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Supplementary Materials for

Using digital traces to build prospective and real-time county-level early warning systems to anticipate COVID-19 outbreaks in the United States

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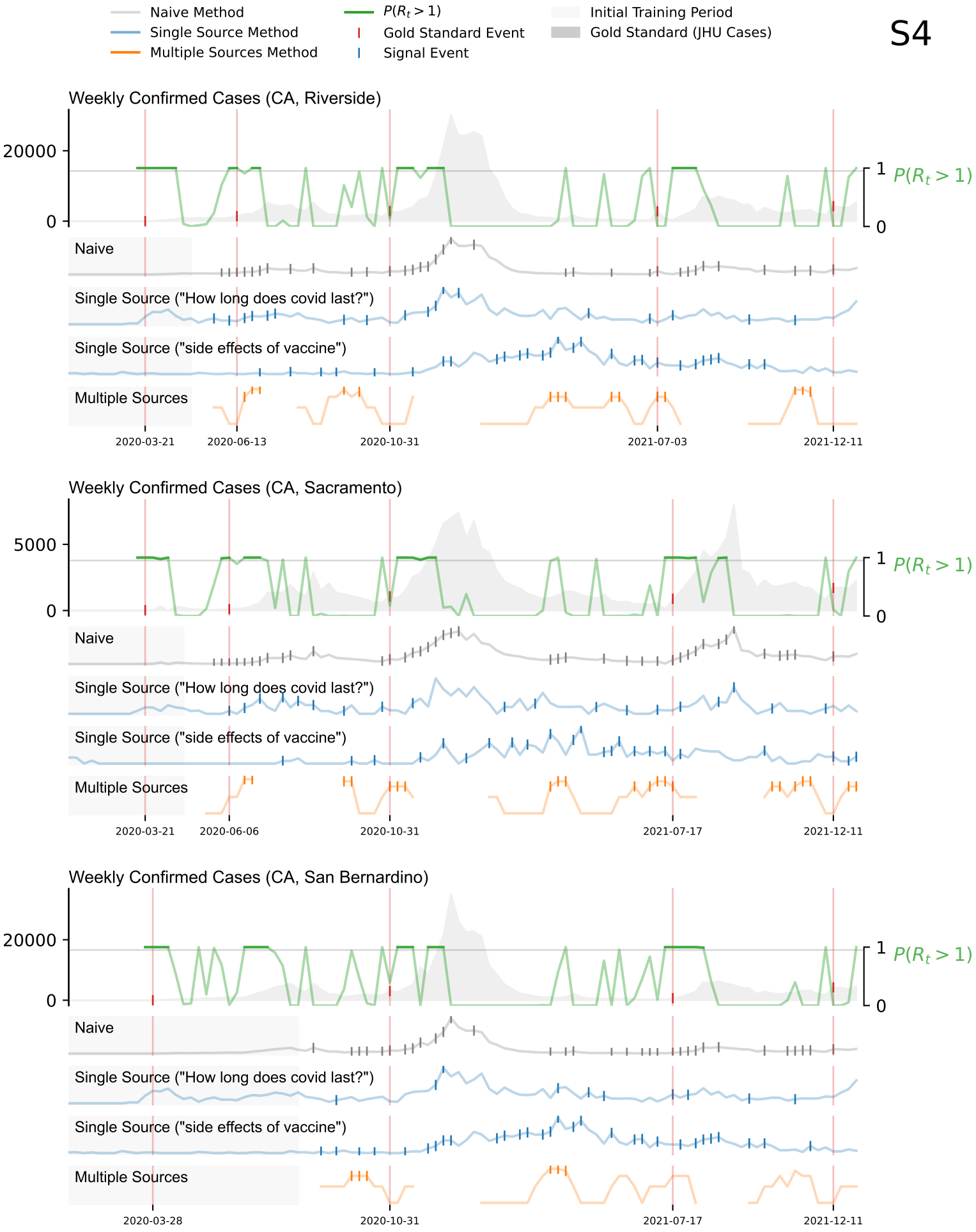
Figures S1-S49.
The probability of resurgence P(Rt > 1) (in green) and the different events generated by the Naive (gray), Single Source (blue) and Multiple Source methods (orange) at both county and state level.

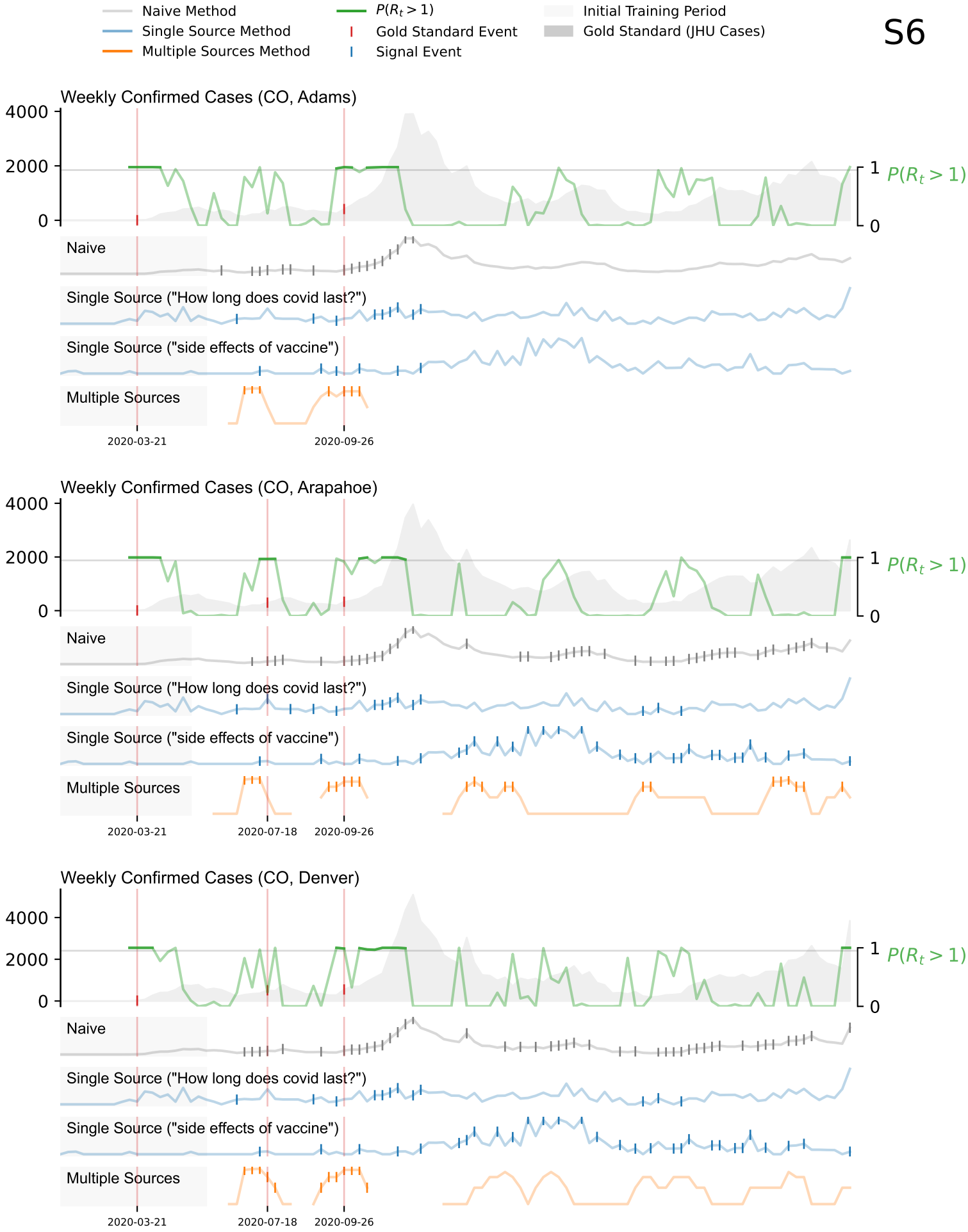
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S1
Weekly Confirmed Cases (AL, Jefferson)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-05-23
2020-11-21
2021-05-01
2021-07-17
2021-12-11
Weekly Confirmed Cases (AL, Madison)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-13
2020-11-14
2021-07-17
2021-11-27
Weekly Confirmed Cases (AR, Pulaski)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-06-13
2021-07-10

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S2
Weekly Confirmed Cases (AZ, Maricopa)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-09-12
2021-04-10
2021-07-24
Weekly Confirmed Cases (AZ, Pima)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-06
2020-11-07
2021-06-26
2021-11-06
Weekly Confirmed Cases (CA, Alameda)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-07-04
2020-10-31
2021-07-17
2021-12-11

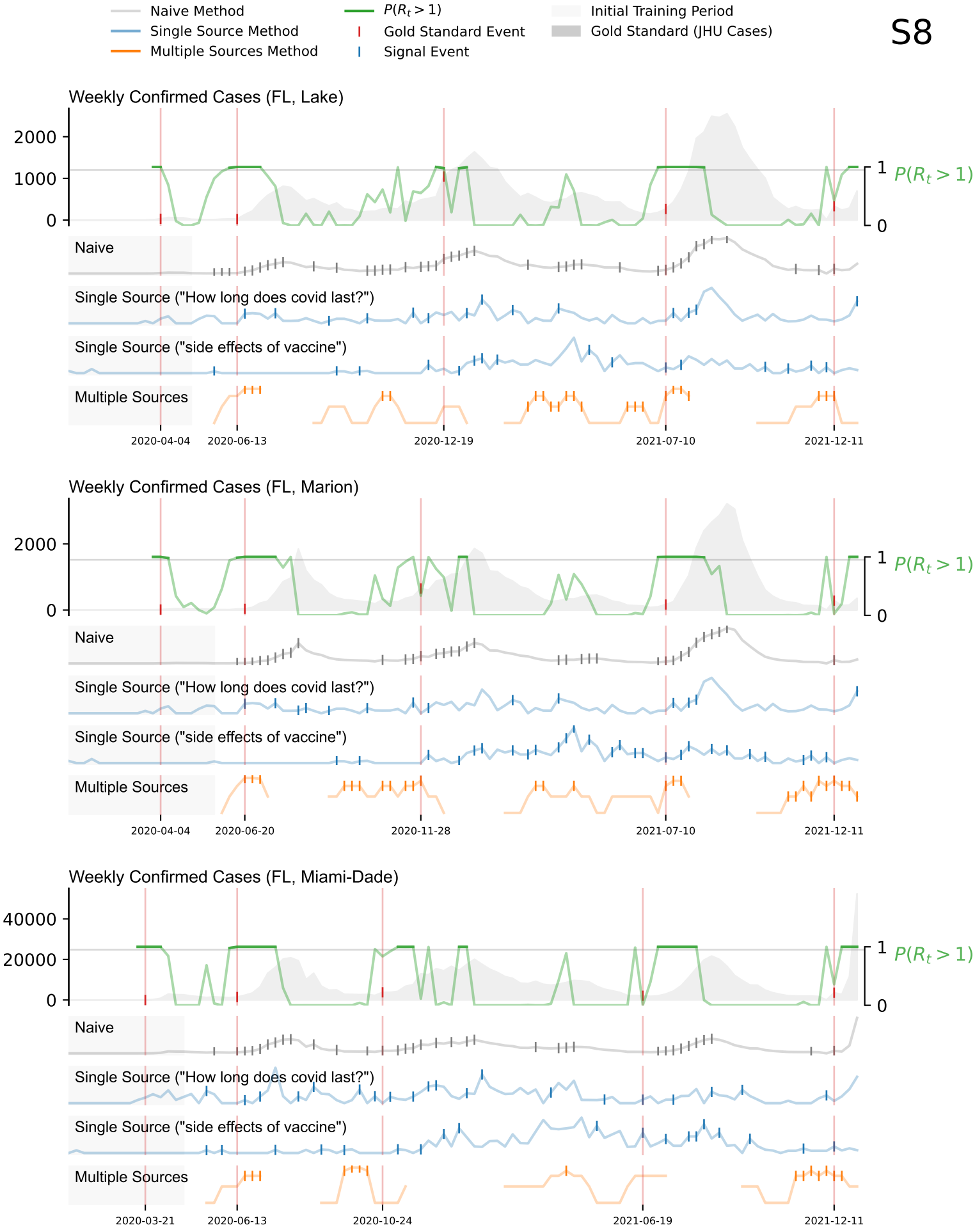
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S3
Weekly Confirmed Cases (CA, Contra Costa)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-05-30
2020-11-14
2021-07-17
2021-12-11
Weekly Confirmed Cases (CA, Los Angeles)
100000
50000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-14
2020-06-06
2020-10-31
2021-06-05
2021-11-13
Weekly Confirmed Cases (CA, Orange)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-20
2020-11-14
2021-07-10
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S4
Weekly Confirmed Cases (CA, Riverside)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-13
2020-10-31
2021-07-03
2021-12-11
Weekly Confirmed Cases (CA, Sacramento)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-06
2020-10-31
2021-07-17
2021-12-11
Weekly Confirmed Cases (CA, San Bernardino)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-10-31
2021-07-17
2021-12-11

