Risk Assessment of Arboviruses in Brazil (Country-wide, States and State Capitals)

2025-09-01

Content:

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1. Gathering Data

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2. Preparing Data

Grouping by Municipality, State, and Country

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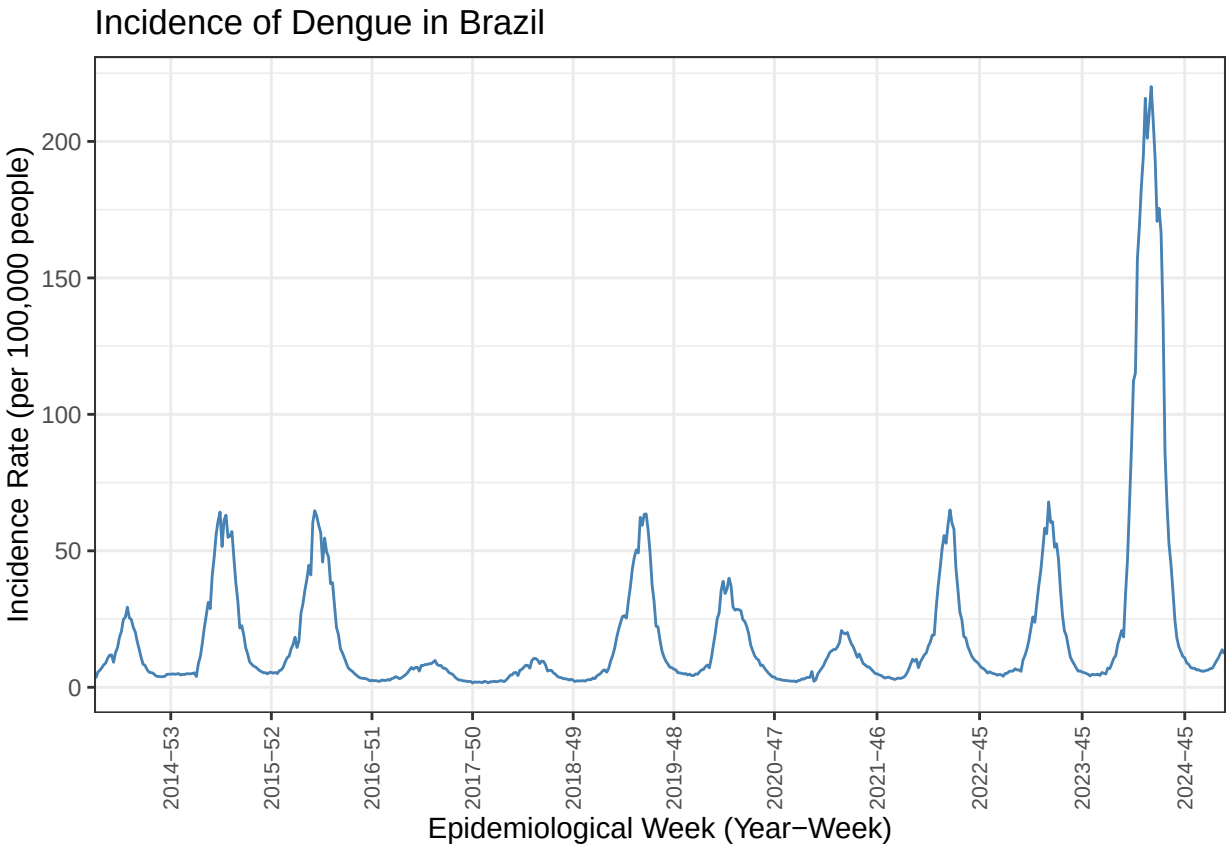
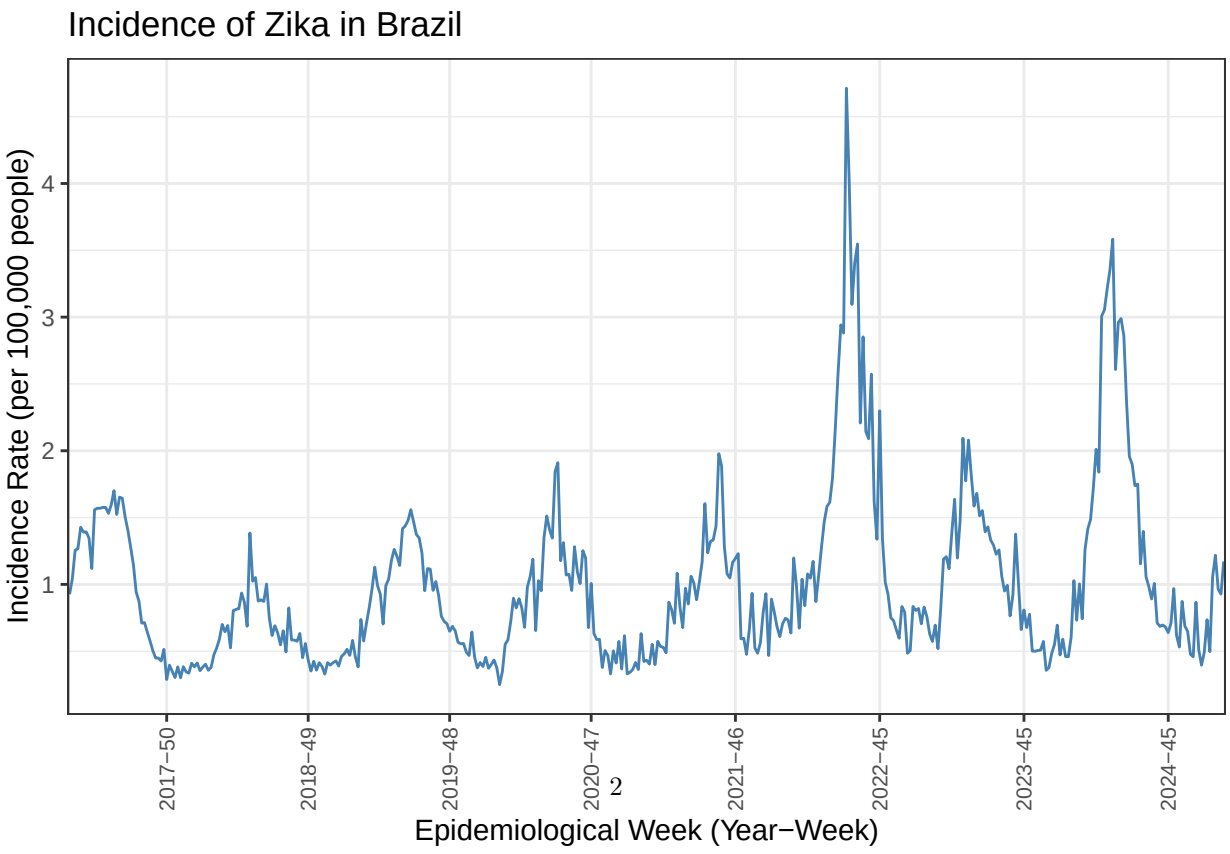
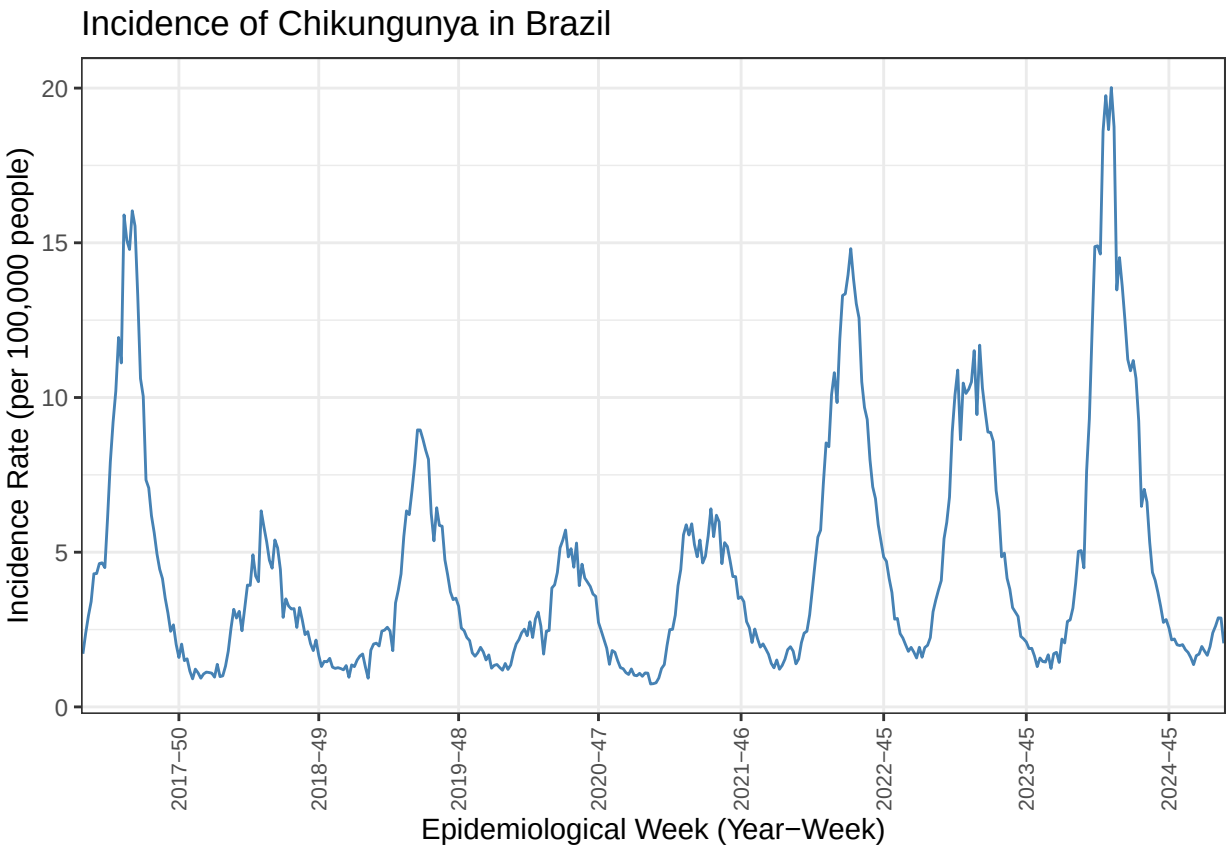
3. Descriptive Incidence Graphs

