters,
  - 74.7% (181 out of 229 reports) were most likely to be Karaoke at "Eating and drinking establishments" when judged by reported cluster names.
  - 12.7% (29 out of 229 reports) were most likely to be Karaoke at "Karaoke Box" when judged by reported cluster names.
  - 7.9% (29 out of 229 reports) were most likely to be Karaoke at "Serviced entertaining bars and escort clubs" when judged by reported cluster names.