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S5
Weekly Confirmed Cases (CA, San Diego)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-27
2020-11-14
2021-07-17
2021-12-11
Weekly Confirmed Cases (CA, San Francisco)
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-14
2020-07-04
2020-08-22
2020-11-07
2021-07-17
2021-12-11
Weekly Confirmed Cases (CA, Santa Clara)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-14
2020-06-27
2020-10-31
2021-07-17
2021-12-11

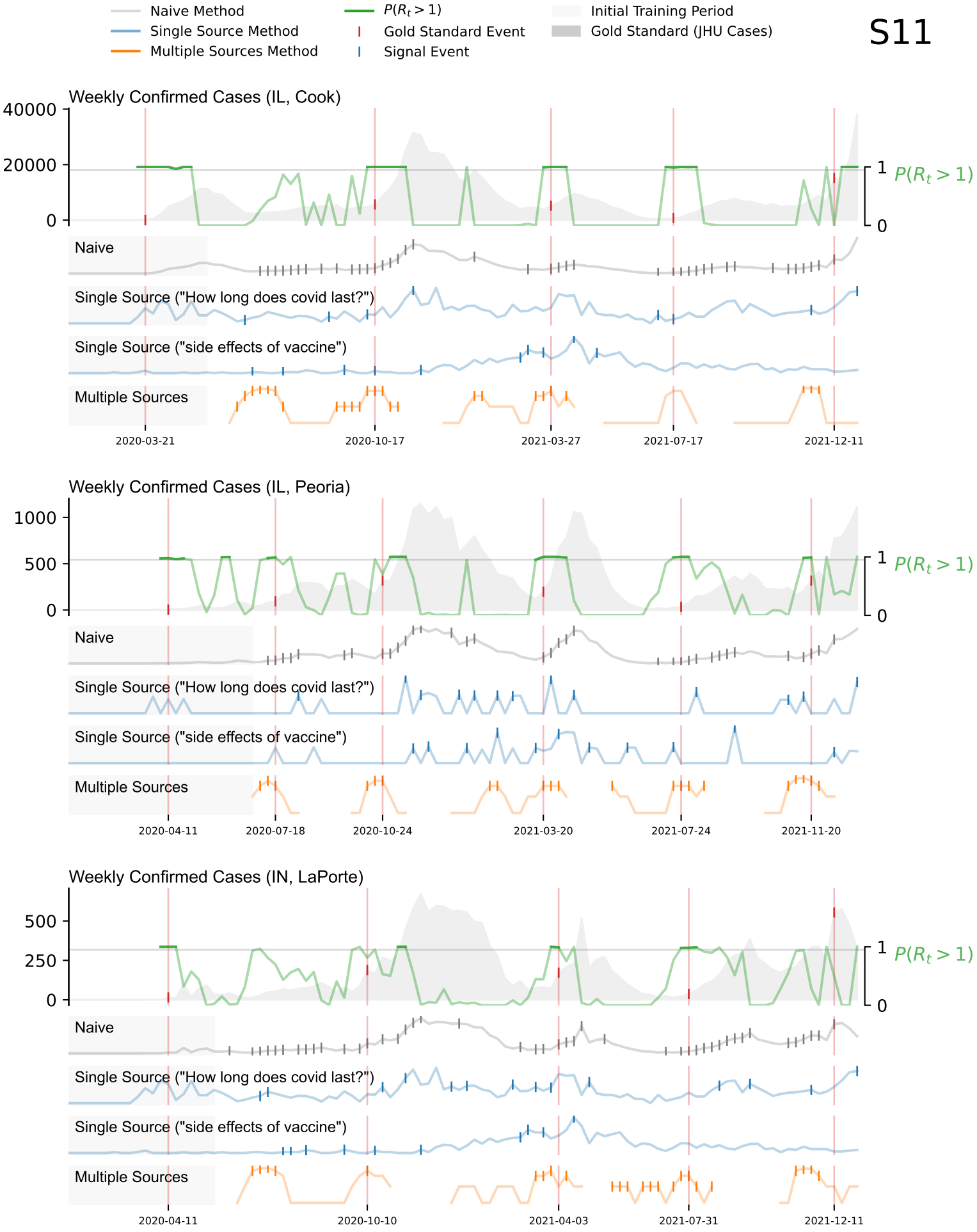

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S6
Weekly Confirmed Cases (CO, Adams)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-09-26
Weekly Confirmed Cases (CO, Arapahoe)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-07-18
2020-09-26
Weekly Confirmed Cases (CO, Denver)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-07-18
2020-09-26

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S7
Weekly Confirmed Cases (FL, Alachua)
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-20
2020-09-19
2021-01-09
2021-07-17
2021-12-11
Weekly Confirmed Cases (FL, Broward)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-13
2020-10-24
2021-06-19
2021-12-11
Weekly Confirmed Cases (FL, Hillsborough)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-13
2020-12-19
2021-07-17
2021-11-27

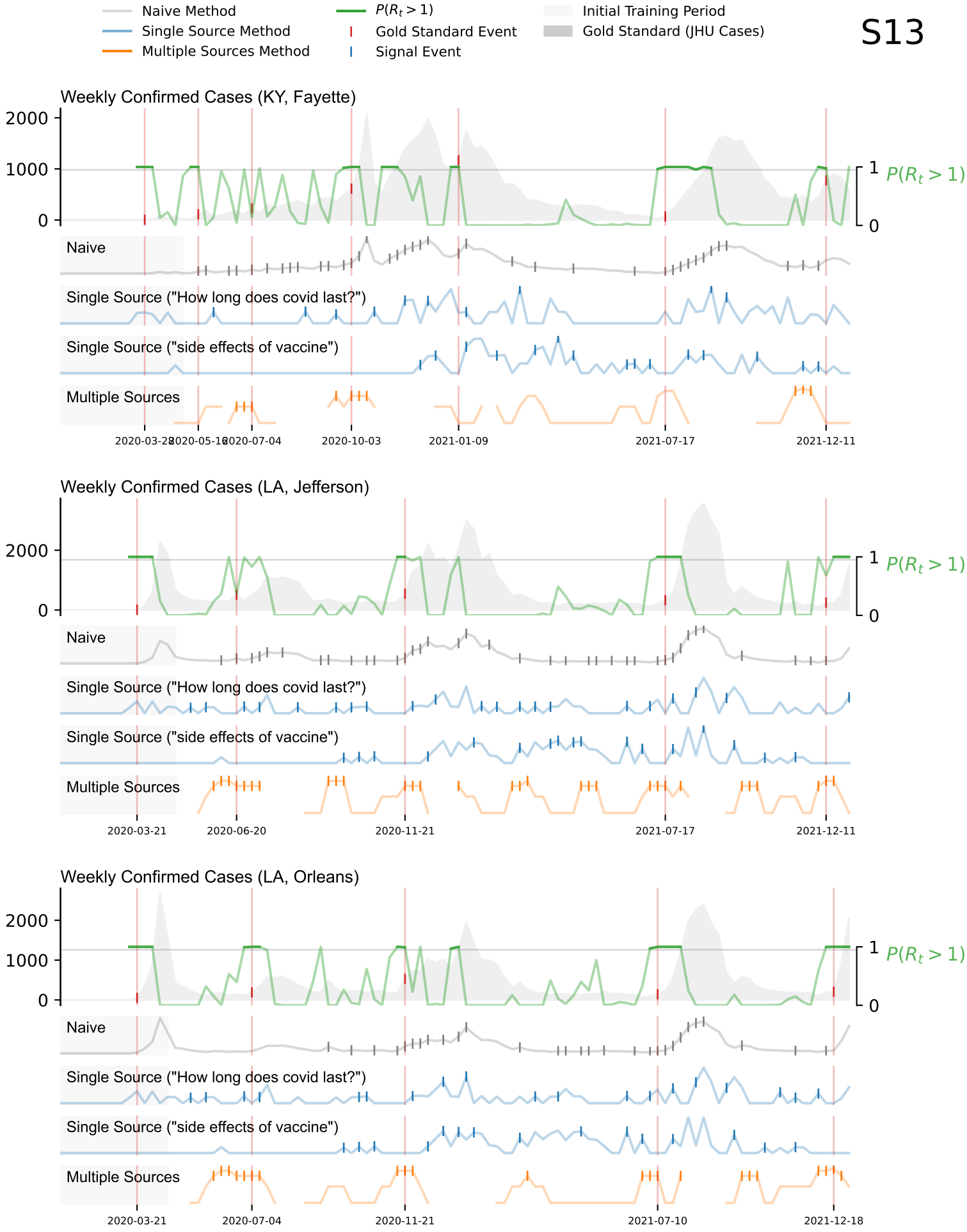

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S8
Weekly Confirmed Cases (FL, Lake)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-06-13
2020-12-19
2021-07-10
2021-12-11
Weekly Confirmed Cases (FL, Marion)
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-06-20
2020-11-28
2021-07-10
2021-12-11
Weekly Confirmed Cases (FL, Miami-Dade)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-13
2020-10-24
2021-06-19
2021-12-11

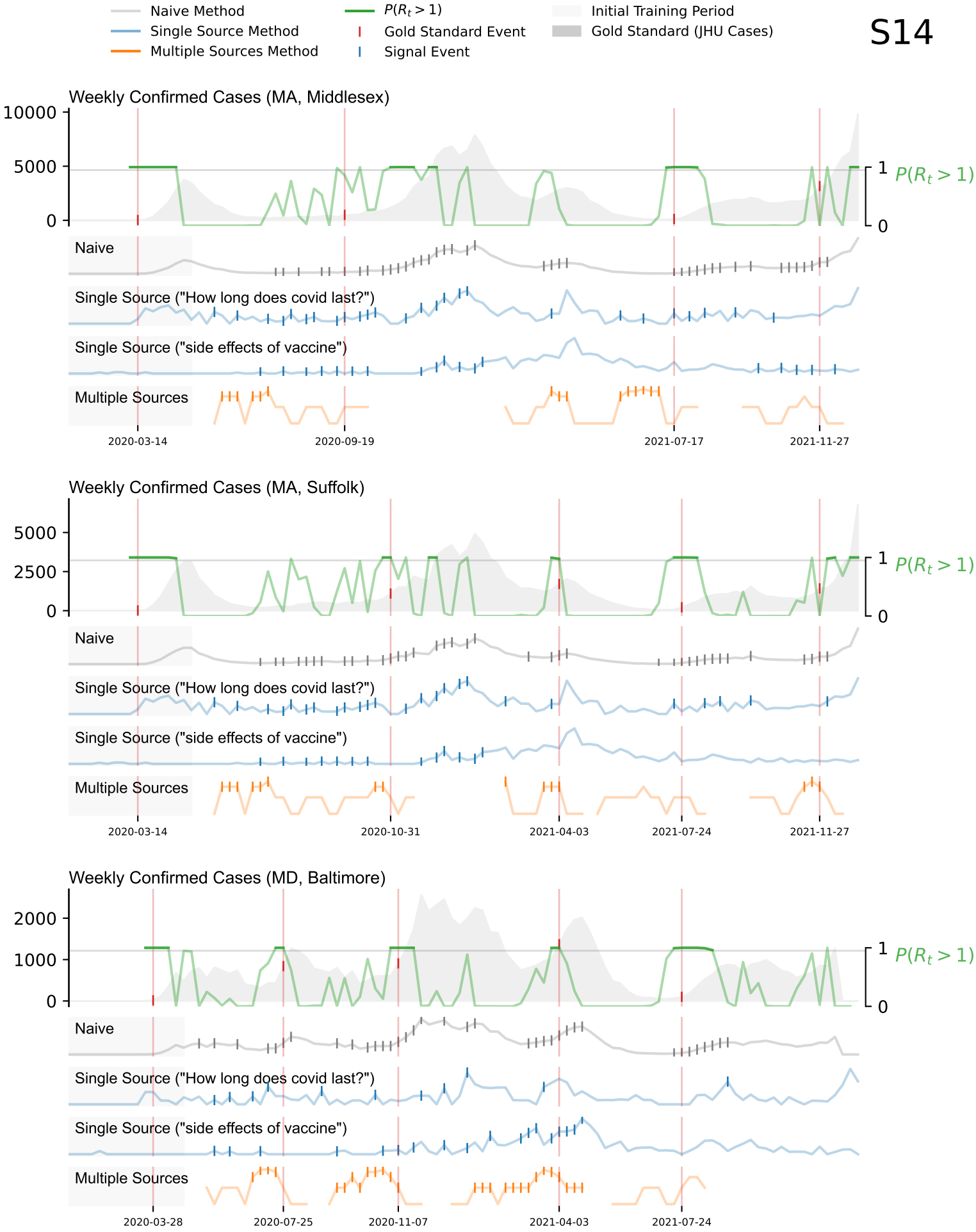
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S9
Weekly Confirmed Cases (FL, Orange)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-13
2020-11-28
2021-07-10
2021-12-11
Weekly Confirmed Cases (FL, Palm Beach)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-05-16
2020-10-24
2021-01-09
2021-07-03
2021-12-11
Weekly Confirmed Cases (FL, Pinellas)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-05-23
2020-10-24
2021-07-17
2021-12-11