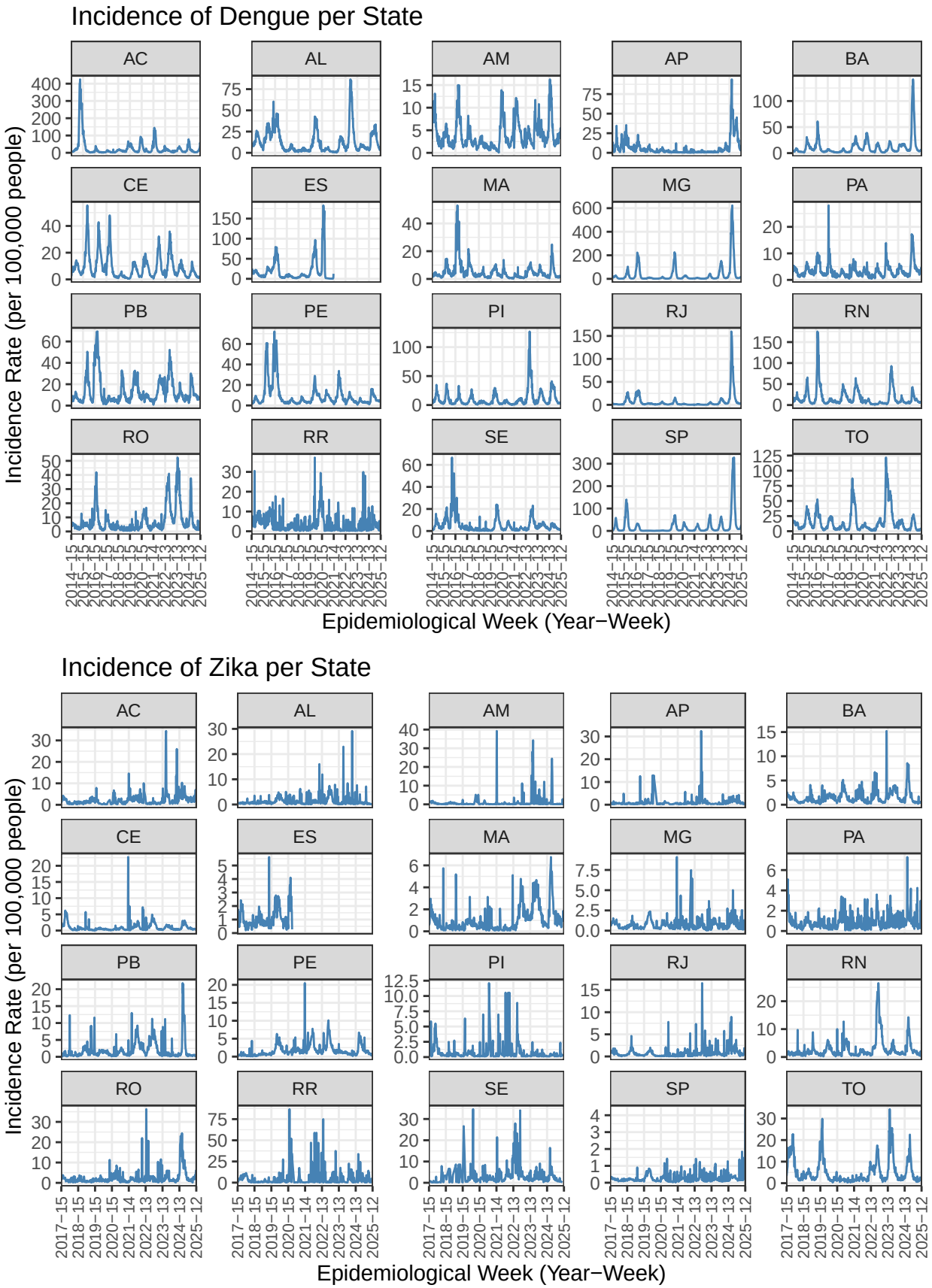
3.1. Country-wide Incidence

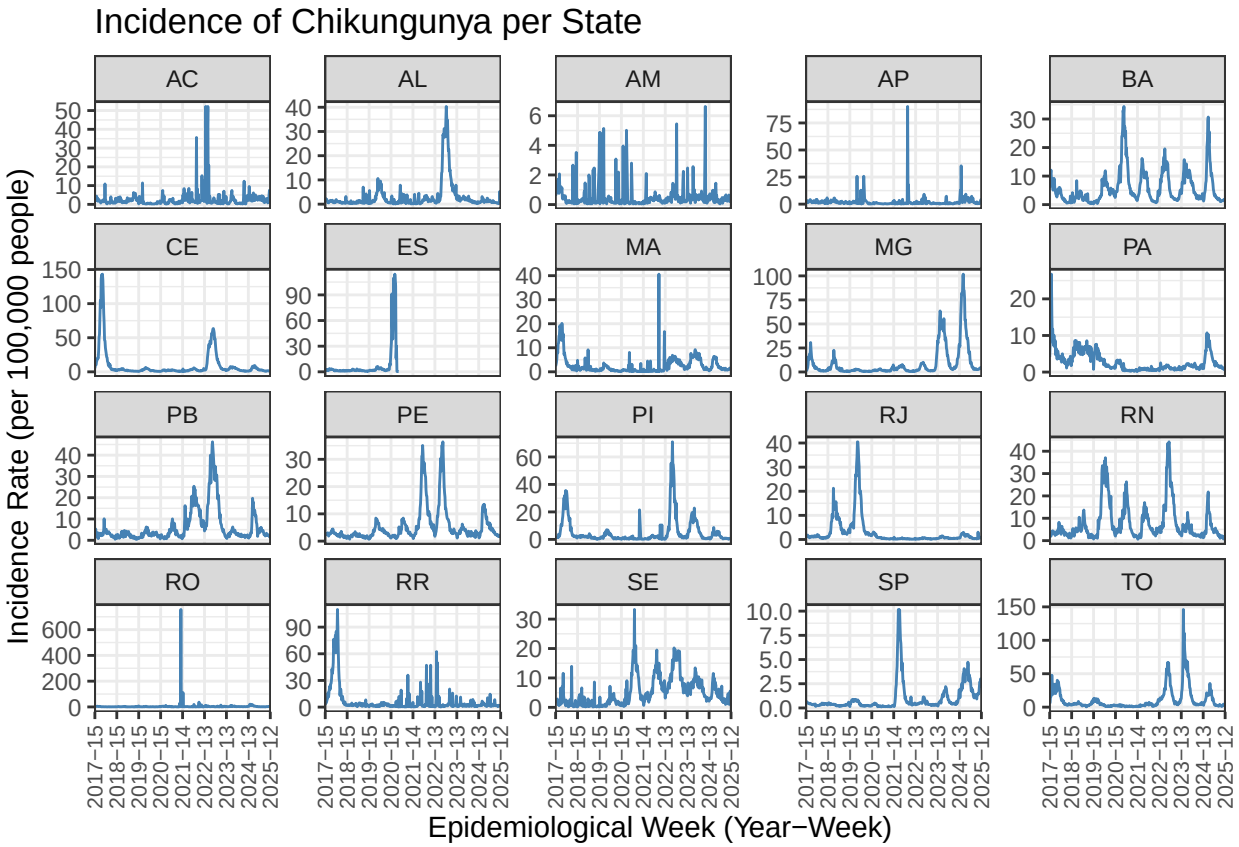




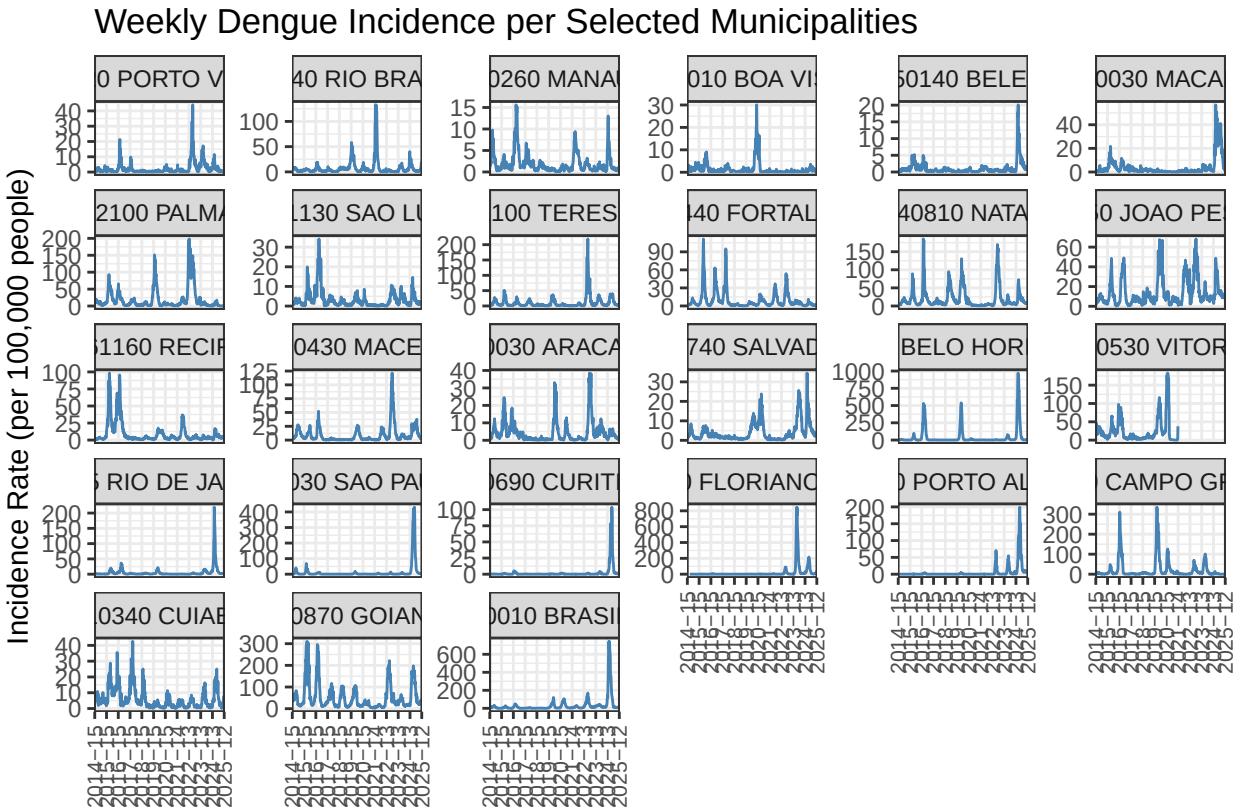

Incidence of Chikungunya in Brazil
Incidence Rate (per 100,000 people)
0
5
10
15
20
2017−50
2018−49
2019−48
2020−47
2021−46
2022−45
2023−45
2024−45
Epidemiological Week (Year−Week)

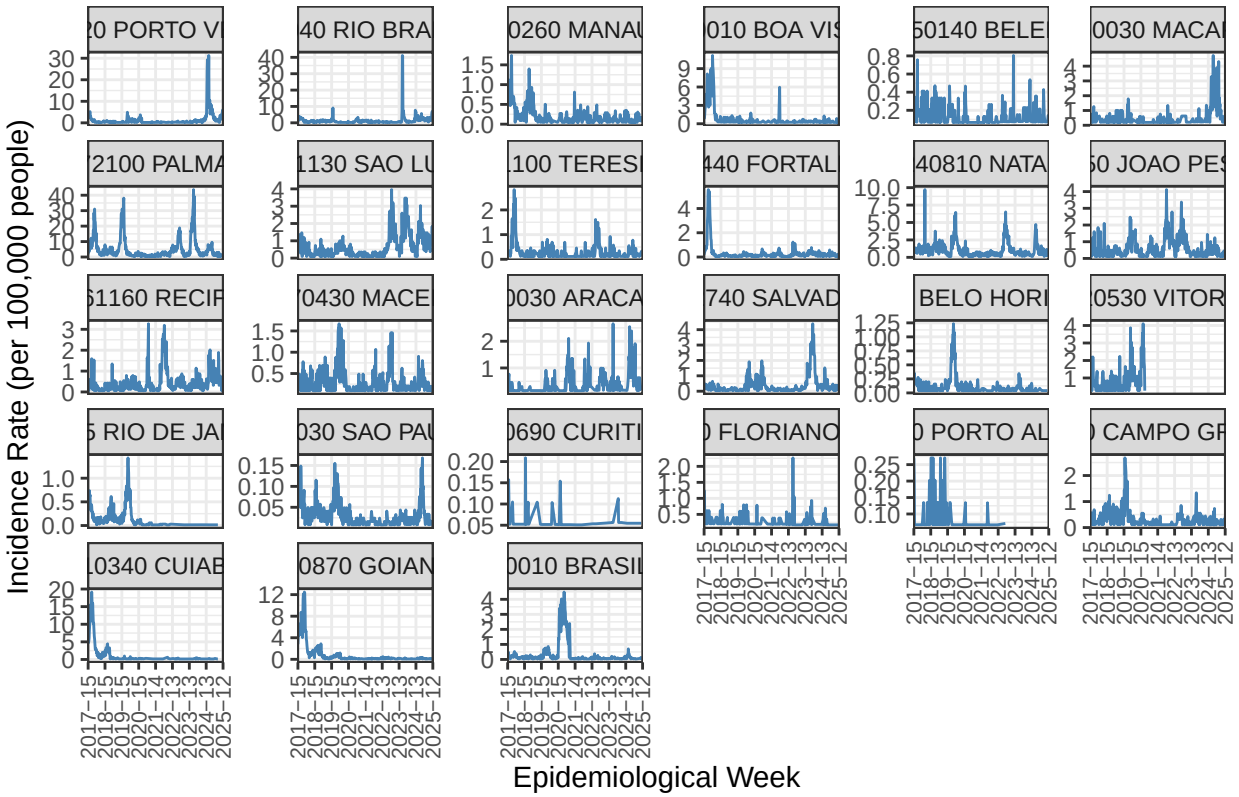
3.2. State-level Incidence

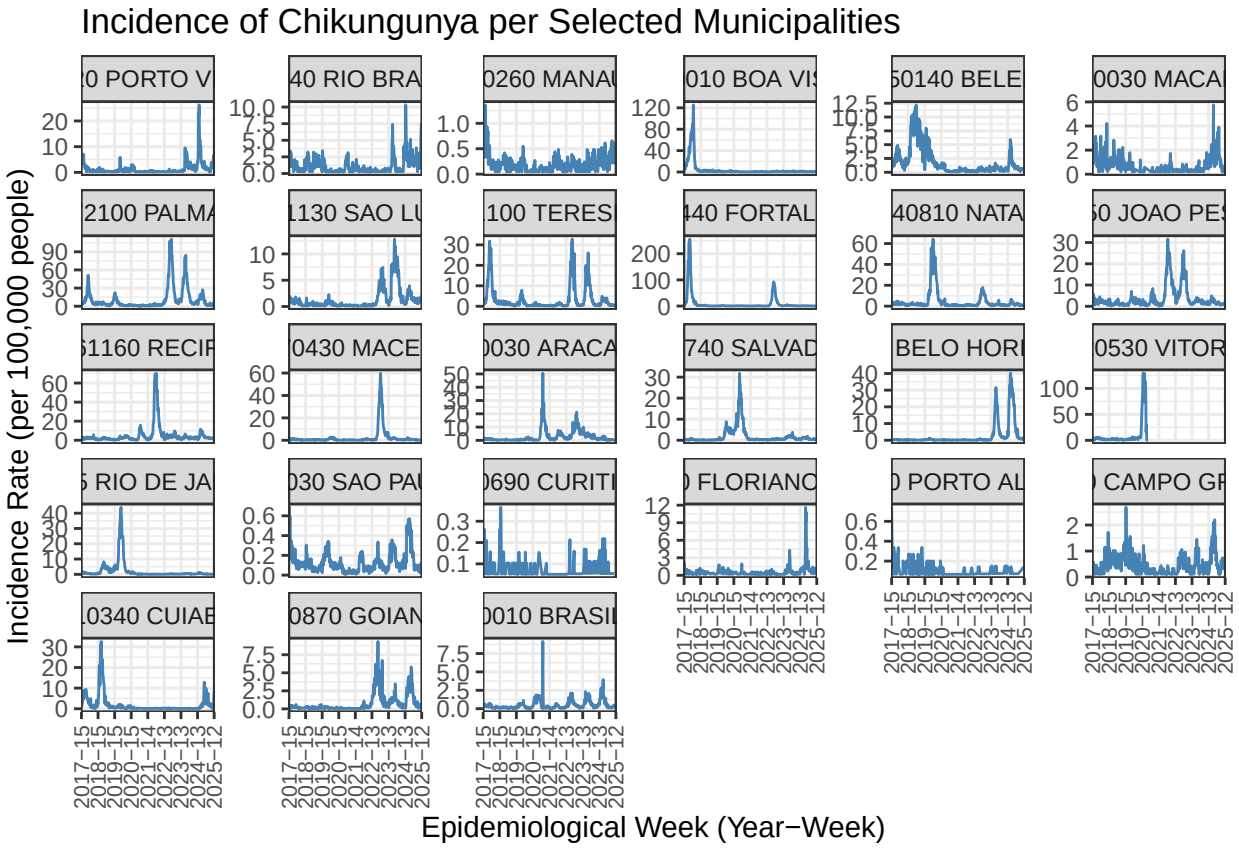



Incidence of Chikungunya per State
AC
AL
AM
AP
BA
CE
ES
MA
MG
PA
PB
PE
PI
RJ
RN
RO
RR
SE
SP
TO
Incidence Rate (per 100,000 people)
Epidemiological Week (Year−Week)
2017−15
2018−15
2019−15
2020−15
2021−14
2022−13
2023−13
2024−13
2025−12

3.3. Selected Municipalities Incidence







4. Risk Assessment Function

5. Risk Assessment - Country Level

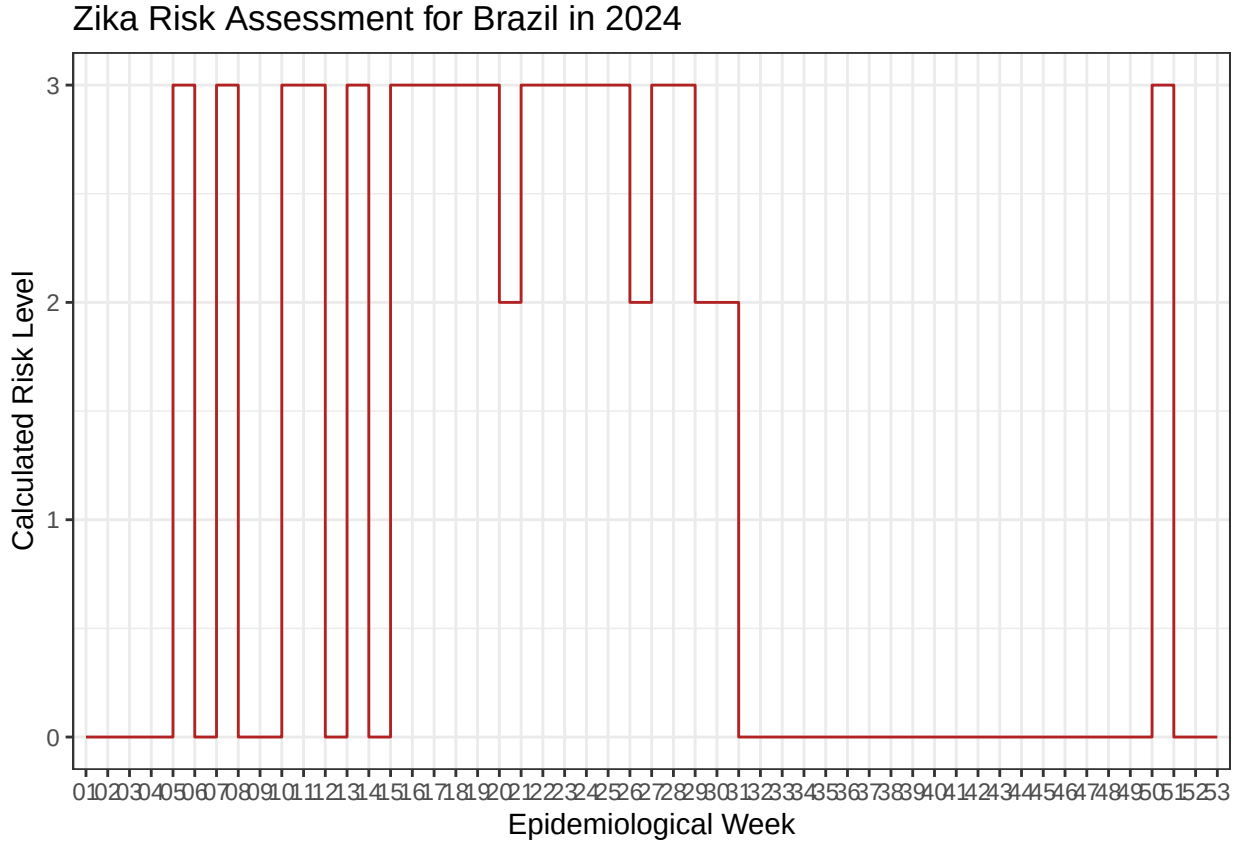
Running risk assessment

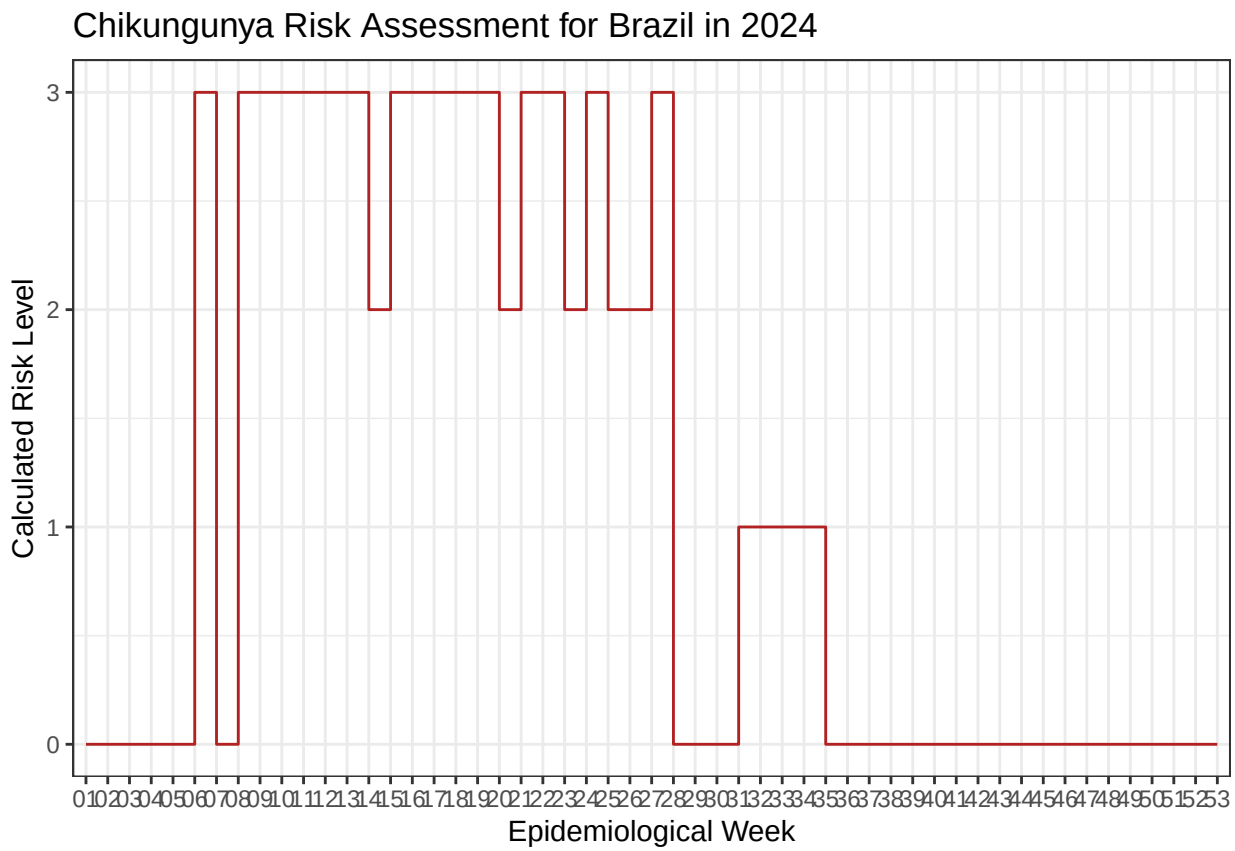
Table of epidemic years for Brazil

Tabela 1: Epidemic Years of Arboviruses for Brazil

Country	Virus	Epidemic Years
Brazil	Chikungunya	2023
Brazil	Dengue	2015, 2016, 2019, 2021, 2023
Brazil	Zika	2022, 2023

Plotting Risk Assessment for Brazil in 2024





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6. Risk Assessment - State Level

Running risk assessment

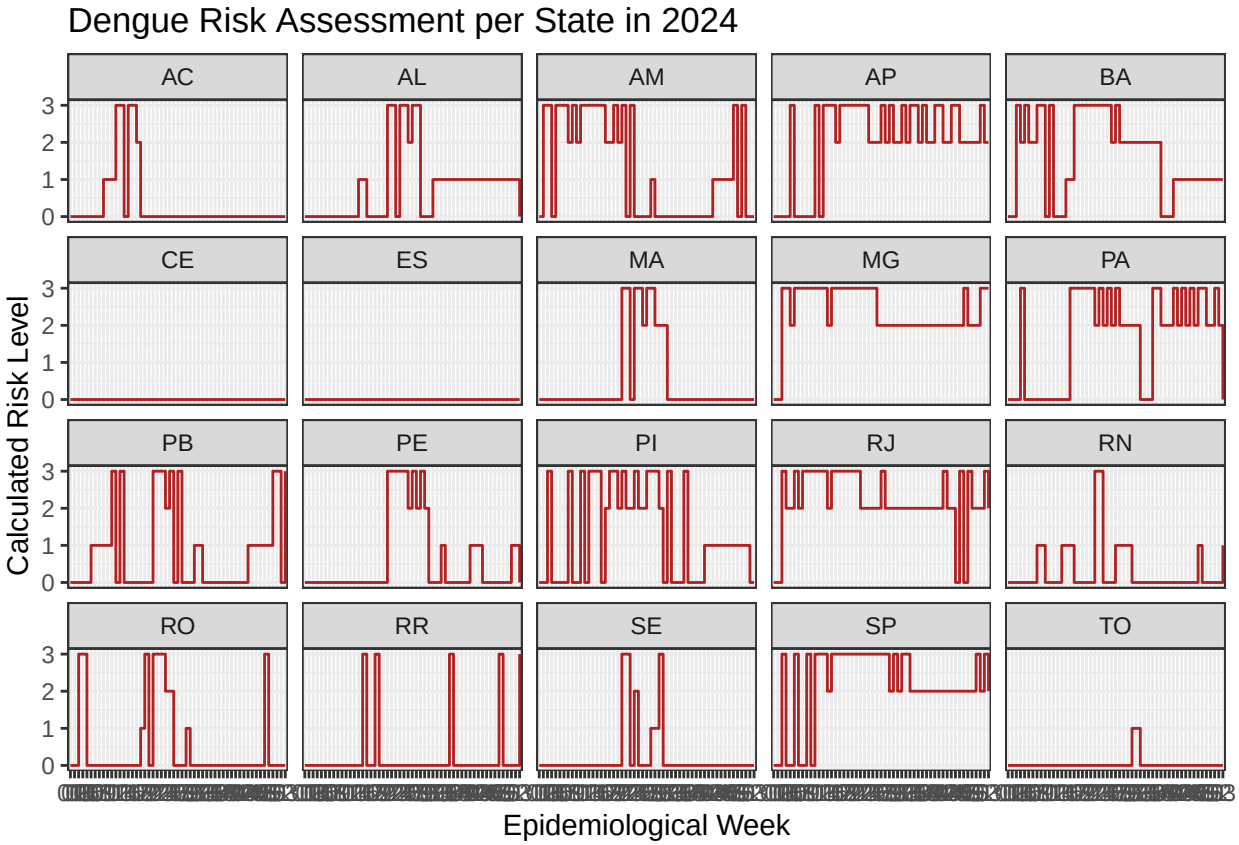
Table of epidemic years per state

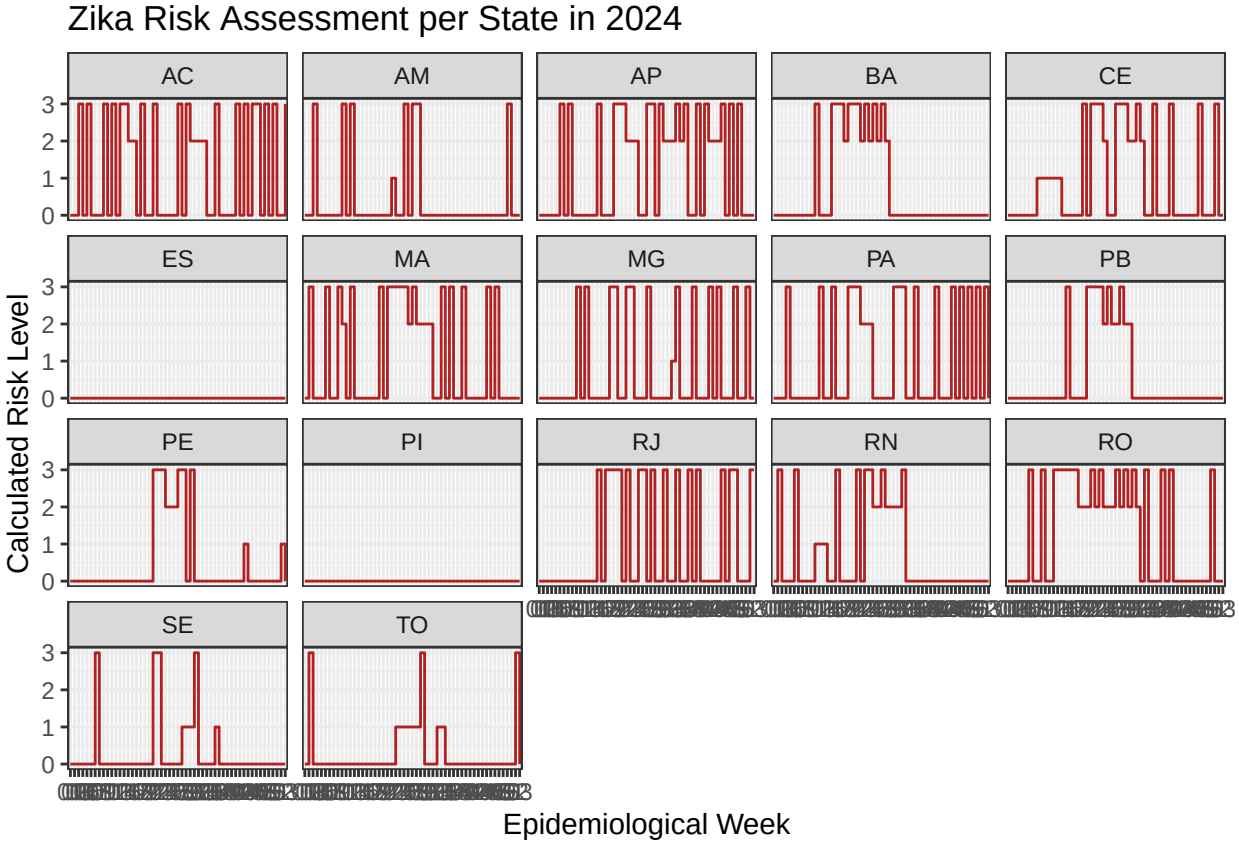
Tabela 2: Epidemic Years of Arboviruses by State

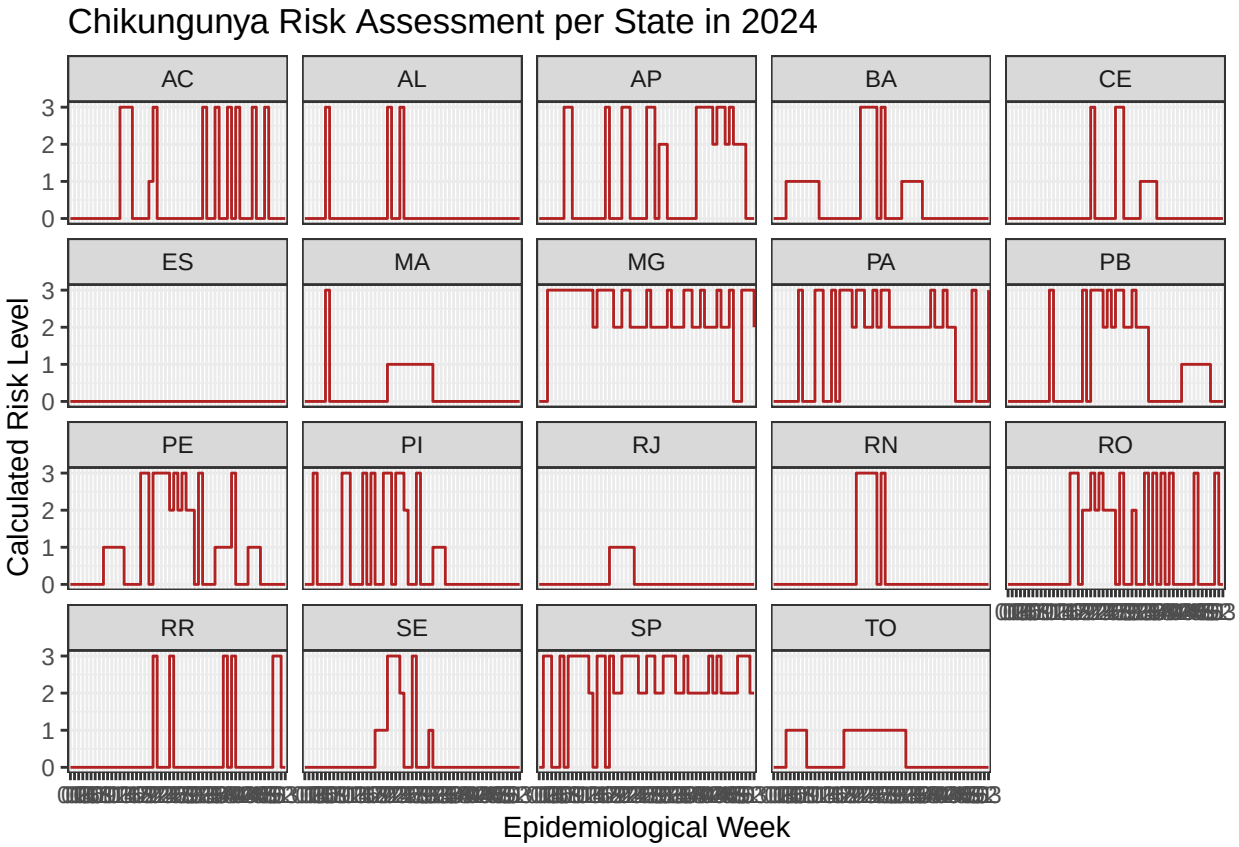
State	Virus	Epidemic Years
AC	Chikungunya	2017, 2019, 2020, 2021, 2022
AC	Dengue	2014, 2015, 2020, 2021
AC	Zika	2021, 2022, 2023
AL	Chikungunya	2022, 2023
AL	Dengue	2016, 2022
AM	Dengue	2016, 2020, 2021, 2022, 2023
AM	Zika	2020, 2021, 2022, 2023
AP	Chikungunya	2017, 2018, 2019, 2021
AP	Dengue	2014, 2015, 2016, 2023
AP	Zika	2019, 2022
BA	Chikungunya	2020