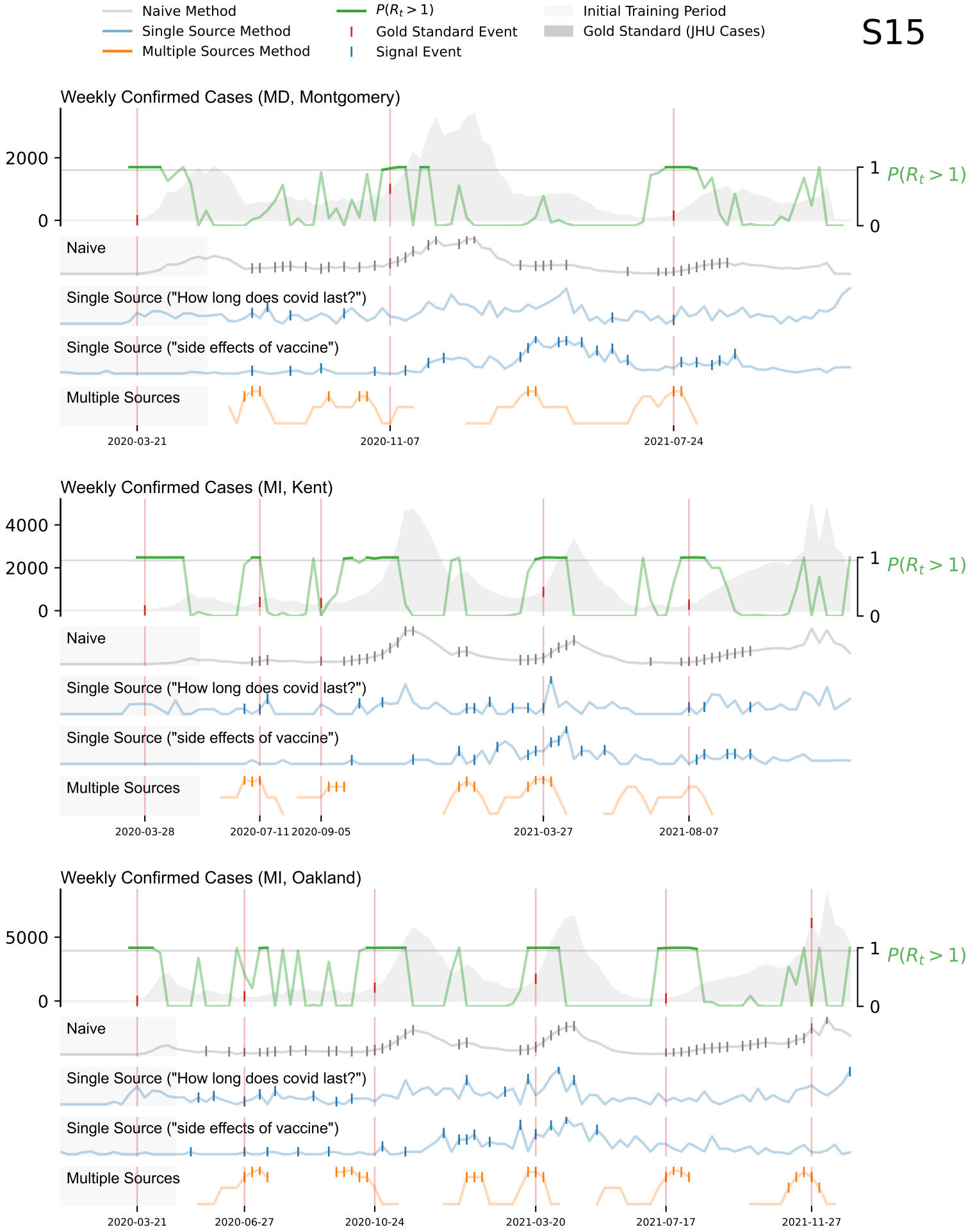
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S10
Weekly Confirmed Cases (FL, Sumter)
500
250
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-06-27
2020-12-12
2021-07-17
2021-12-11
Weekly Confirmed Cases (GA, DeKalb)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-06
2020-11-14
2021-07-17
2021-12-25
Weekly Confirmed Cases (GA, Fulton)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-06
2020-10-17
2021-07-17
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S11
Weekly Confirmed Cases (IL, Cook)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-10-17
2021-03-27
2021-07-17
2021-12-11
Weekly Confirmed Cases (IL, Peoria)
1000
500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-11
2020-07-18
2020-10-24
2021-03-20
2021-07-24
2021-11-20
Weekly Confirmed Cases (IN, LaPorte)
500
250
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-11
2020-10-10
2021-04-03
2021-07-31
2021-12-11

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S12
Weekly Confirmed Cases (IN, Lake)
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-10-10
2021-08-07
2021-12-11
Weekly Confirmed Cases (IN, Porter)
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-07-11
2020-10-17
2021-04-17
2021-08-07
2021-11-20
Weekly Confirmed Cases (KY, Clark)
200
100
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2021-01-16
2021-07-24
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S13
Weekly Confirmed Cases (KY, Fayette)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-05-18
2020-07-04
2020-10-03
2021-01-09
2021-07-17
2021-12-11
Weekly Confirmed Cases (LA, Jefferson)
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-20
2020-11-21
2021-07-17
2021-12-11
Weekly Confirmed Cases (LA, Orleans)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-07-04
2020-11-21
2021-07-10
2021-12-18


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S14
Weekly Confirmed Cases (MA, Middlesex)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-14
2020-09-19
2021-07-17
2021-11-27
Weekly Confirmed Cases (MA, Suffolk)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-14
2020-10-31
2021-04-03
2021-07-24
2021-11-27
Weekly Confirmed Cases (MD, Baltimore)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-07-25
2020-11-07
2021-04-03
2021-07-24

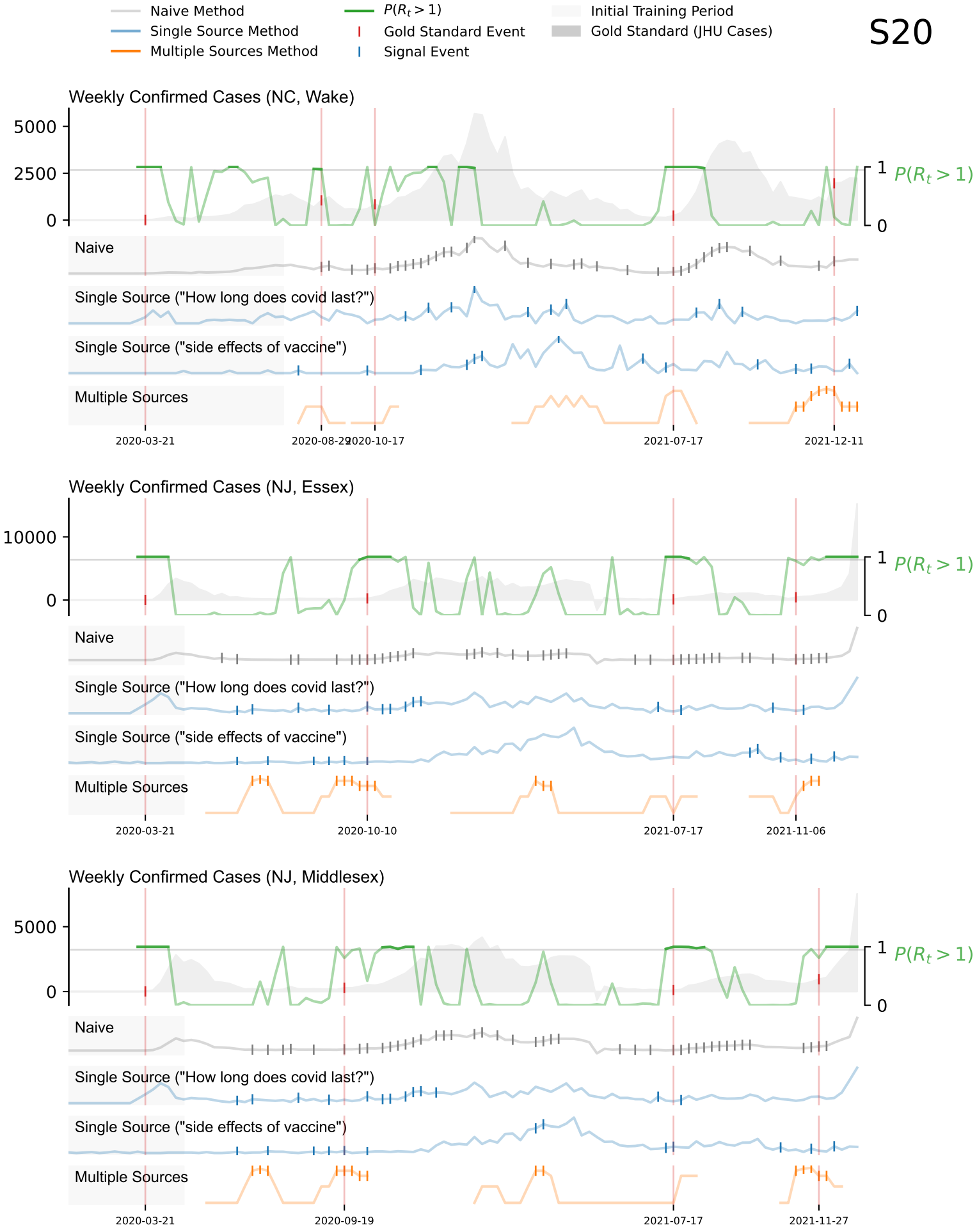

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S15
Weekly Confirmed Cases (MD, Montgomery)
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-11-07
2021-07-24
Weekly Confirmed Cases (MI, Kent)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-07-11
2020-09-05
2021-03-27
2021-08-07
Weekly Confirmed Cases (MI, Oakland)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-27
2020-10-24
2021-03-20
2021-07-17
2021-11-27

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S16
Weekly Confirmed Cases (MI, Washtenaw)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-07-11
2020-10-03
2021-01-16
2021-04-03
2021-07-24
2021-11-13
Weekly Confirmed Cases (MI, Wayne)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-07-04
2020-10-24
2021-03-13
2021-07-31
2021-11-27
Weekly Confirmed Cases (MN, Hennepin)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-07-18
2020-09-26
2021-03-20
2021-07-24

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S17
Weekly Confirmed Cases (MO, Clay)
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-10-17
2021-03-13
2021-07-24
2021-11-20
Weekly Confirmed Cases (MO, Jackson)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-27
2020-10-17
2021-07-17
2021-11-27
Weekly Confirmed Cases (MO, St. Louis)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-07-04
2020-10-24
2021-07-03
2021-11-20

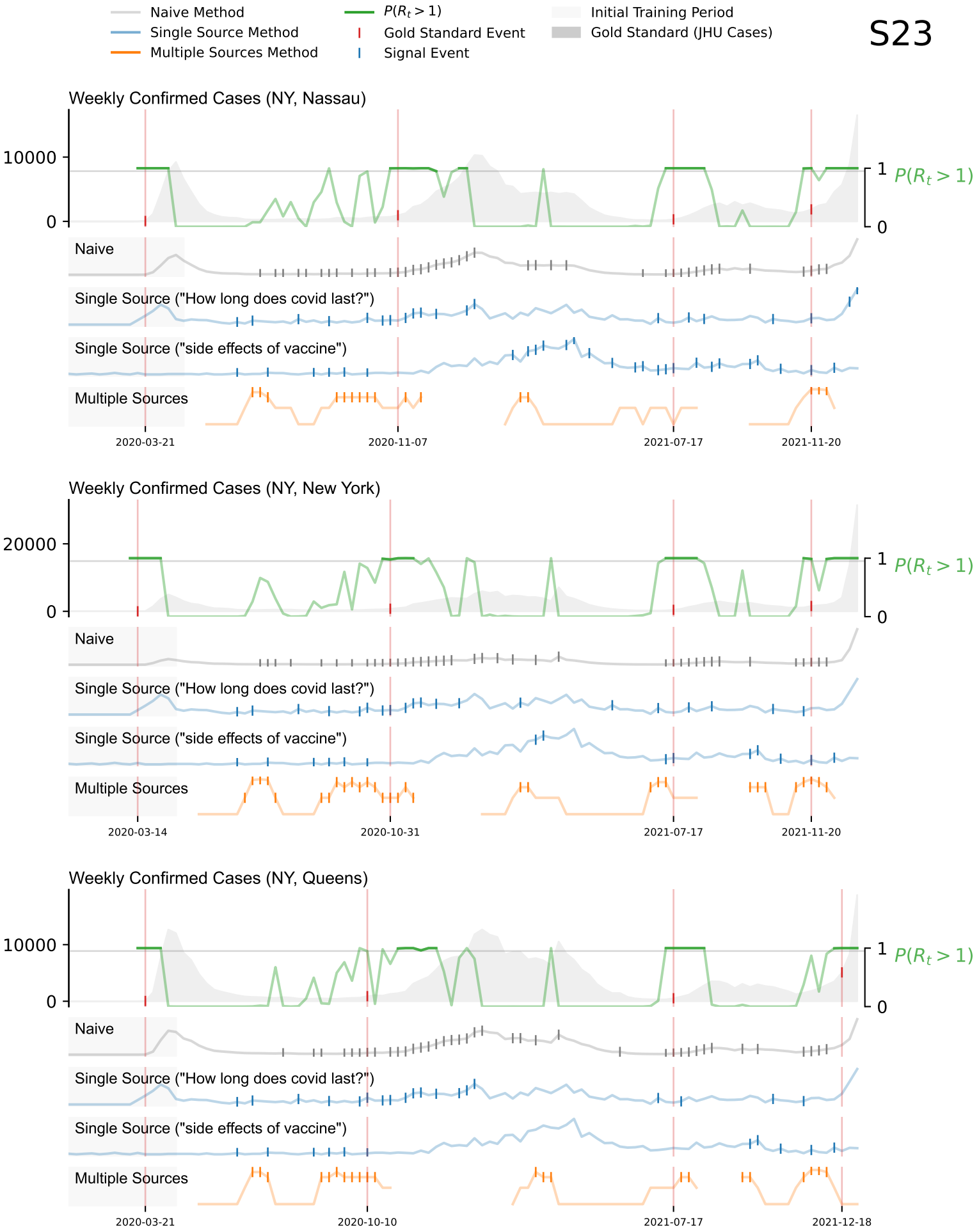
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S18
Weekly Confirmed Cases (MS, Hinds)
1000
500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-07-04
2020-10-24
2021-07-03
2021-12-11
Weekly Confirmed Cases (NC, Cumberland)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-11-28
2021-07-17
2021-12-11
Weekly Confirmed Cases (NC, Forsyth)
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-10-17
2021-07-24
2021-11-27