State	Virus	Epidemic Years
BA	Dengue	2016, 2019, 2020
BA	Zika	2017, 2019, 2022, 2023
CE	Chikungunya	2017, 2022
CE	Dengue	2015, 2017
CE	Zika	2017, 2018, 2021, 2022
ES	Dengue	2016, 2019, 2020
MA	Chikungunya	2017, 2021, 2022
MA	Dengue	2015, 2016, 2017
MA	Zika	2017, 2018, 2022, 2023
MG	Chikungunya	2023
MG	Dengue	2016, 2019, 2023
MG	Zika	2019, 2020, 2021
PA	Chikungunya	2017, 2018, 2019
PA	Dengue	2015, 2016, 2017, 2022
PA	Zika	2017, 2020, 2021, 2022, 2023
PB	Chikungunya	2021, 2022
PB	Dengue	2016, 2019, 2021, 2022
PB	Zika	2019, 2020, 2021, 2022, 2023
PE	Chikungunya	2021, 2022
PE	Dengue	2015, 2016, 2021
PE	Zika	2021, 2022
PI	Chikungunya	2017, 2018, 2022, 2023
PI	Dengue	2014, 2015, 2022, 2023
PI	Zika	2017, 2020, 2021, 2022
RJ	Chikungunya	2019
RJ	Dengue	2015, 2016
RJ	Zika	2018, 2020, 2021, 2022, 2023
RN	Chikungunya	2019, 2020, 2022
RN	Dengue	2016, 2019, 2020, 2022
RN	Zika	2017, 2020, 2022, 2023
RO	Chikungunya	2018, 2020, 2021, 2022, 2023
RO	Dengue	2016, 2019, 2021, 2022, 2023
RO	Zika	2020, 2021, 2022, 2023
RR	Chikungunya	2017, 2021, 2022, 2023
RR	Dengue	2014, 2015, 2016, 2019, 2020, 2021, 2023
SE	Chikungunya	2022
SE	Dengue	2015, 2016, 2019, 2022
SE	Zika	2019, 2022
SP	Chikungunya	2021, 2022
SP	Dengue	2015, 2016, 2019
TO	Chikungunya	2023
TO	Dengue	2021, 2022
TO	Zika	2017, 2019

Plotting Risk Assessment per State in 2024







7. Risk Assessment - Municipality Level

Running risk assessment

Table of epidemic years per municipality

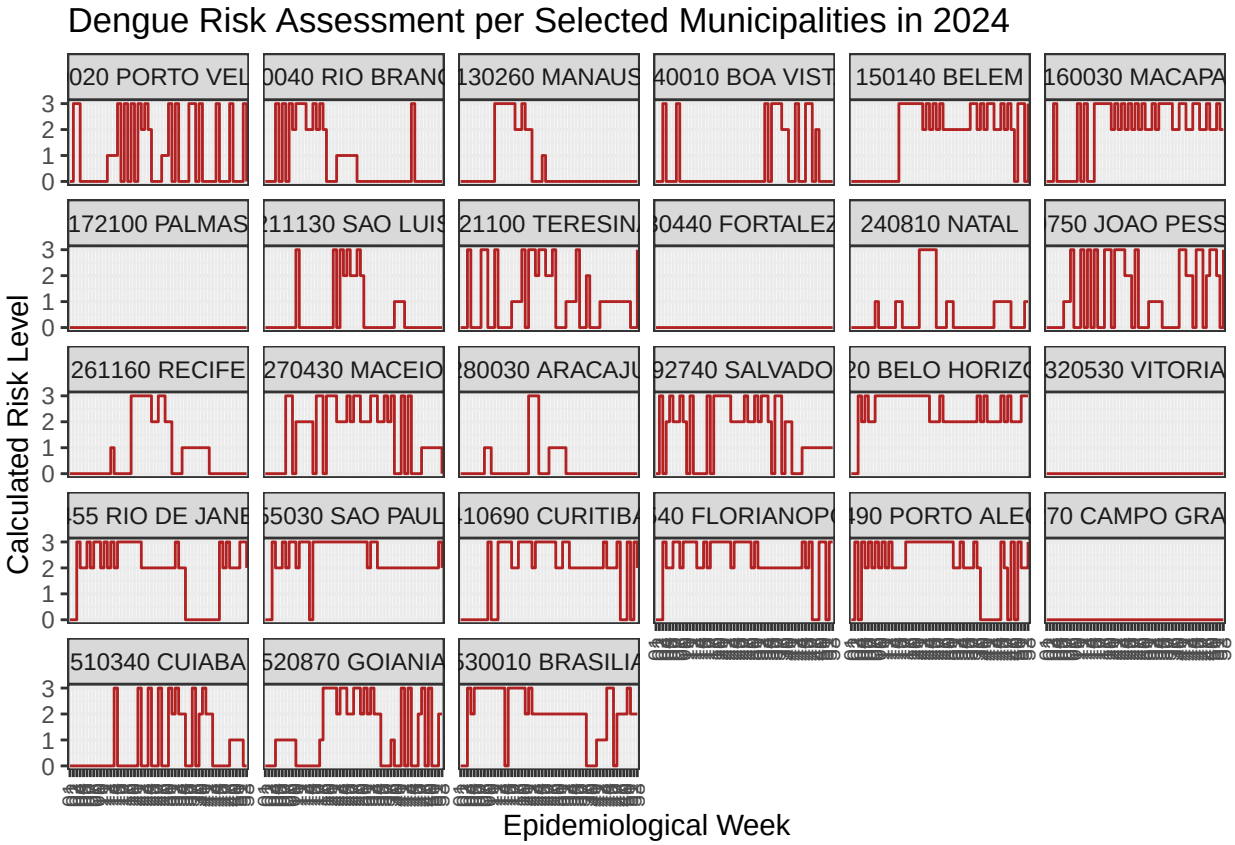
Tabela 3: Epidemic Years of Arboviruses by Municipality

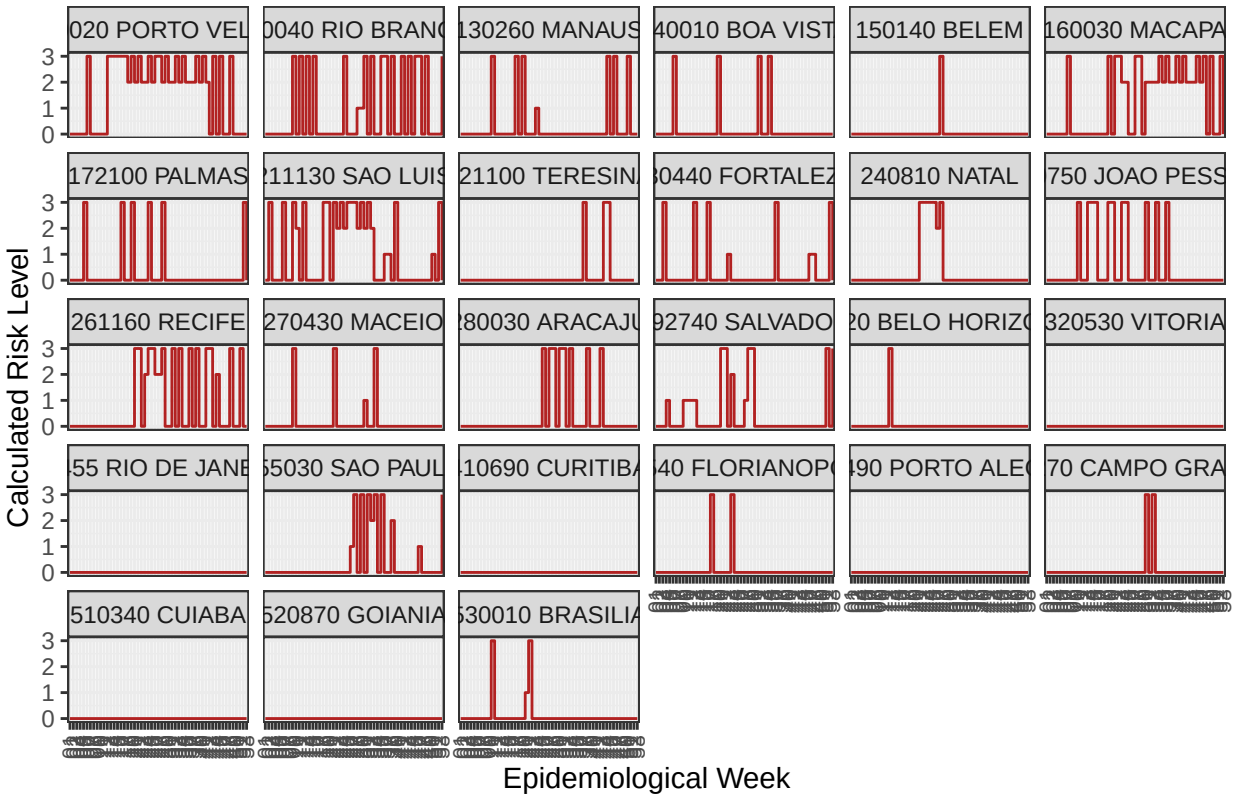
Municipality	Virus	Epidemic Years
110020 PORTO VELHO	Chikungunya	2023
110020 PORTO VELHO	Dengue	2015, 2016, 2022, 2023
110020 PORTO VELHO	Zika	2017, 2019
120040 RIO BRANCO	Chikungunya	2018, 2019, 2020, 2023
120040 RIO BRANCO	Dengue	2018, 2019, 2021
120040 RIO BRANCO	Zika	2023
130260 MANAUS	Chikungunya	2017, 2021, 2023
130260 MANAUS	Dengue	2016, 2017
130260 MANAUS	Zika	2017, 2018
140010 BOA VISTA	Chikungunya	2017, 2018
140010 BOA VISTA	Dengue	2015, 2017, 2019, 2020

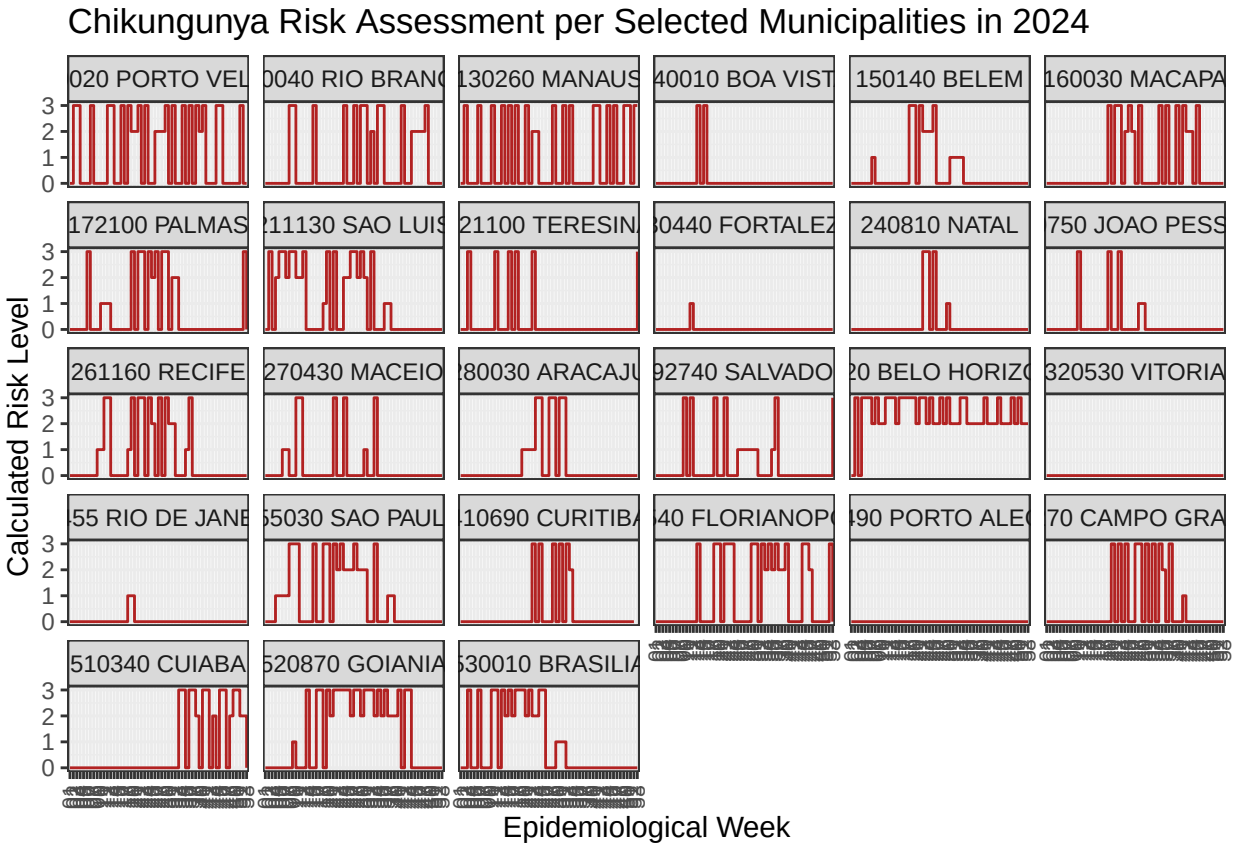
Municipality	Virus	Epidemic Years
140010 BOA VISTA	Zika	2017
150140 BELEM	Chikungunya	2018, 2019
150140 BELEM	Dengue	2015, 2016, 2018, 2021, 2023
160030 MACAPA	Chikungunya	2017
160030 MACAPA	Dengue	2015, 2016, 2017, 2018, 2023
172100 PALMAS	Chikungunya	2022, 2023
172100 PALMAS	Dengue	2015, 2019, 2021, 2022
172100 PALMAS	Zika	2017, 2019, 2023
211130 SAO LUIS	Chikungunya	2023
211130 SAO LUIS	Dengue	2015, 2016, 2022, 2023
211130 SAO LUIS	Zika	2017, 2023
221100 TERESINA	Chikungunya	2017, 2018, 2023
221100 TERESINA	Dengue	2014, 2015, 2018, 2022, 2023
221100 TERESINA	Zika	2017, 2022
230440 FORTALEZA	Chikungunya	2017, 2018
230440 FORTALEZA	Dengue	2015, 2016, 2017
230440 FORTALEZA	Zika	2017
240810 NATAL	Chikungunya	2019, 2020
240810 NATAL	Dengue	2016, 2019, 2020, 2022
240810 NATAL	Zika	2017, 2020, 2022
250750 JOAO PESSOA	Chikungunya	2021, 2022
250750 JOAO PESSOA	Dengue	2016, 2018, 2019, 2020, 2021, 2022
250750 JOAO PESSOA	Zika	2019, 2021, 2022
261160 RECIFE	Chikungunya	2021, 2022
261160 RECIFE	Dengue	2015, 2016, 2021
261160 RECIFE	Zika	2017, 2020, 2021, 2022
270430 MACEIO	Chikungunya	2022, 2023
270430 MACEIO	Dengue	2015, 2016, 2022
270430 MACEIO	Zika	2019, 2023
280030 ARACAJU	Chikungunya	2020, 2022, 2023
280030 ARACAJU	Dengue	2015, 2016, 2019, 2022
292740 SALVADOR	Chikungunya	2019, 2020
292740 SALVADOR	Dengue	2019, 2020, 2023
292740 SALVADOR	Zika	2019, 2023
310620 BELO HORIZONTE	Chikungunya	2023
310620 BELO HORIZONTE	Dengue	2015, 2016, 2019, 2023
310620 BELO HORIZONTE	Zika	2019
320530 VITORIA	Dengue	2016, 2019, 2020
330455 RIO DE JANEIRO	Chikungunya	2019
330455 RIO DE JANEIRO	Dengue	2015, 2016, 2023
355030 SAO PAULO	Chikungunya	2017
355030 SAO PAULO	Dengue	2014, 2015, 2016, 2023
355030 SAO PAULO	Zika	2019
410690 CURITIBA	Dengue	2016, 2023
420540 FLORIANOPOLIS	Chikungunya	2018, 2019, 2023
420540 FLORIANOPOLIS	Dengue	2023
431490 PORTO ALEGRE	Dengue	2016, 2022, 2023
500270 CAMPO GRANDE	Chikungunya	2019
500270 CAMPO GRANDE	Dengue	2016, 2019, 2022
500270 CAMPO GRANDE	Zika	2018, 2019
510340 CUIABA	Chikungunya	2018
510340 CUIABA	Dengue	2015, 2016, 2017