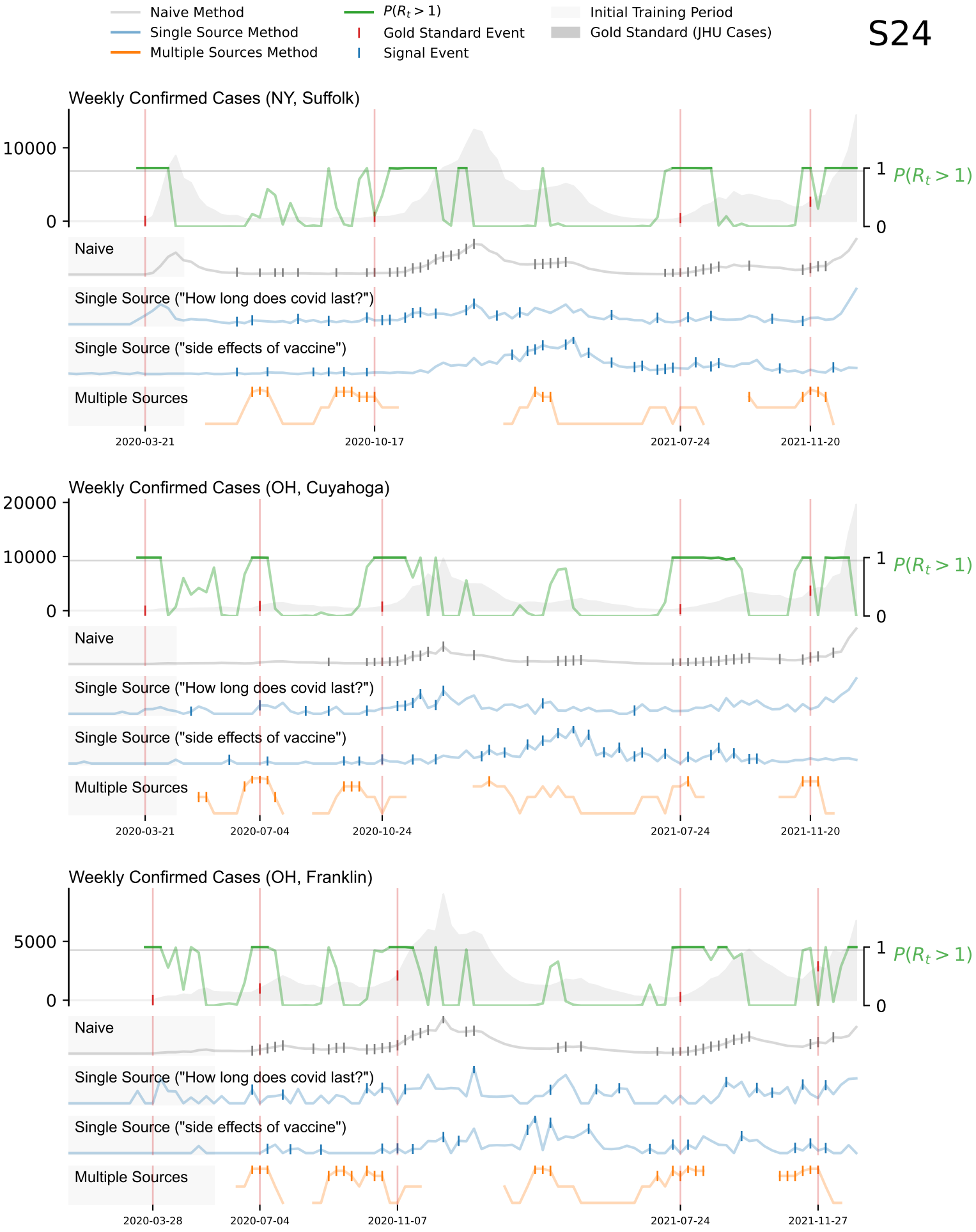
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S19
Weekly Confirmed Cases (NC, Hoke)
200
100
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-11
2021-07-17
Weekly Confirmed Cases (NC, Johnston)
1000
500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-10-17
2021-07-17
2021-12-18
Weekly Confirmed Cases (NC, Mecklenburg)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-05-16
2020-11-28
2021-07-24
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S20
Weekly Confirmed Cases (NC, Wake)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-08-29
2020-10-17
2021-07-17
2021-12-11
Weekly Confirmed Cases (NJ, Essex)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-10-10
2021-07-17
2021-11-06
Weekly Confirmed Cases (NJ, Middlesex)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-09-19
2021-07-17
2021-11-27

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S21
Weekly Confirmed Cases (NM, Bernalillo)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-07-04
2020-10-03
2021-07-17
2021-11-20
Weekly Confirmed Cases (NV, Clark)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-20
2020-10-03
2021-03-20
2021-07-03
2021-12-11
Weekly Confirmed Cases (NV, Washoe)
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-07-04
2020-10-31
2021-07-03
2021-10-23

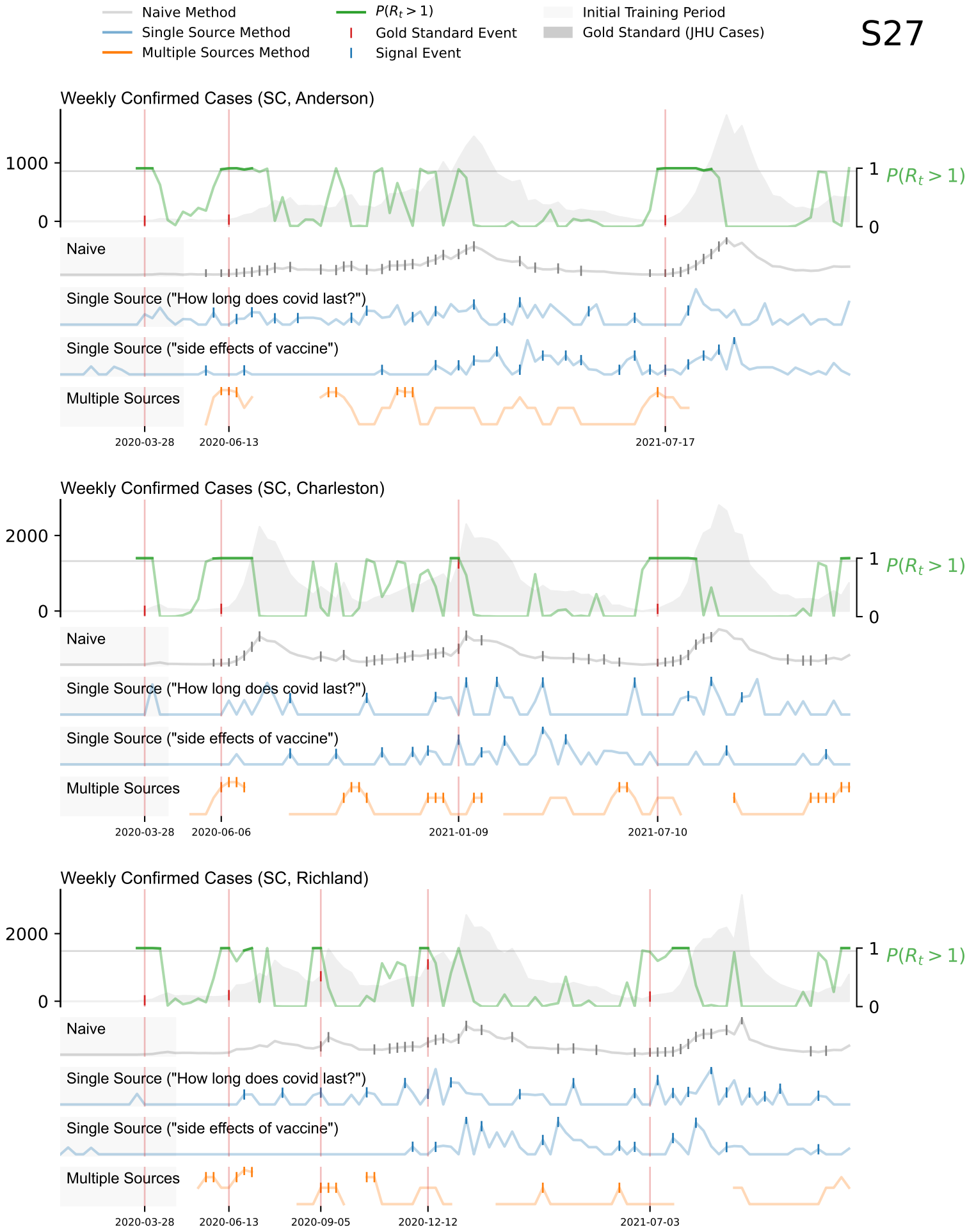
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S22
Weekly Confirmed Cases (NY, Bronx)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-10-31
2021-07-17
2021-12-18
Weekly Confirmed Cases (NY, Kings)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-09-26
2021-07-17
2021-12-18
Weekly Confirmed Cases (NY, Monroe)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-10-24
2021-07-31
2021-11-13


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S23
Weekly Confirmed Cases (NY, Nassau)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-11-07
2021-07-17
2021-11-20
Weekly Confirmed Cases (NY, New York)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-14
2020-10-31
2021-07-17
2021-11-20
Weekly Confirmed Cases (NY, Queens)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-10-10
2021-07-17
2021-12-18


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S24
Weekly Confirmed Cases (NY, Suffolk)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-10-17
2021-07-24
2021-11-20
Weekly Confirmed Cases (OH, Cuyahoga)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-07-04
2020-10-24
2021-07-24
2021-11-20
Weekly Confirmed Cases (OH, Franklin)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-07-04
2020-11-07
2021-07-24
2021-11-27

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S25
Weekly Confirmed Cases (OH, Hamilton)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-20
2020-10-17
2021-07-17
2021-12-11
Weekly Confirmed Cases (OH, Summit)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-10-24
2021-07-24
2021-11-20
Weekly Confirmed Cases (OH, Warren)
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-10-17
2021-07-24
2021-12-11

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S26
Weekly Confirmed Cases (OR, Multnomah)
2000
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-20
2020-11-07
2021-03-20
2021-07-24
2021-12-11
Weekly Confirmed Cases (PA, Allegheny)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-07-04
2020-10-24
2021-04-03
2021-07-24
2021-11-20
Weekly Confirmed Cases (PA, Philadelphia)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-09-12
2021-03-27
2021-07-24
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S27
Weekly Confirmed Cases (SC, Anderson)
1000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-13
2021-07-17
Weekly Confirmed Cases (SC, Charleston)
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-06
2021-01-09
2021-07-10
Weekly Confirmed Cases (SC, Richland)
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-13
2020-09-05
2020-12-12
2021-07-03

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S28
Weekly Confirmed Cases (TN, Blount)
1000
500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-06-27
2020-11-21
2021-04-24
2021-07-24
2021-12-11
Weekly Confirmed Cases (TN, Davidson)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-27
2020-09-19
2021-06-19
2021-12-11
Weekly Confirmed Cases (TN, Knox)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-06-13
2020-09-12
2020-11-21
2021-07-24
2021-12-11

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S29
Weekly Confirmed Cases (TN, Sevier)
1000
500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-06-06
2020-11-21
2021-07-17
2021-12-11
Weekly Confirmed Cases (TN, Shelby)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-13
2020-10-31
2021-07-17
2021-12-11
Weekly Confirmed Cases (TX, Bexar)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-10-31
2021-07-24
2021-12-11