Municipality	Virus	Epidemic Years
520870 GOIANIA	Chikungunya	2022
520870 GOIANIA	Dengue	2015, 2016, 2022
520870 GOIANIA	Zika	2017
530010 BRASILIA	Chikungunya	2020
530010 BRASILIA	Dengue	2019, 2022, 2023
530010 BRASILIA	Zika	2020

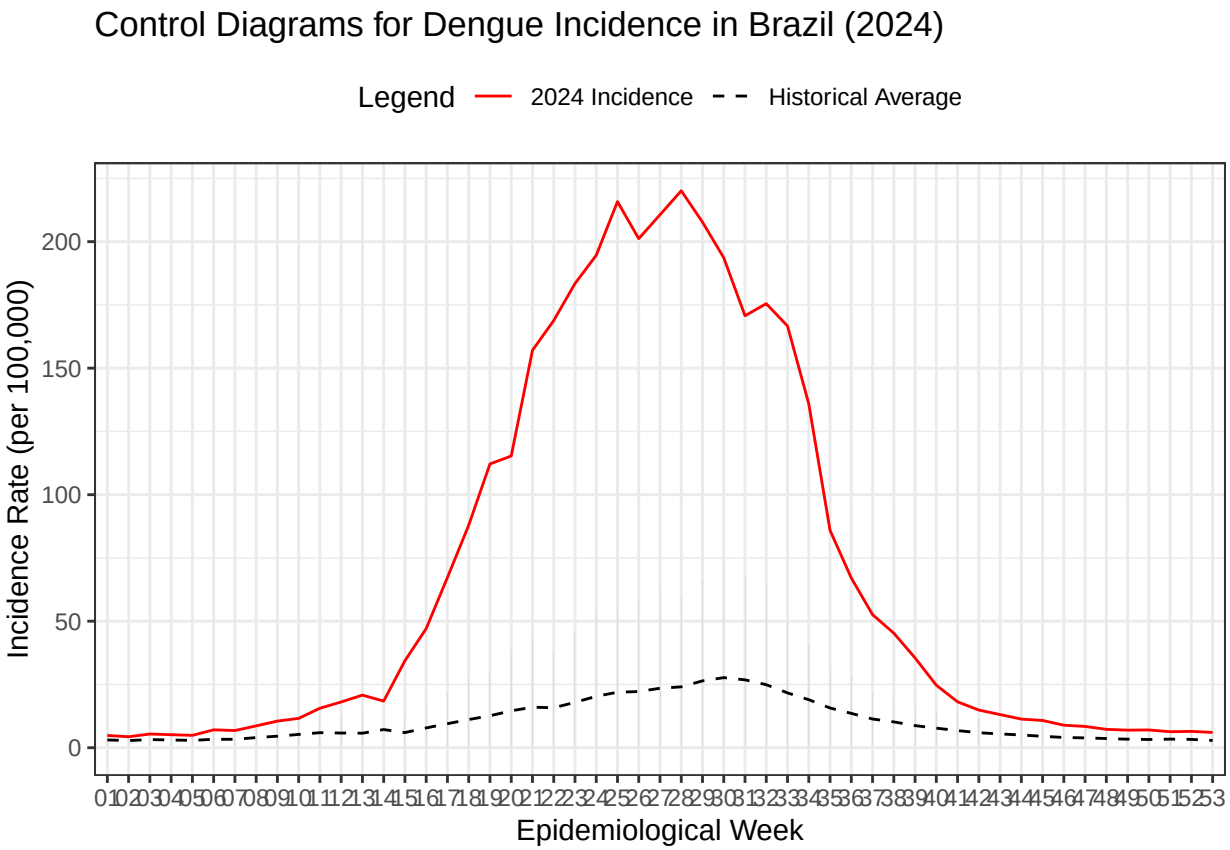
Plotting Risk Assessment per Selected Municipalities in 2024

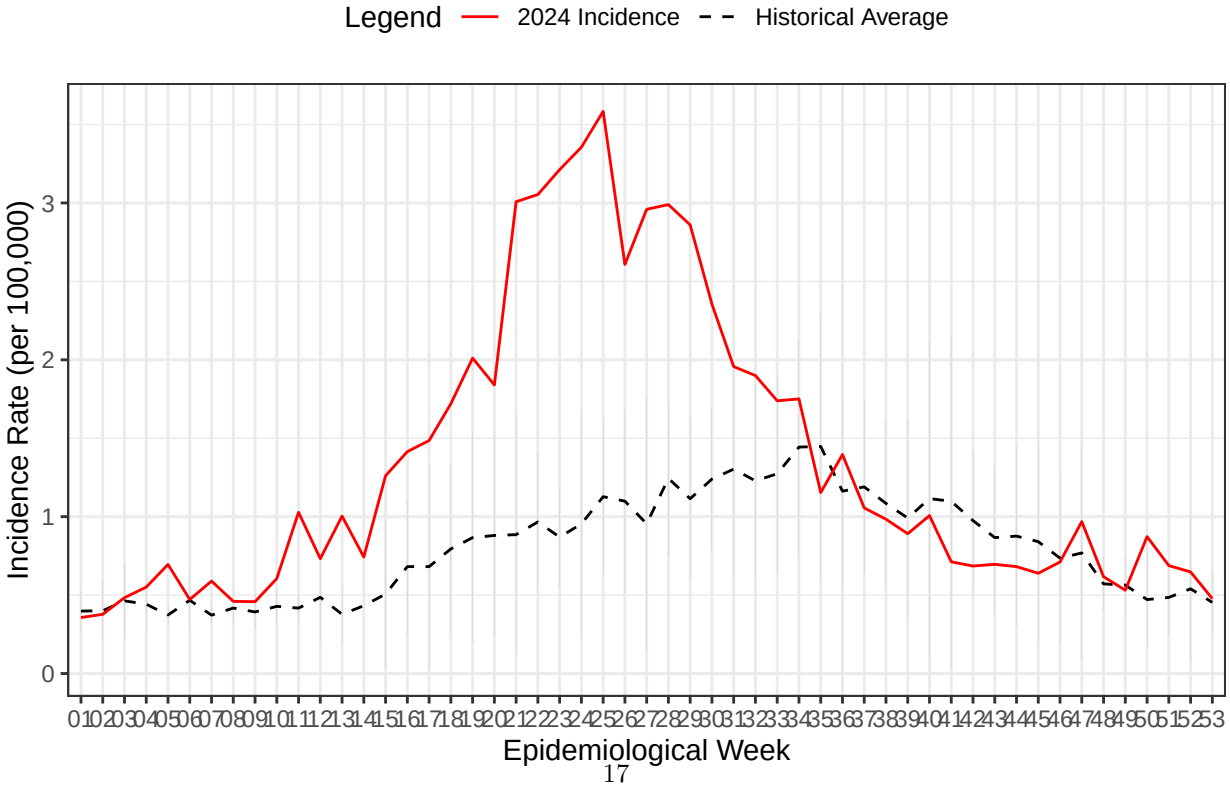


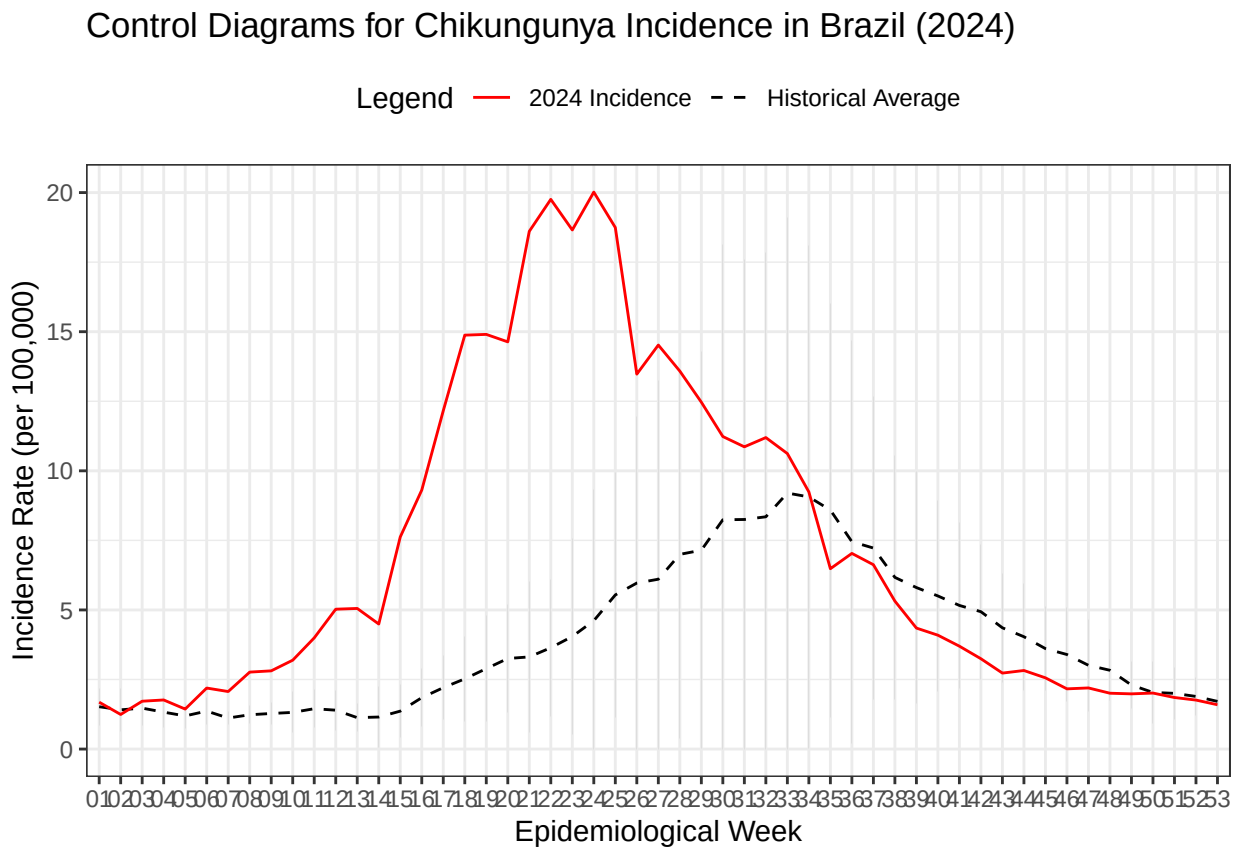



Chikungunya Risk Assessment per Selected Municipalities in 2024
020 PORTO VEL
0040 RIO BRAN
130260 MANAUS
40010 BOA VIST
150140 BELEM
160030 MACAPA
172100 PALMAS
211130 SAO LUIS
21100 TERESIN
0440 FORTALEZ
240810 NATAL
750 JOAO PESS
261160 RECIFE
270430 MACEIO
80030 ARACAJU
92740 SALVADO
20 BELO HORIZ
320530 VITORIA
55 RIO DE JANE
55030 SAO PAUL
10690 CURITIBA
40 FLORIANOP
490 PORTO ALE
70 CAMPO GRA
510340 CUIABA
520870 GOIANIA
530010 BRASILIA
Calculated Risk Level
0
1
2
3
Epidemiological Week