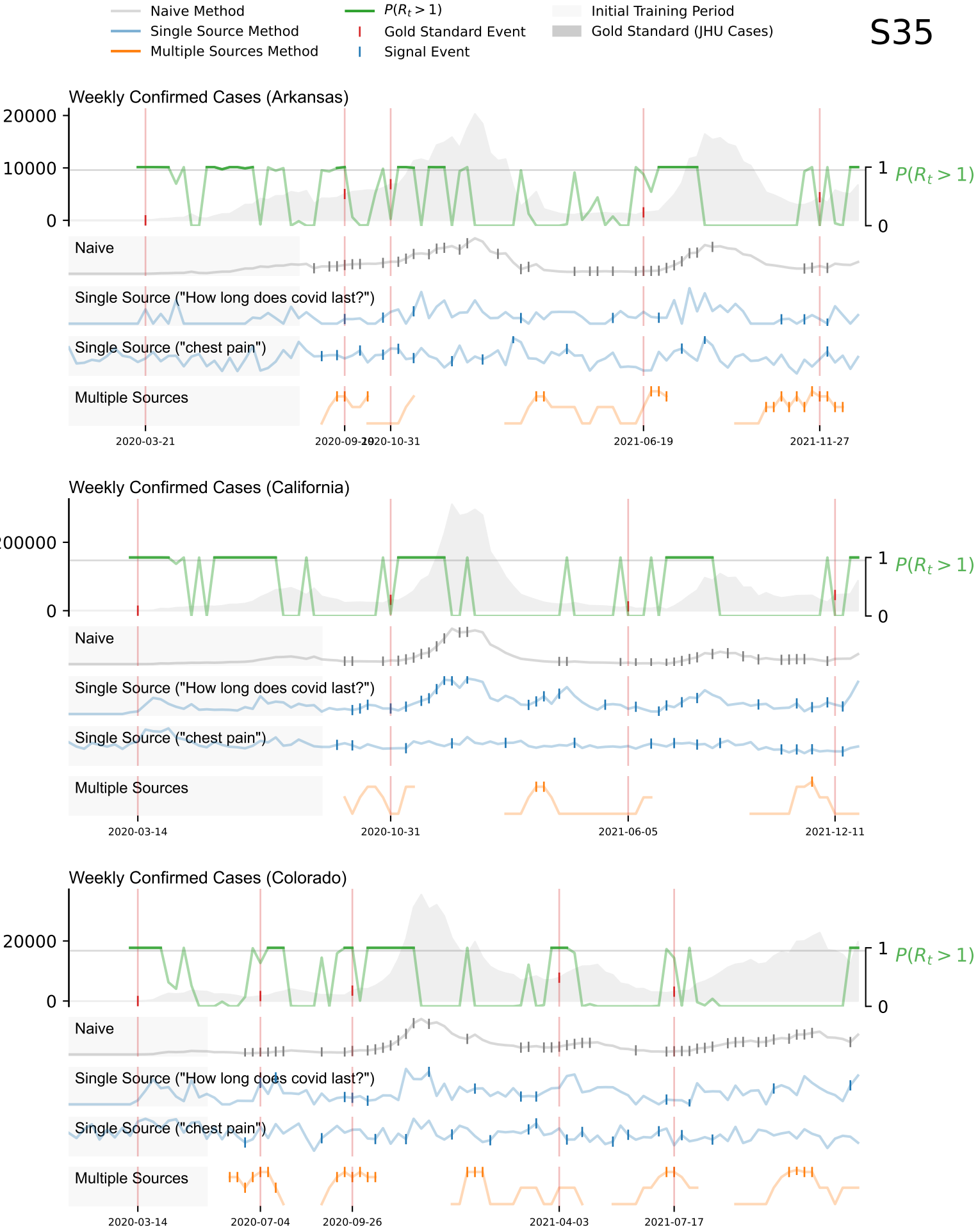
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S30
Weekly Confirmed Cases (TX, Collin)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-06-27
2020-09-26
2021-06-19
2021-12-11
Weekly Confirmed Cases (TX, Dallas)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-11-07
2021-07-24
2021-12-11
Weekly Confirmed Cases (TX, Harris)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-14
2020-06-13
2020-09-26
2021-07-10
2021-12-18

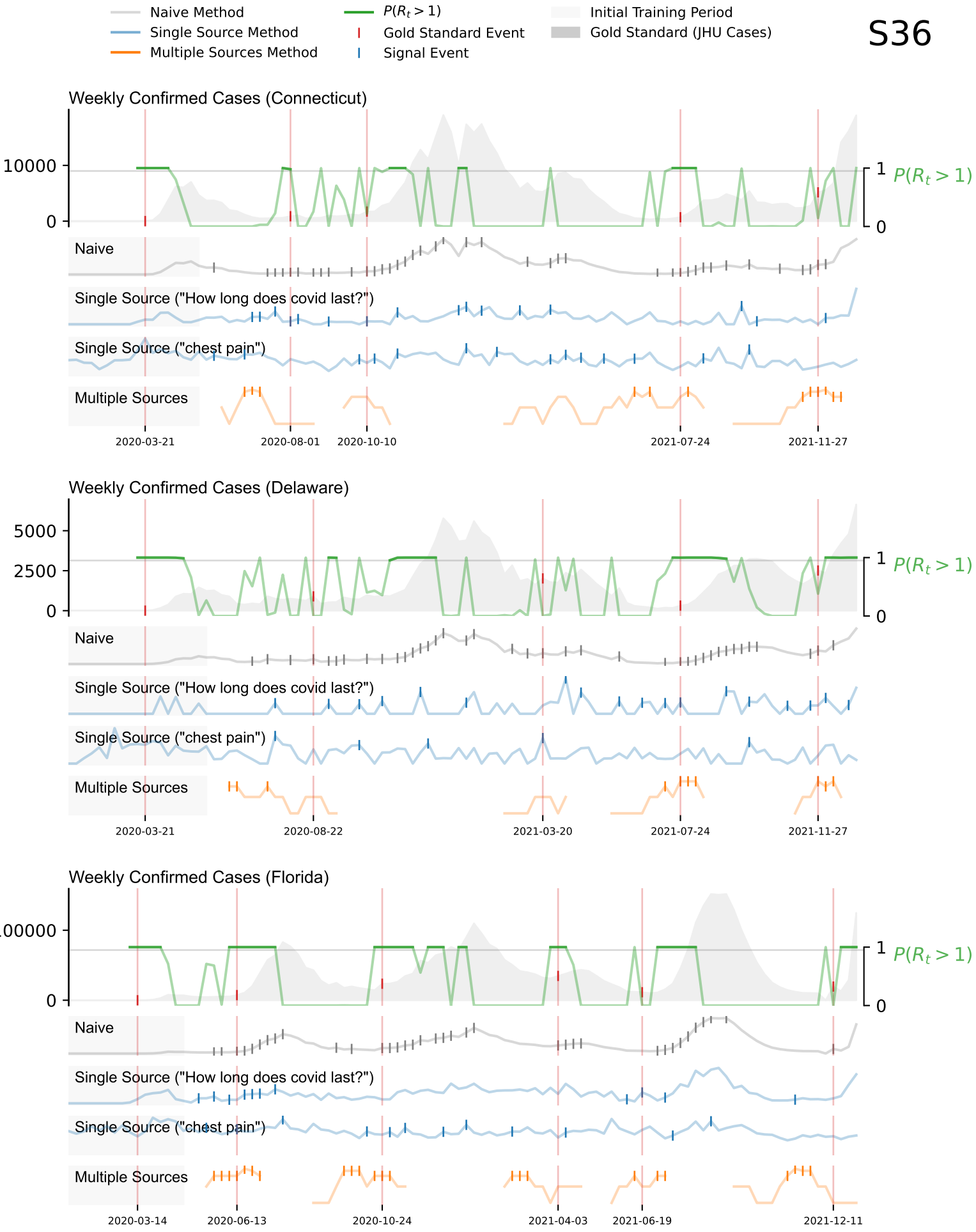
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S31
Weekly Confirmed Cases (TX, Tarrant)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-20
2020-09-26
2021-07-24
2021-12-11
Weekly Confirmed Cases (TX, Travis)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-06-20
2020-11-14
2021-07-17
2021-12-11
Weekly Confirmed Cases (UT, Salt Lake)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-28
2020-09-26
2021-01-09

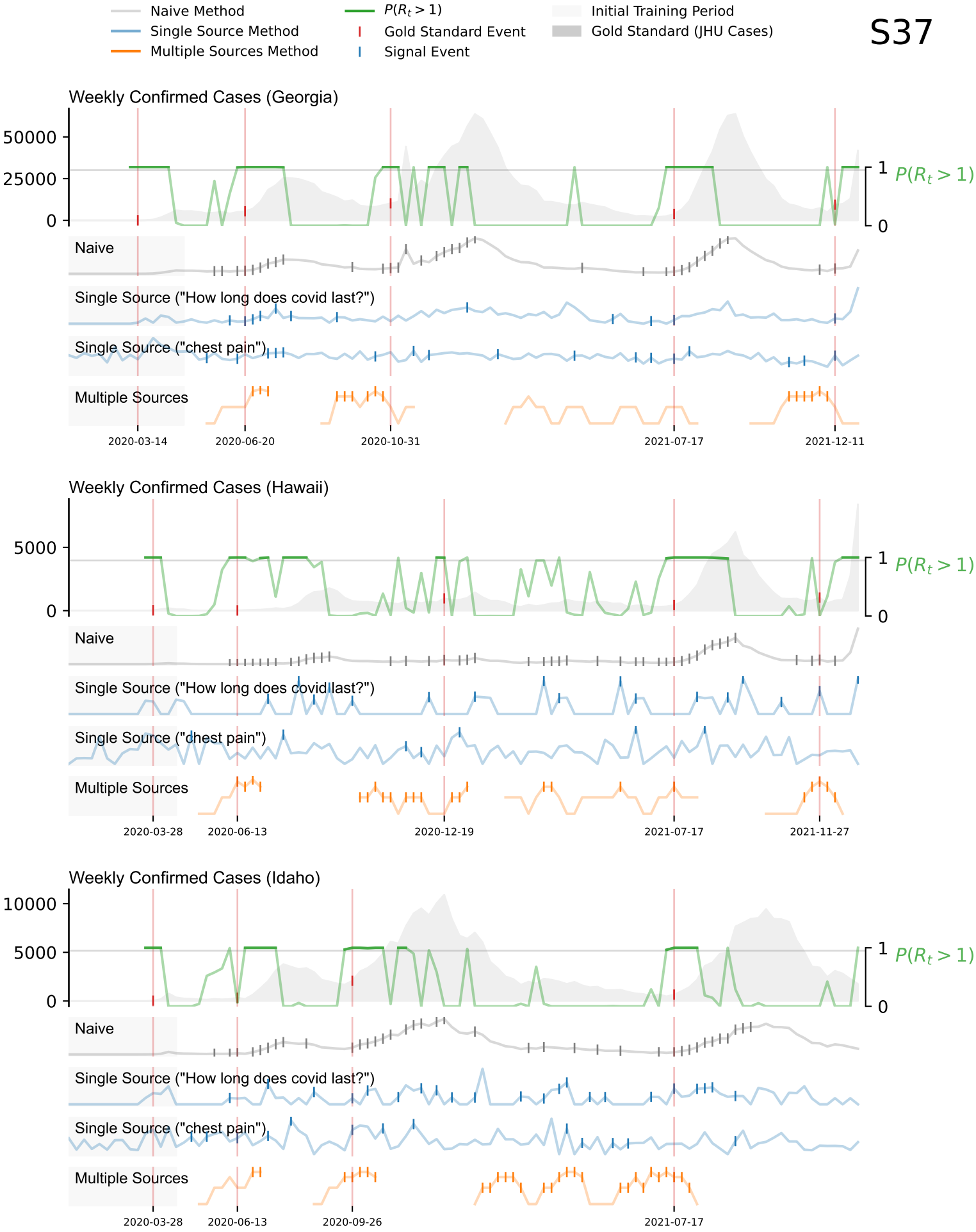
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S32
Weekly Confirmed Cases (VA, Albemarle)
200
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-04-04
2020-11-28
2021-07-24
Weekly Confirmed Cases (VA, Charlottesville)
400
200
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-09-05
2021-02-20
2021-09-04
2021-12-18
Weekly Confirmed Cases (VA, Fairfax)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("side effects of vaccine")
Multiple Sources
2020-03-21
2020-11-28
2021-07-03