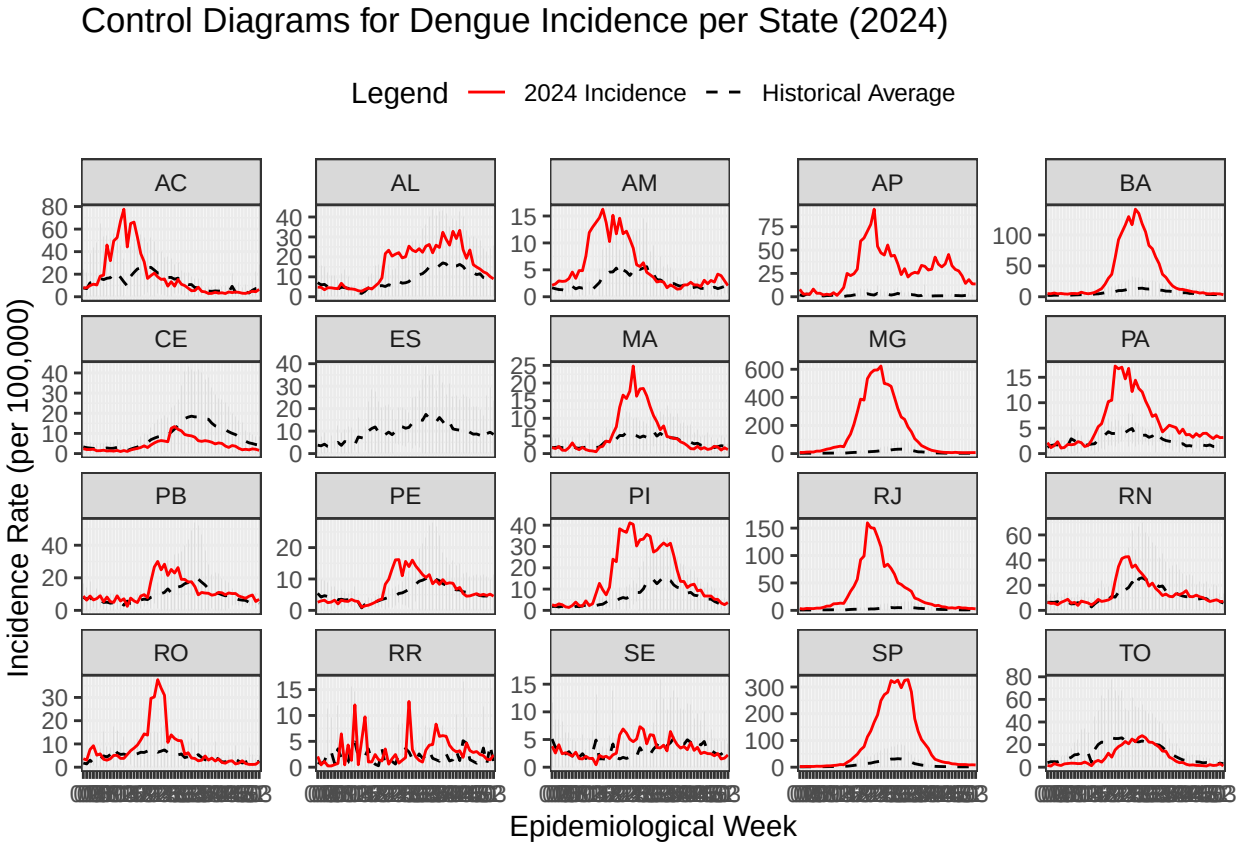
8. Control Diagrams - Country Level

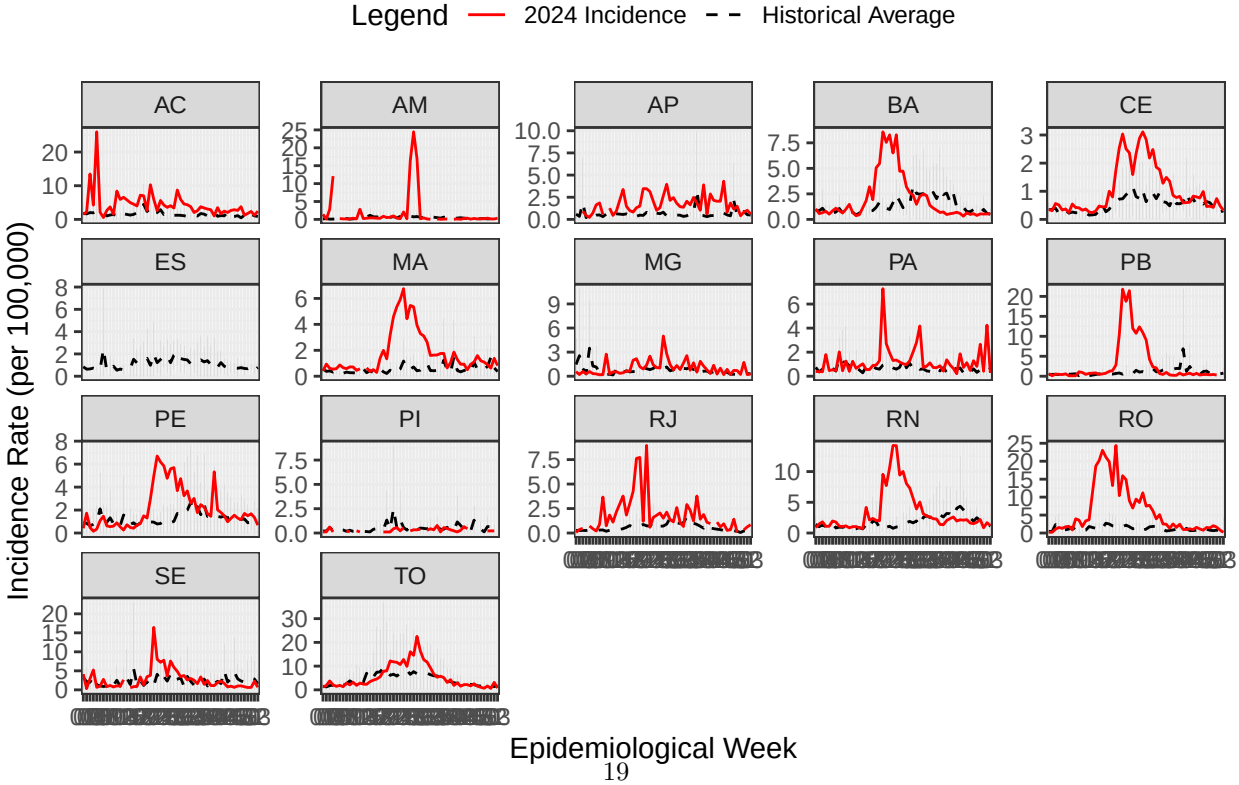


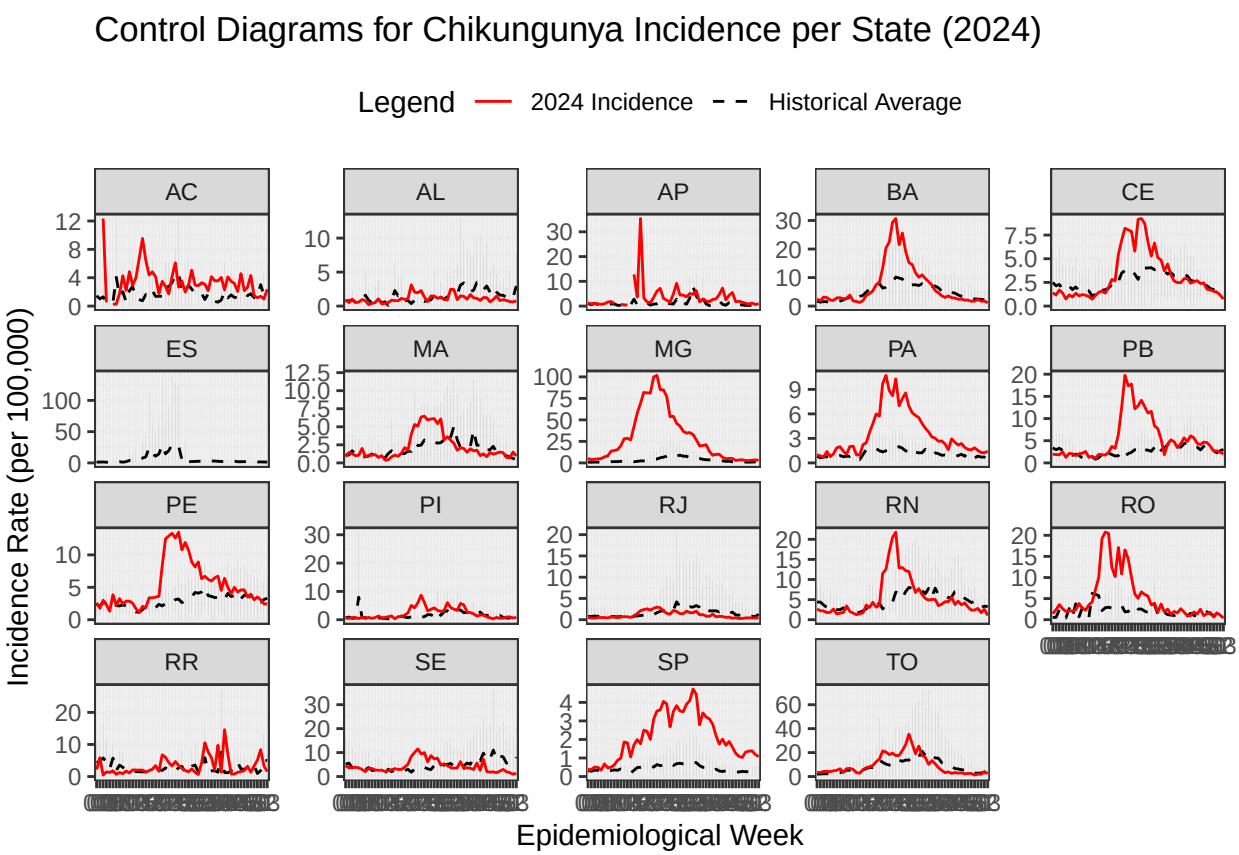



Control Diagrams for Chikungunya Incidence in Brazil (2024)
Legend
2024 Incidence
Historical Average
Incidence Rate (per 100,000)
0
5
10
15
20
Epidemiological Week

9. Control Diagrams - State Level



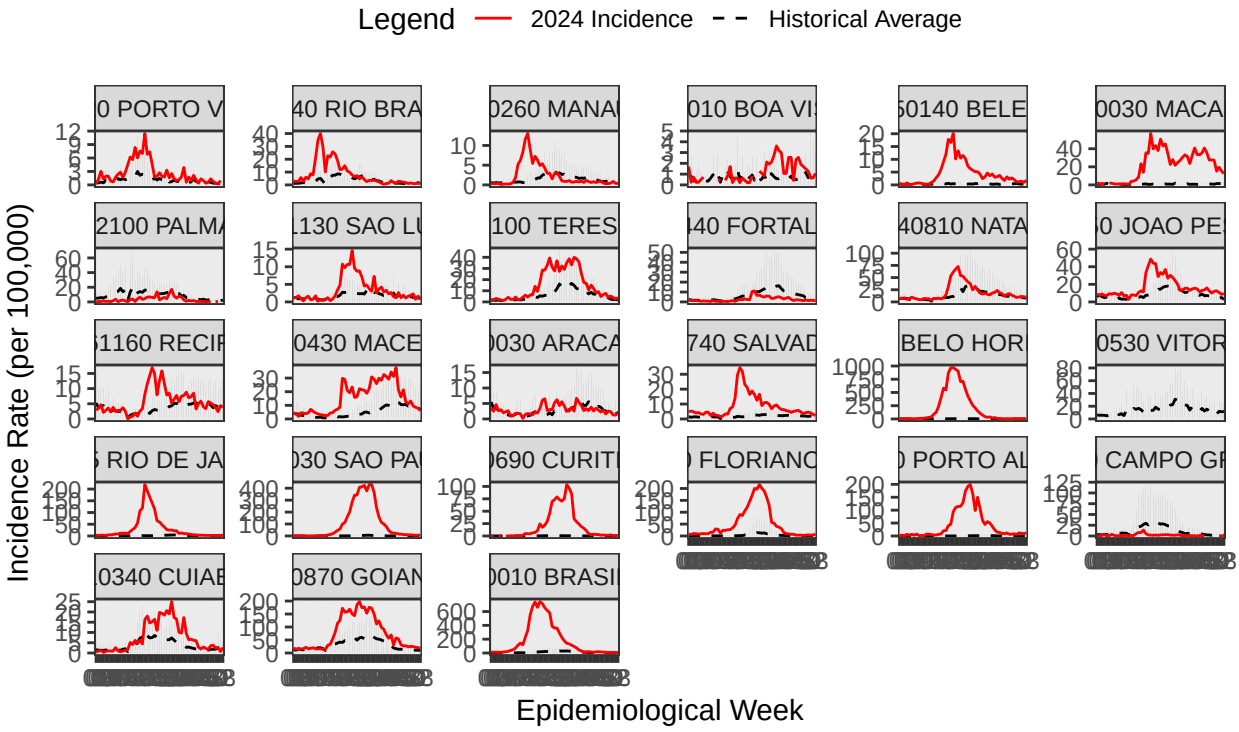



Control Diagrams for Chikungunya Incidence per State (2024)
Legend
2024 Incidence
Historical Average
AC
AL
AP
BA
CE
ES
MA
MG
PA
PB
PE
PI
RJ
RN
RO
RR
SE
SP
TO
Incidence Rate (per 100,000)
Epidemiological Week

10. Control Diagrams - Municipality Level

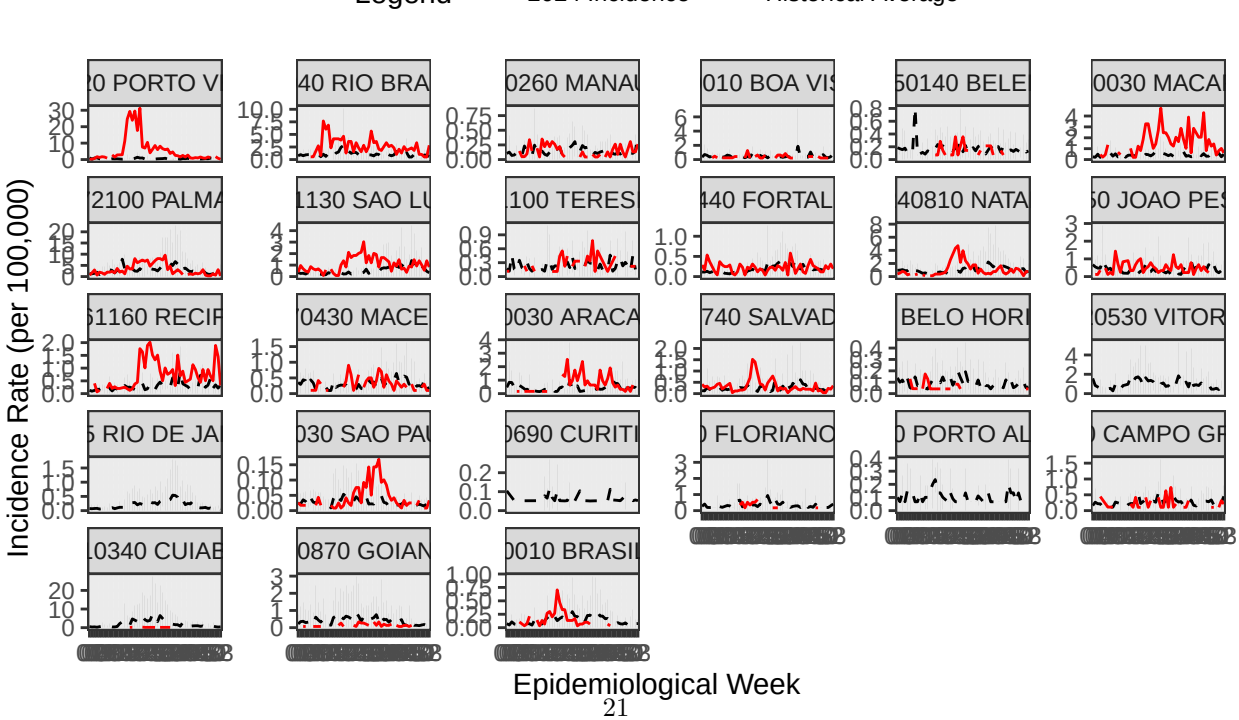
Control Diagrams for Dengue Incidence per Selected Municipalities (2024)

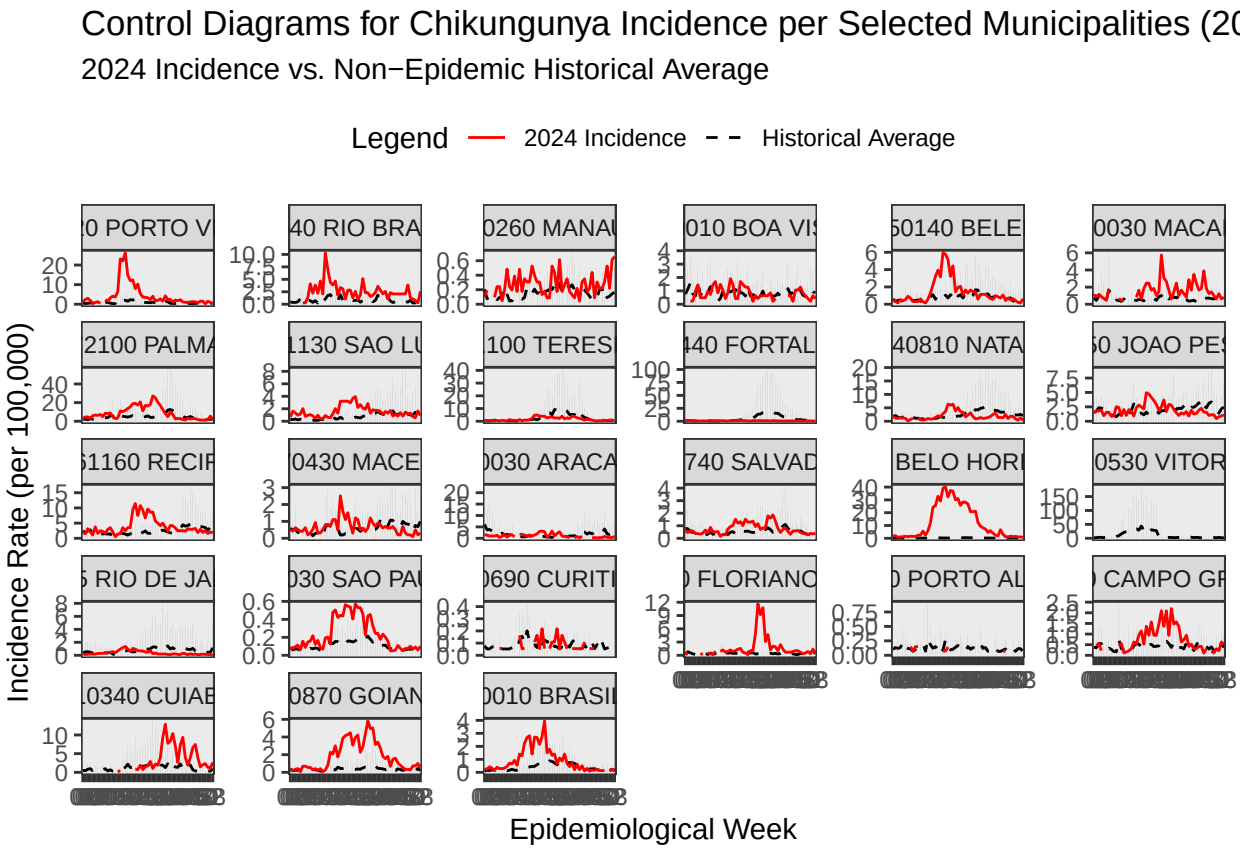
2024 Incidence vs. Non−Epidemic Historical Average