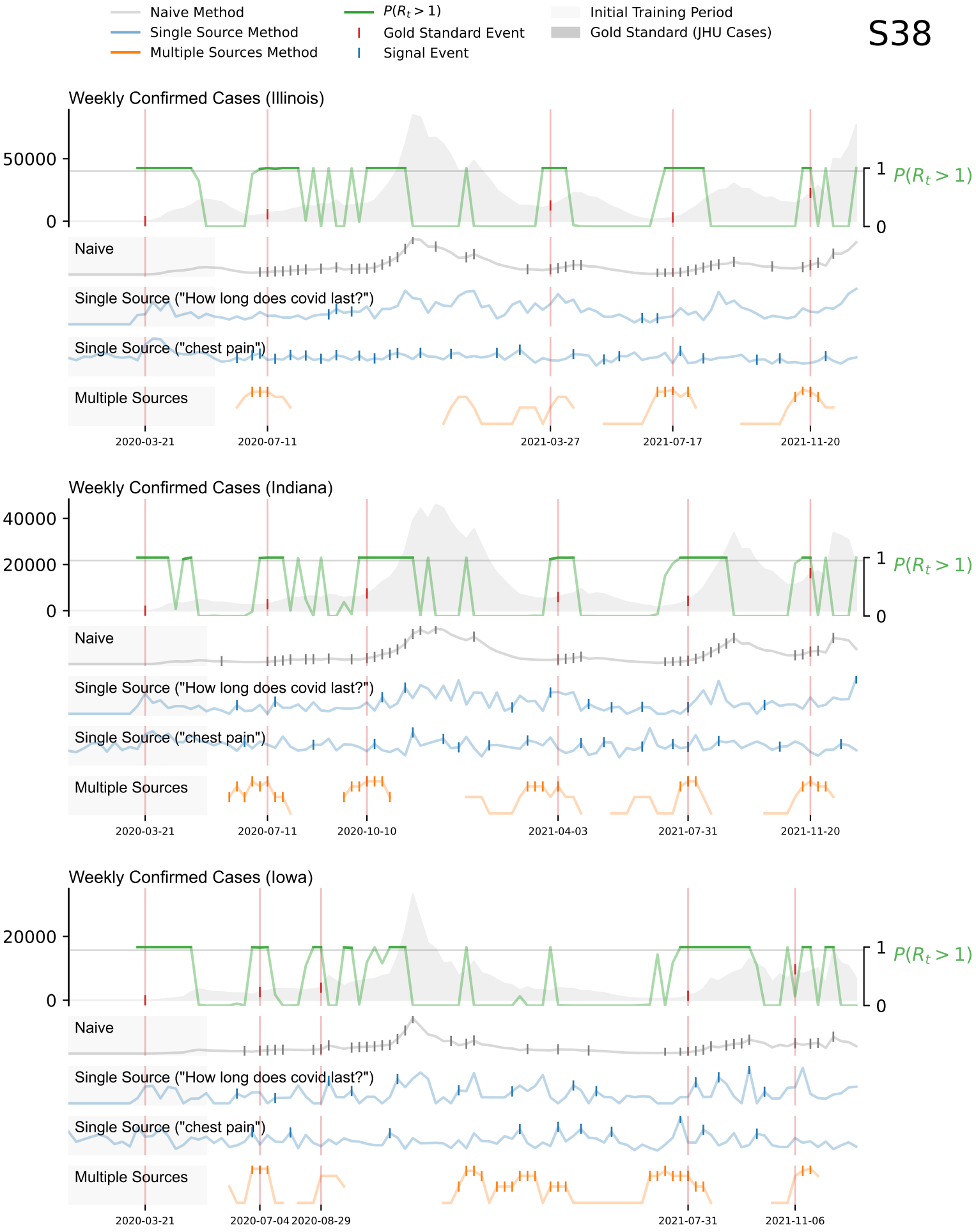
Figures S1-S49.
The probability of resurgence P(Rt > 1) (in green) and the different events generated by the Naive (gray), Single Source (blue) and Multiple Source methods (orange) at both county and state level.

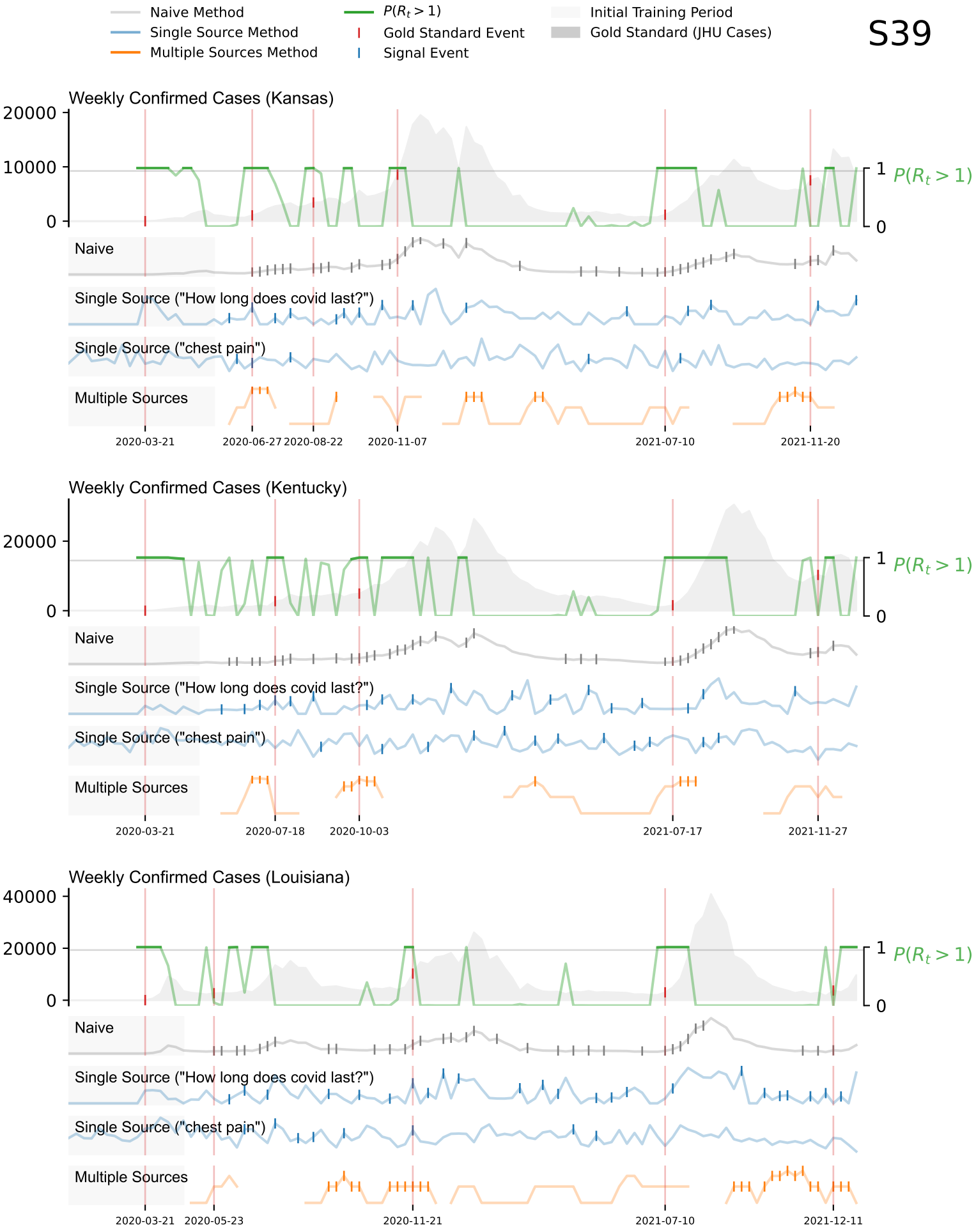
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S34
Weekly Confirmed Cases (Alabama)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-09-05
2021-03-27
2021-07-17
2021-12-11
Weekly Confirmed Cases (Alaska)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-28
2020-06-06
2020-10-03
2021-07-10
Weekly Confirmed Cases (Arizona)
50000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-09-26
2021-04-10
2021-07-03
2021-10-30


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S35
Weekly Confirmed Cases (Arkansas)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-09-19
2020-10-31
2021-06-19
2021-11-27
Weekly Confirmed Cases (California)
200000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-10-31
2021-06-05
2021-12-11
Weekly Confirmed Cases (Colorado)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-07-04
2020-09-26
2021-04-03
2021-07-17

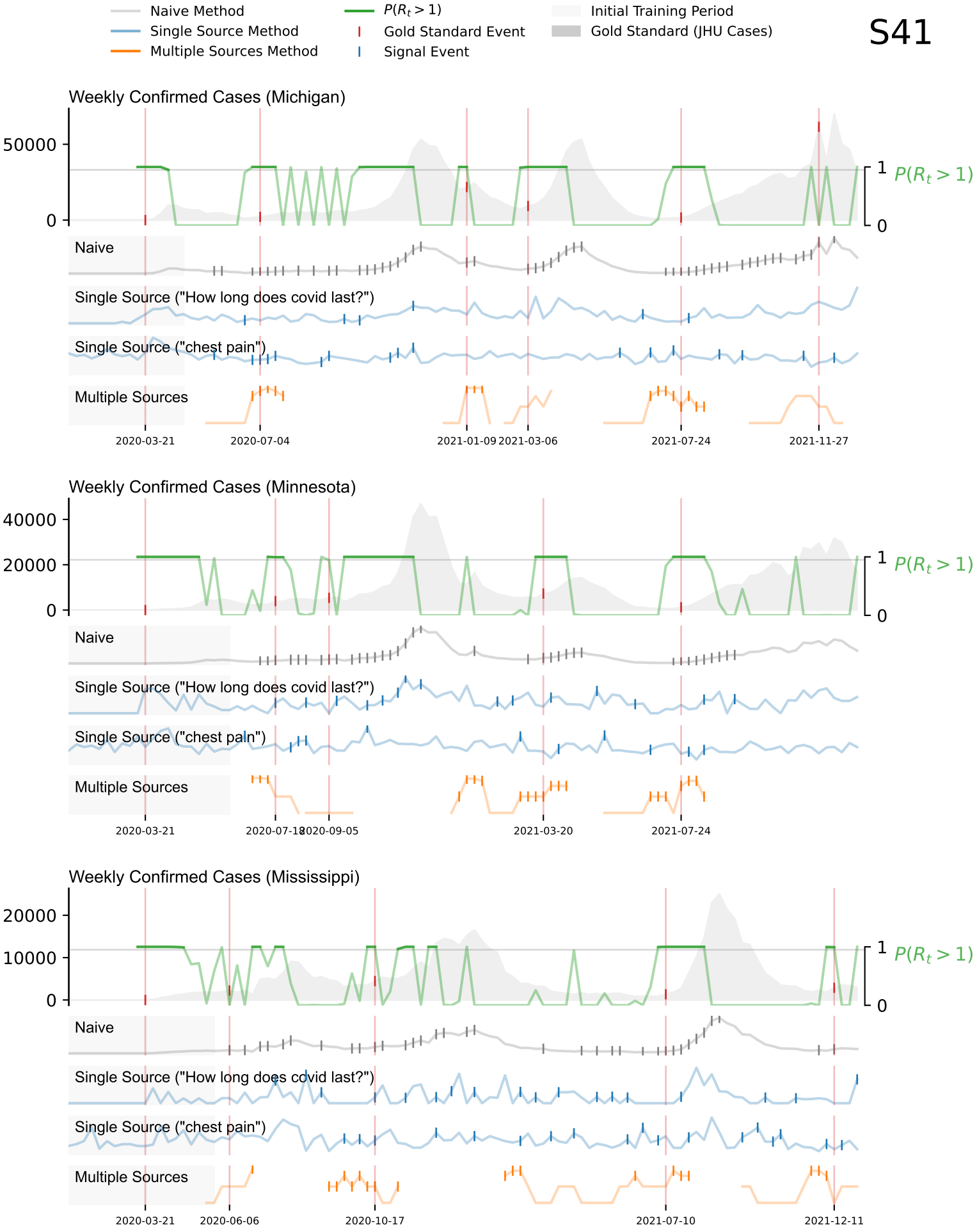

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S36
Weekly Confirmed Cases (Connecticut)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-08-01
2020-10-10
2021-07-24
2021-11-27
Weekly Confirmed Cases (Delaware)
5000
2500
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-08-22
2021-03-20
2021-07-24
2021-11-27
Weekly Confirmed Cases (Florida)
100000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-06-13
2020-10-24
2021-04-03
2021-06-19
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S37
Weekly Confirmed Cases (Georgia)
50000
25000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-06-20
2020-10-31
2021-07-17
2021-12-11
Weekly Confirmed Cases (Hawaii)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-28
2020-06-13
2020-12-19
2021-07-17
2021-11-27
Weekly Confirmed Cases (Idaho)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-28
2020-06-13
2020-09-26
2021-07-17

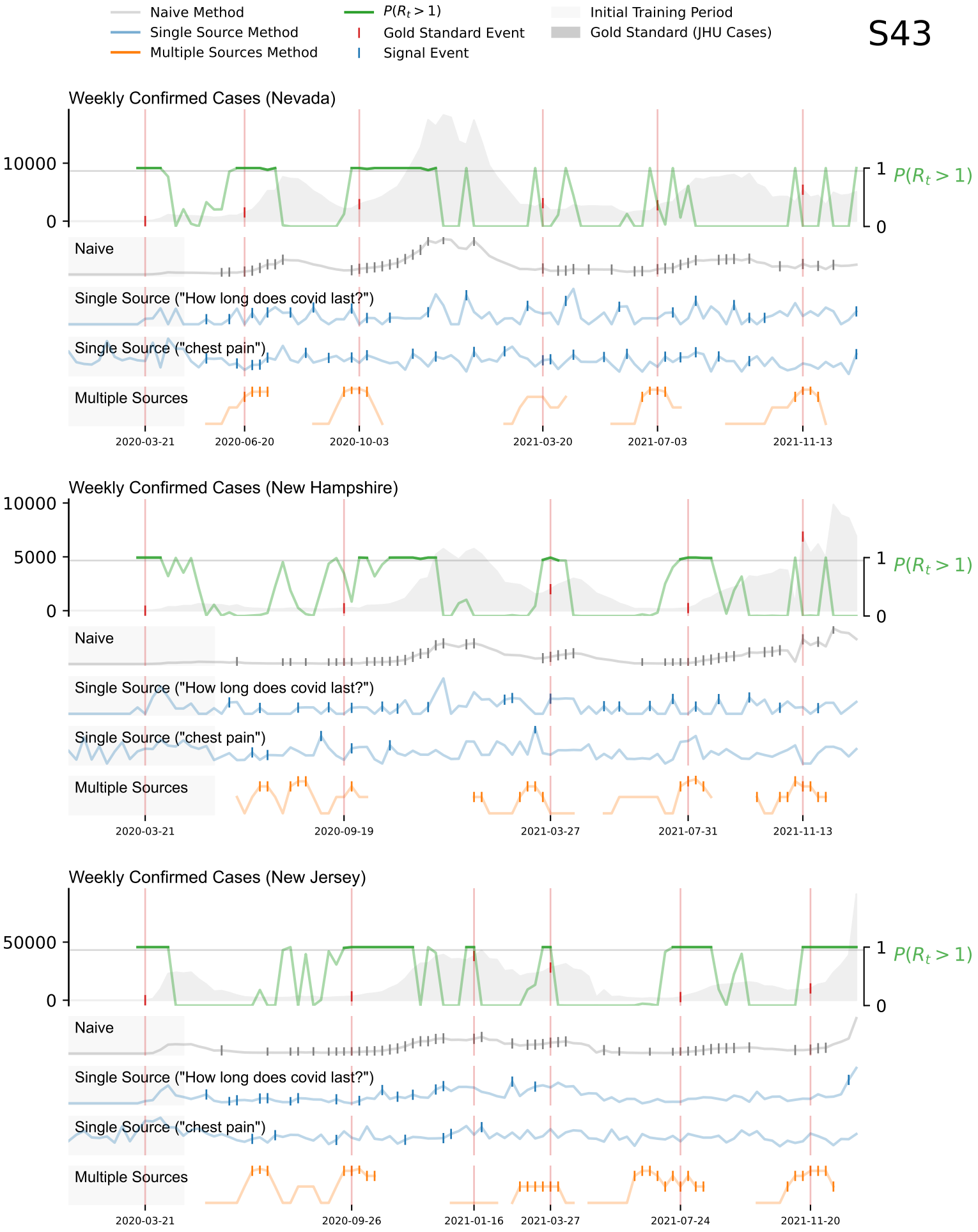

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S38
Weekly Confirmed Cases (Illinois)
50000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-11
2021-03-27
2021-07-17
2021-11-20
Weekly Confirmed Cases (Indiana)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-11
2020-10-10
2021-04-03
2021-07-31
2021-11-20
Weekly Confirmed Cases (Iowa)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-04
2020-08-29
2021-07-31
2021-11-06

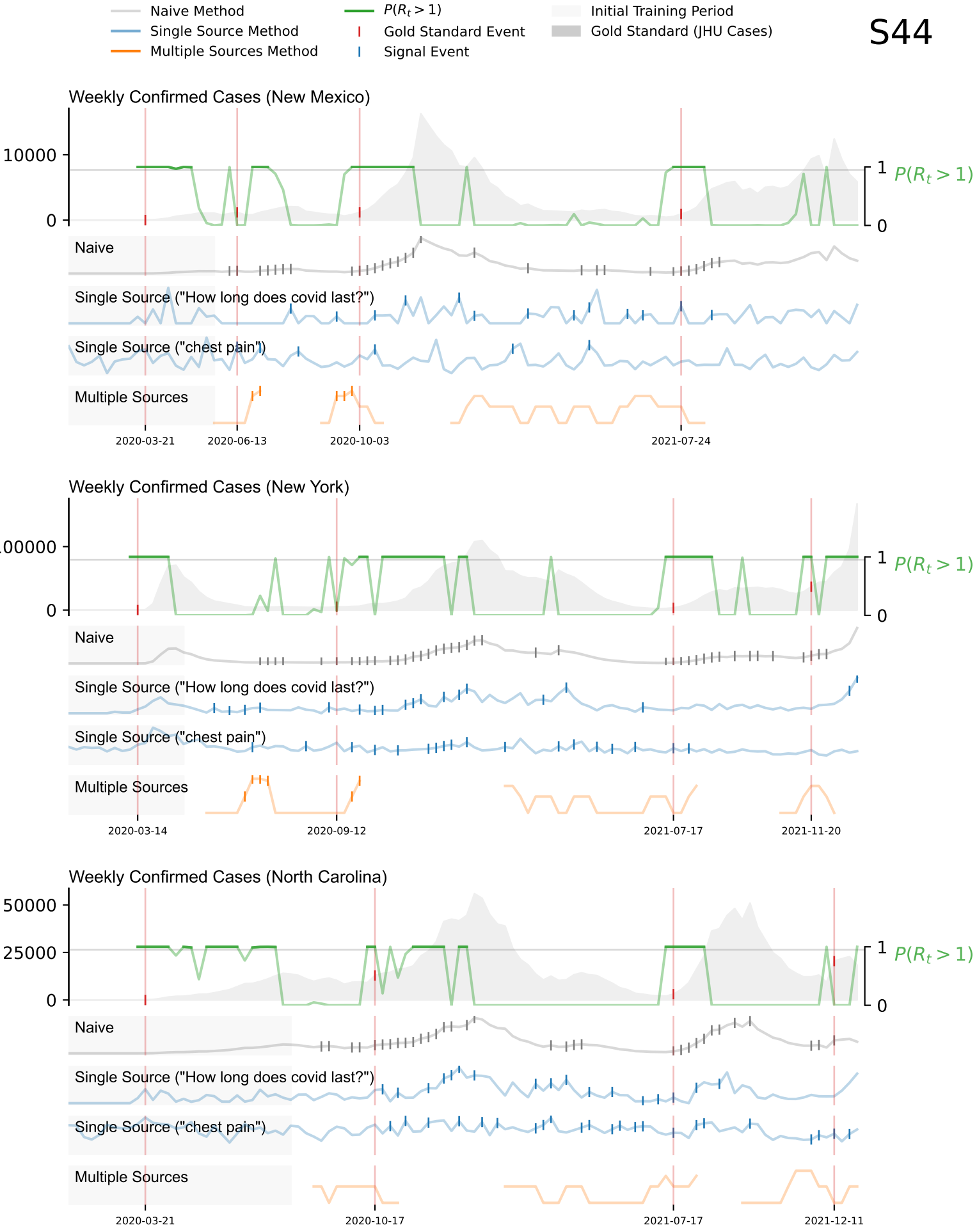

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S39
Weekly Confirmed Cases (Kansas)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-27
2020-08-22
2020-11-07
2021-07-10
2021-11-20
Weekly Confirmed Cases (Kentucky)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-18
2020-10-03
2021-07-17
2021-11-27
Weekly Confirmed Cases (Louisiana)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-05-23
2020-11-21
2021-07-10
2021-12-11

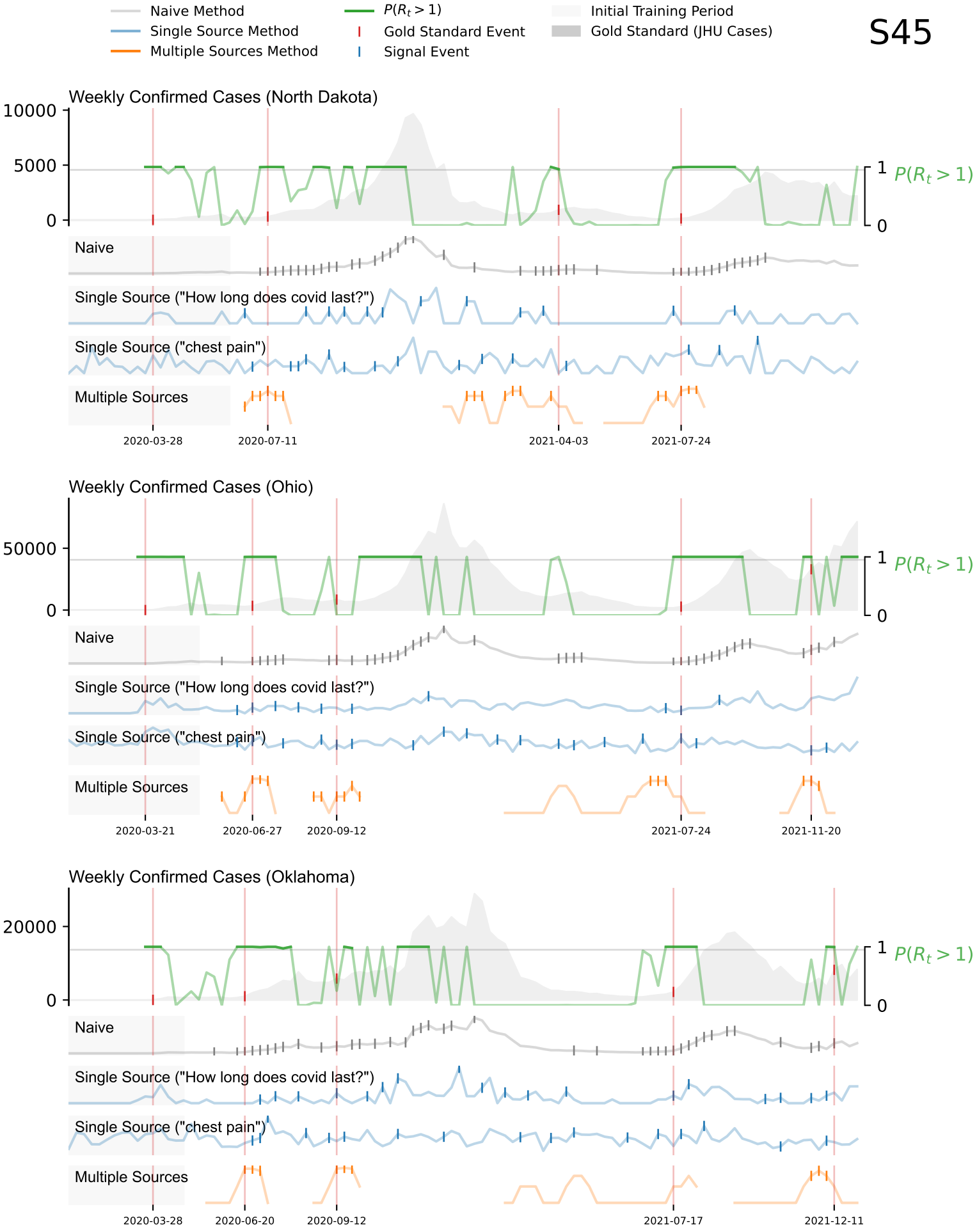
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S40
Weekly Confirmed Cases (Maine)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-28
2020-05-16
2020-11-07
2021-04-10
2021-07-24
2021-11-27
Weekly Confirmed Cases (Maryland)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-25
2020-09-12
2021-03-20
2021-07-17
2021-11-20
Weekly Confirmed Cases (Massachusetts)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-09-19
2021-03-27
2021-07-17
2021-11-27