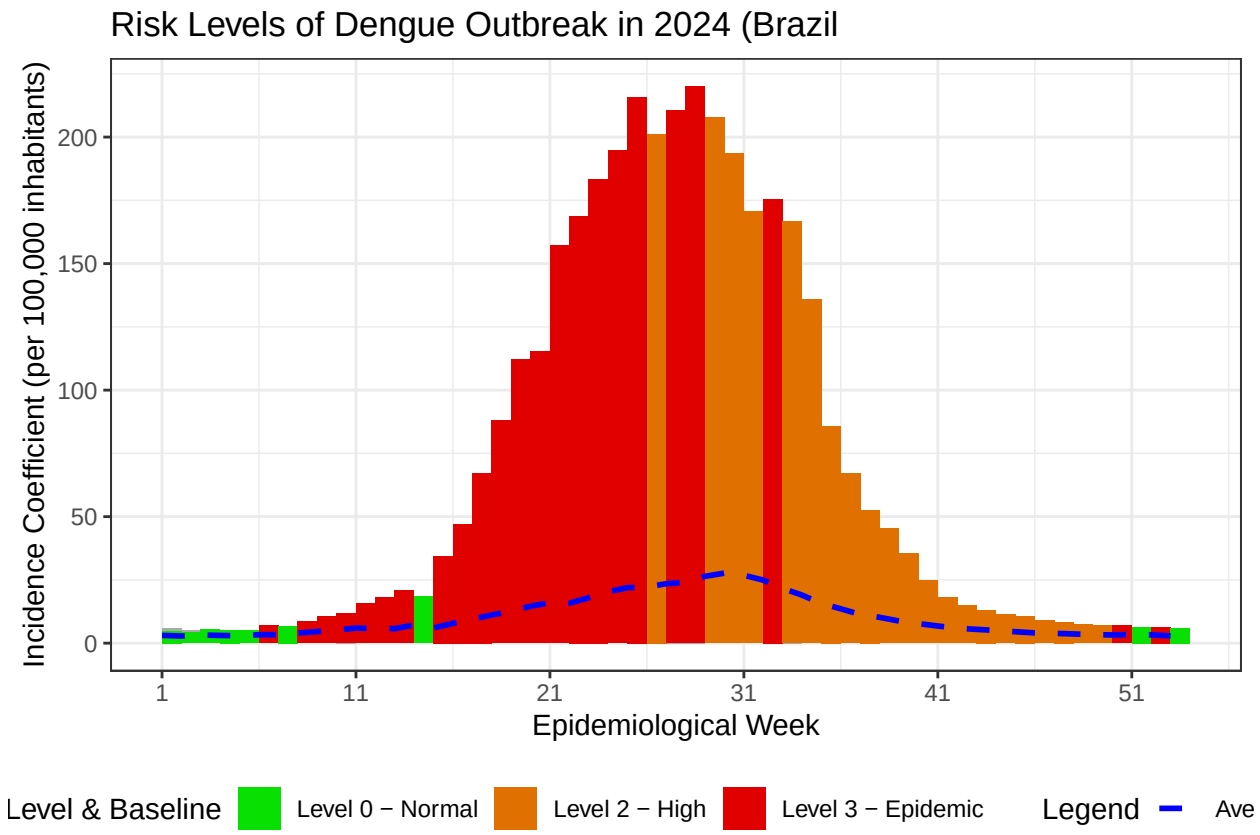
Control Diagrams for Zika Incidence per Selected Municipalities (2024)

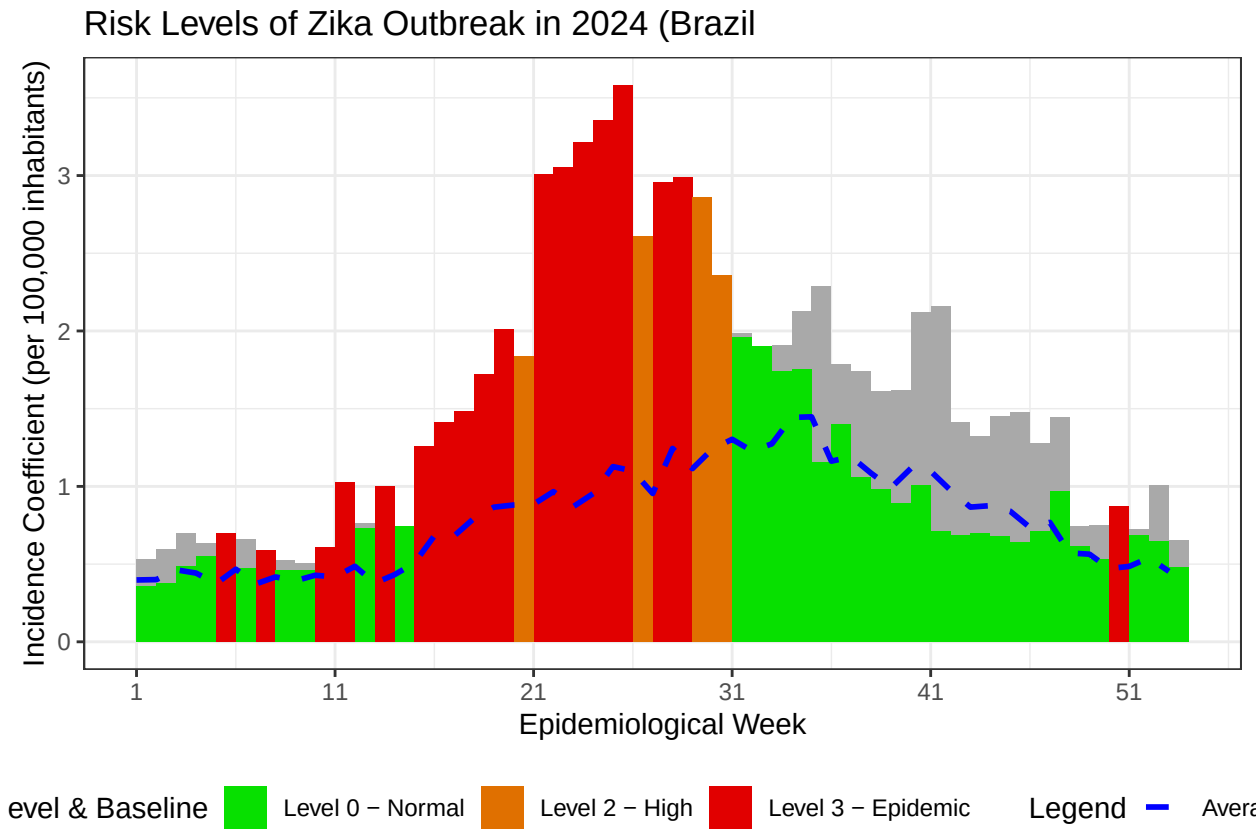
2024 Incidence vs. Non−Epidemic Historical Average

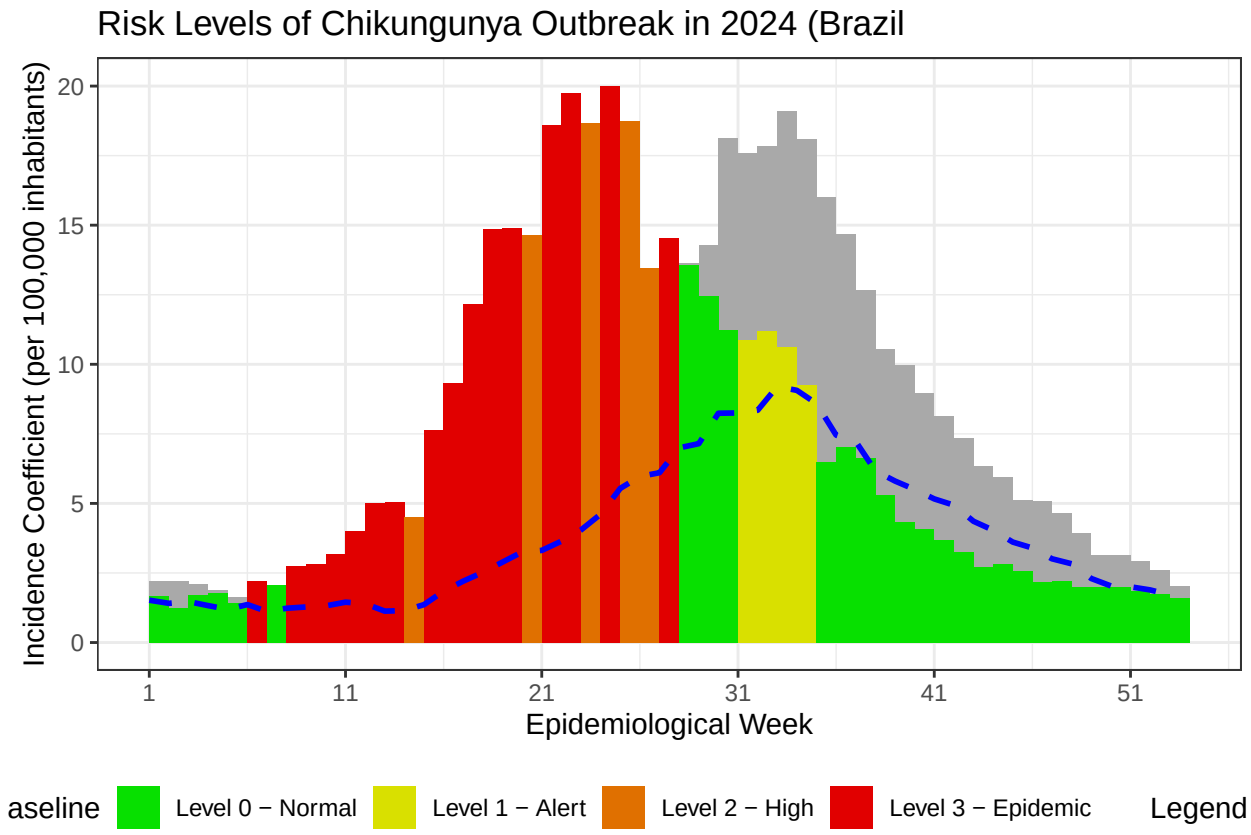



Control Diagrams for Chikungunya Incidence per Selected Municipalities (2(
2024 Incidence vs. Non−Epidemic Historical Average
Legend
2024 Incidence
Historical Average
Incidence Rate (per 100,000)
Epidemiological Week

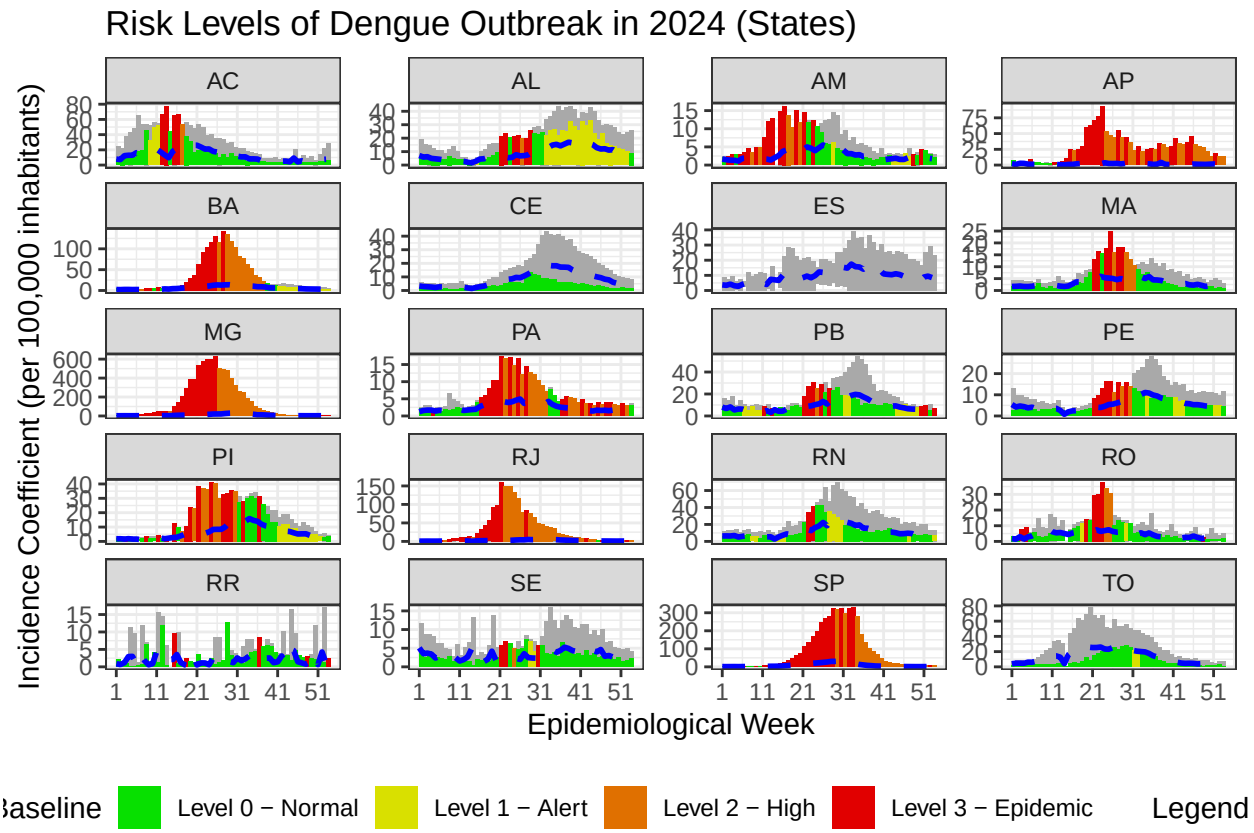
11. Risk Levels in 2024 - Country Level

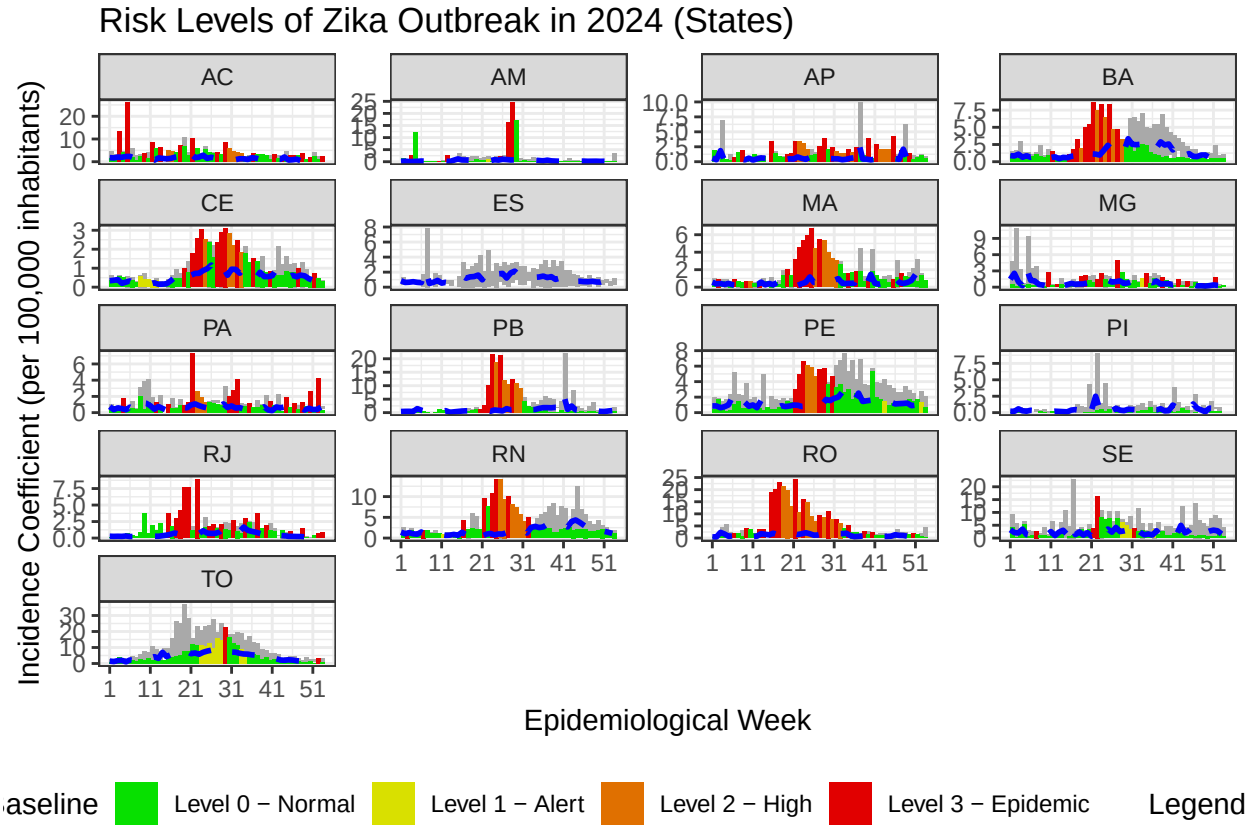


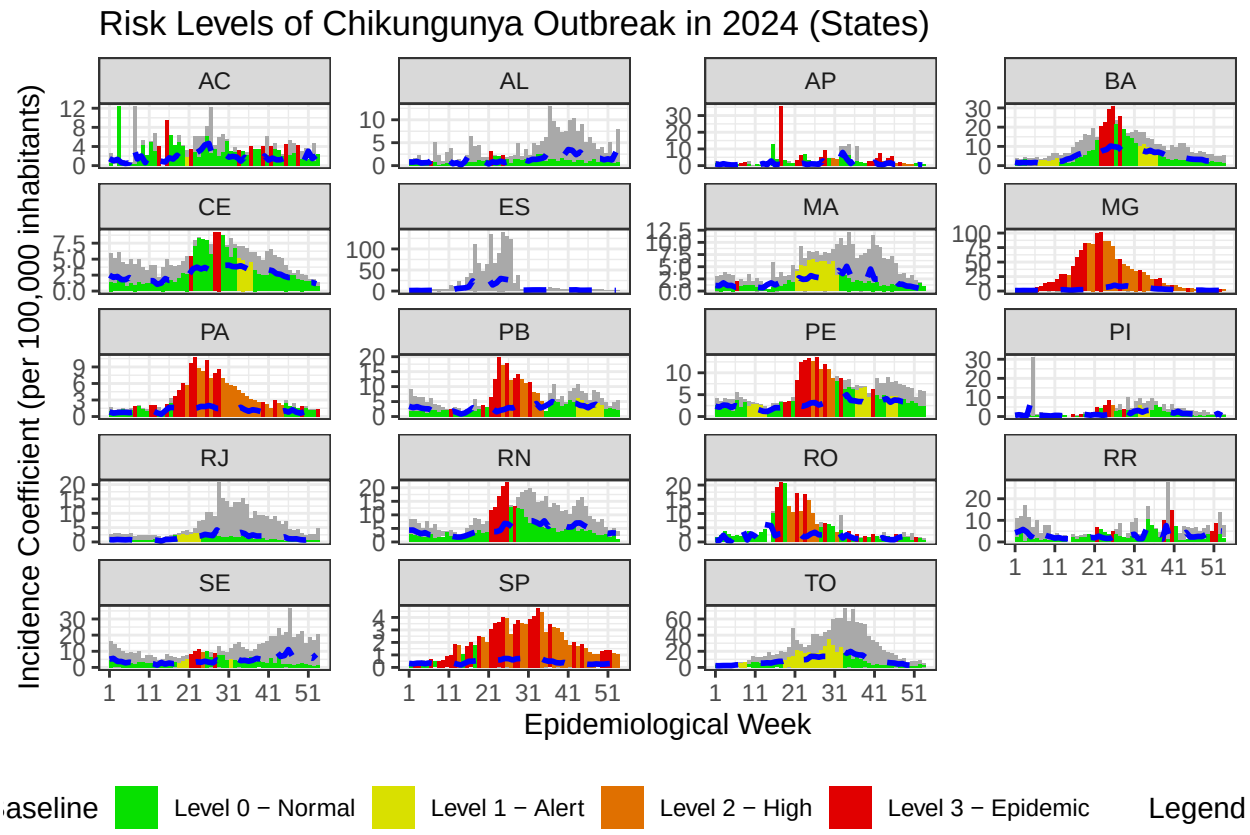



Risk Levels of Chikungunya Outbreak in 2024 (Brazil
Incidence Coefficient (per 100,000 inhabitants)
20
15
10
5
0
1
11
21
31
41
51
Epidemiological Week
aseline
Level 0 − Normal
Level 1 − Alert
Level 2 − High
Level 3 − Epidemic
Legend

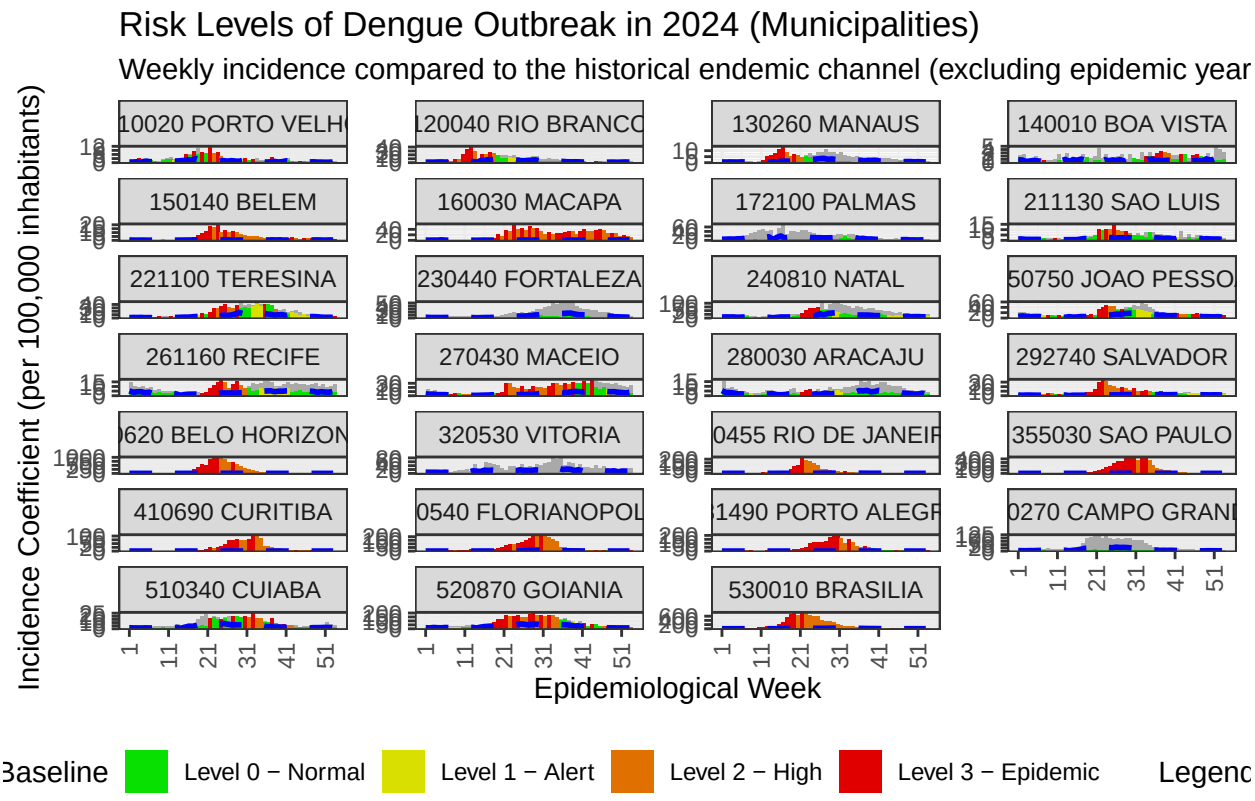
12. Risk Levels in 2024 - State Level



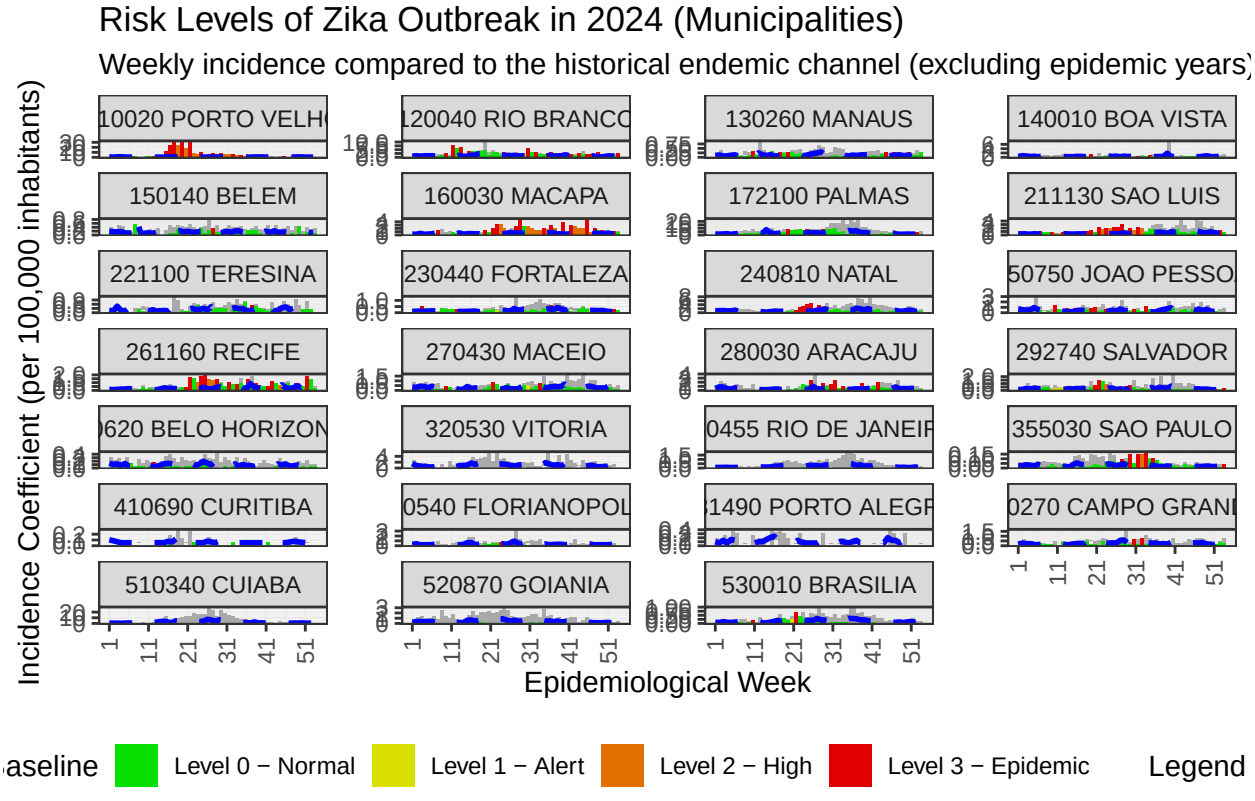



Risk Levels of Chikungunya Outbreak in 2024 (States)
AC
AL
AP
BA
CE
ES
MA
MG
PA
PB
PE
PI
RJ
RN
RO
RR
SE
SP
TO
Incidence Coefficient (per 100,000 inhabitants)
Epidemiological Week
Baseline
Level 0 − Normal
Level 1 − Alert
Level 2 − High
Level 3 − Epidemic
Legend

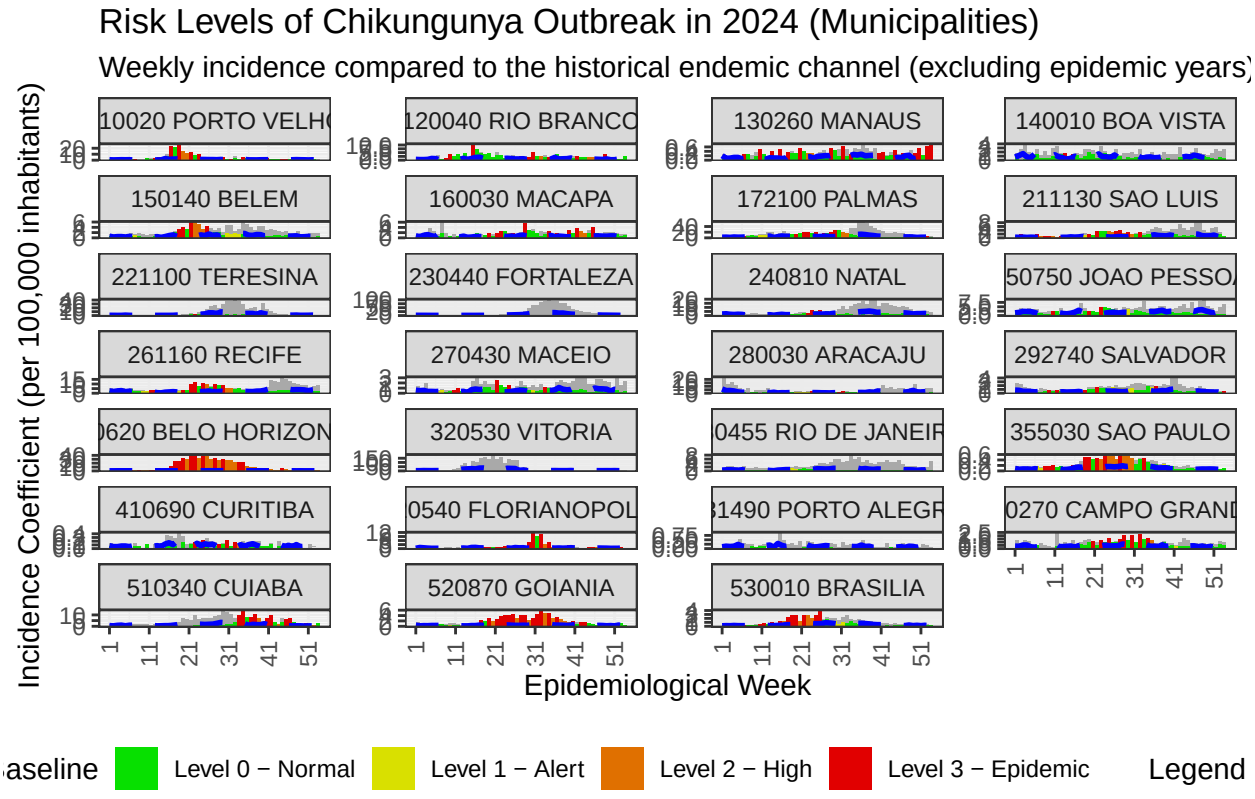
13. Risk Levels in 2024 - Municipality Level



Data from: DATASUS. Analysis and Visualization by the authors



Data from: DATASUS. Analysis and Visualization by the authors



Data from: DATASUS. Analysis and Visualization by the authors