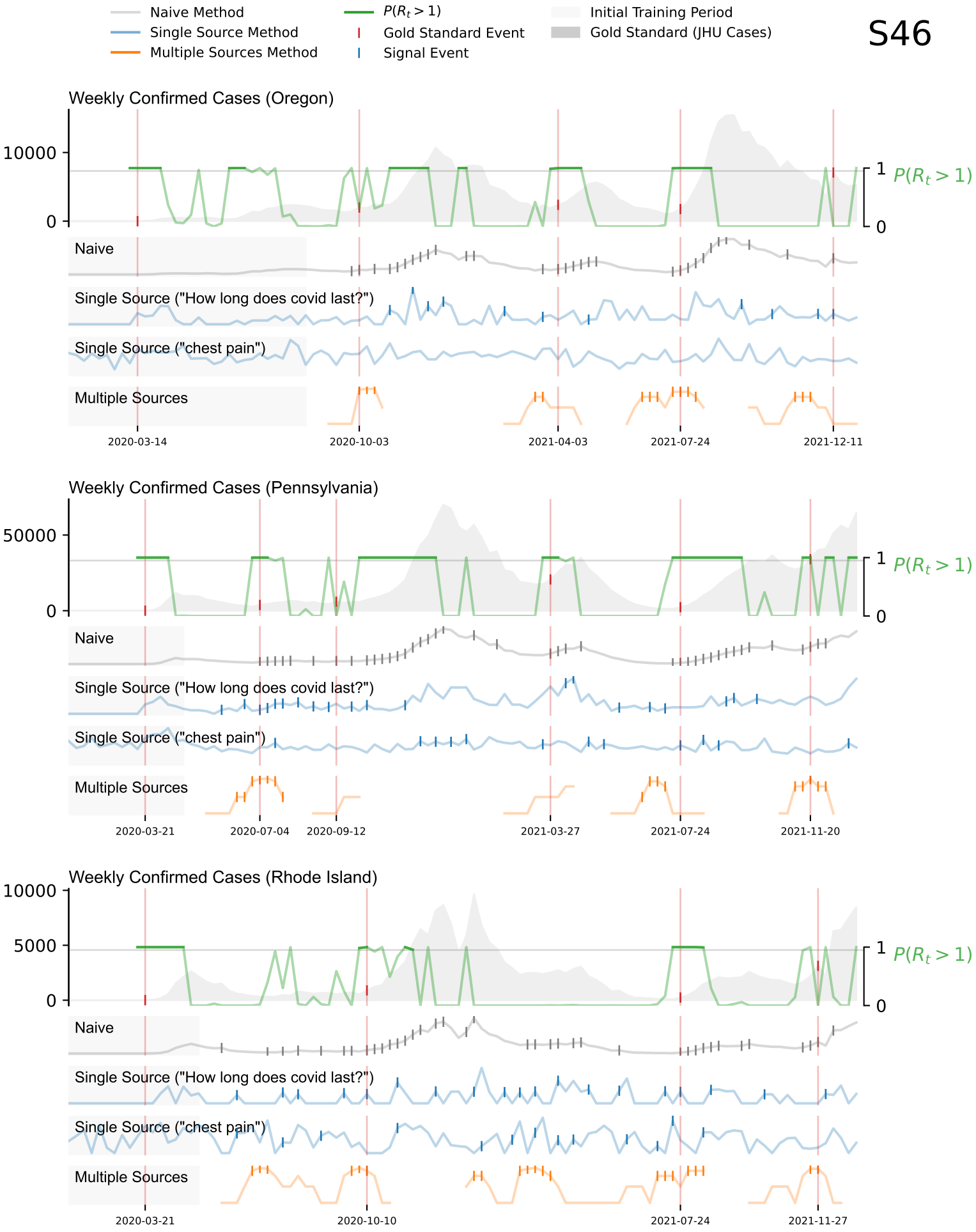

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S41
Weekly Confirmed Cases (Michigan)
50000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-04
2021-01-09
2021-03-06
2021-07-24
2021-11-27
Weekly Confirmed Cases (Minnesota)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-18
2020-09-05
2021-03-20
2021-07-24
Weekly Confirmed Cases (Mississippi)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-06
2020-10-17
2021-07-10
2021-12-11

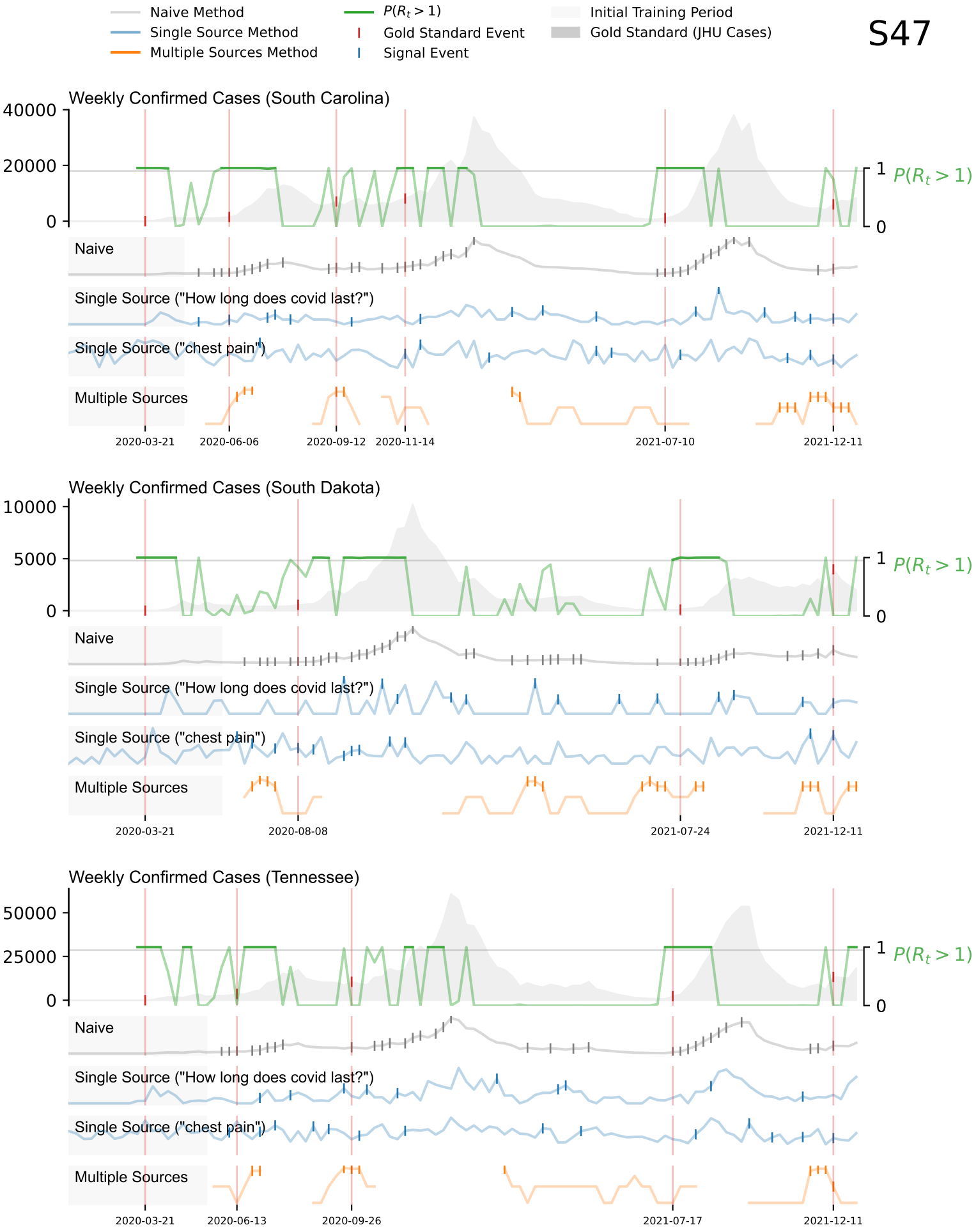
Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S42
Weekly Confirmed Cases (Missouri)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-13
2020-09-12
2021-01-09
2021-03-27
2021-06-19
2021-11-20
Weekly Confirmed Cases (Montana)
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-06
2020-09-05
2021-07-31
Weekly Confirmed Cases (Nebraska)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-25
2020-09-26
2021-04-03
2021-07-10
2021-12-11

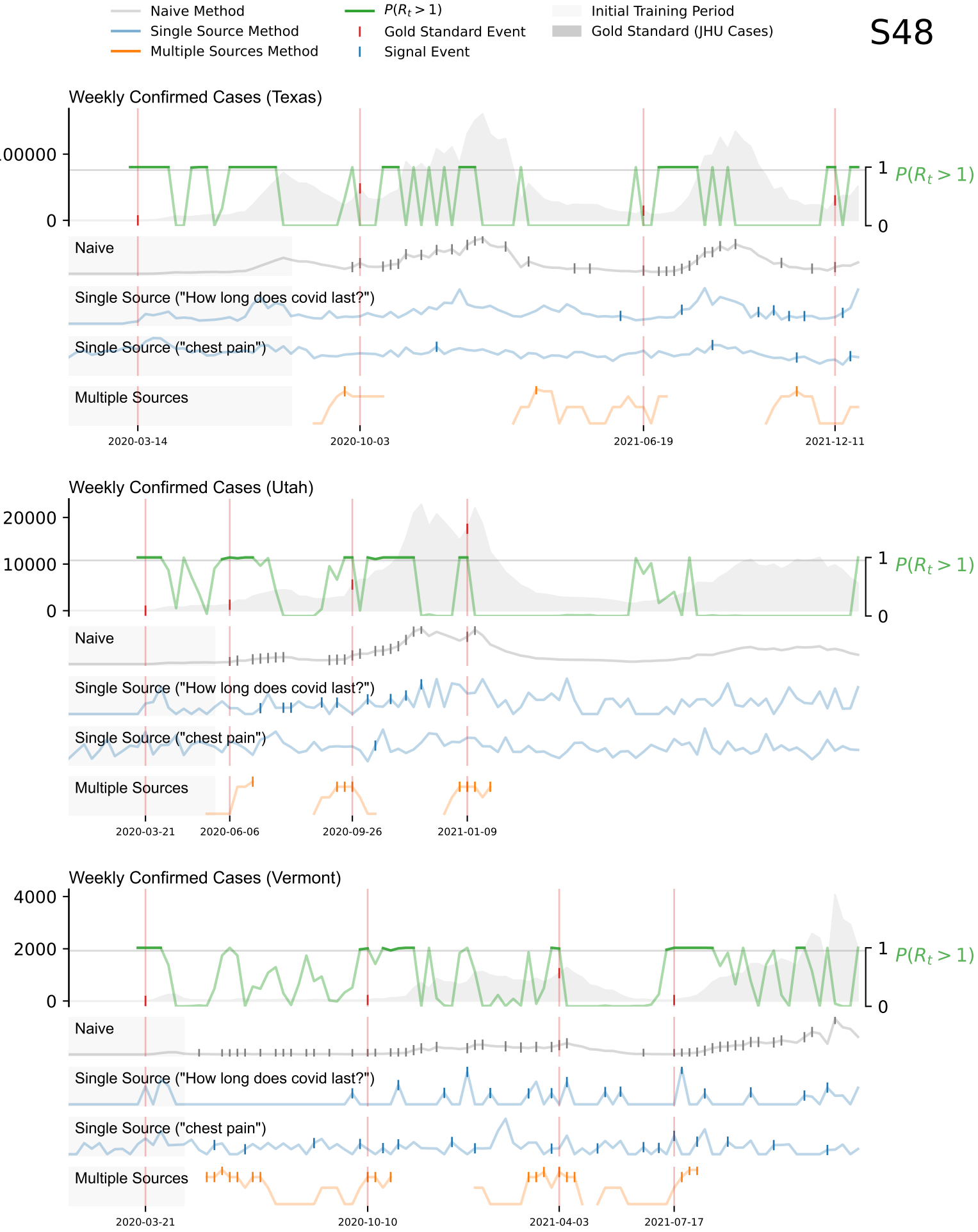

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S43
Weekly Confirmed Cases (Nevada)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-20
2020-10-03
2021-03-20
2021-07-03
2021-11-13
Weekly Confirmed Cases (New Hampshire)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-09-19
2021-03-27
2021-07-31
2021-11-13
Weekly Confirmed Cases (New Jersey)
50000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-09-26
2021-01-16
2021-03-27
2021-07-24
2021-11-20


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S44
Weekly Confirmed Cases (New Mexico)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-13
2020-10-03
2021-07-24
Weekly Confirmed Cases (New York)
100000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-09-12
2021-07-17
2021-11-20
Weekly Confirmed Cases (North Carolina)
50000
25000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-10-17
2021-07-17
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S45
Weekly Confirmed Cases (North Dakota)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-28
2020-07-11
2021-04-03
2021-07-24
Weekly Confirmed Cases (Ohio)
50000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-27
2020-09-12
2021-07-24
2021-11-20
Weekly Confirmed Cases (Oklahoma)
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-28
2020-06-20
2020-09-12
2021-07-17
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S46
Weekly Confirmed Cases (Oregon)
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-10-03
2021-04-03
2021-07-24
2021-12-11
Weekly Confirmed Cases (Pennsylvania)
50000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-04
2020-09-12
2021-03-27
2021-07-24
2021-11-20
Weekly Confirmed Cases (Rhode Island)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-10-10
2021-07-24
2021-11-27


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S47
Weekly Confirmed Cases (South Carolina)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-06
2020-09-12
2020-11-14
2021-07-10
2021-12-11
Weekly Confirmed Cases (South Dakota)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-08-08
2021-07-24
2021-12-11
Weekly Confirmed Cases (Tennessee)
50000
25000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-13
2020-09-26
2021-07-17
2021-12-11


Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S48
Weekly Confirmed Cases (Texas)
100000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-10-03
2021-06-19
2021-12-11
Weekly Confirmed Cases (Utah)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-06-06
2020-09-26
2021-01-09
Weekly Confirmed Cases (Vermont)
4000
2000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-10-10
2021-04-03
2021-07-17

Naive Method
Single Source Method
Multiple Sources Method
$P(R_t > 1)$
Gold Standard Event
Signal Event
Initial Training Period
Gold Standard (JHU Cases)
S49
Weekly Confirmed Cases (Virginia)
40000
20000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-21
2020-07-18
2020-10-17
2021-07-03
2021-12-18
Weekly Confirmed Cases (Washington)
20000
10000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-14
2020-06-06
2020-10-03
2021-04-03
2021-07-24
2021-12-11
Weekly Confirmed Cases (West Virginia)
10000
5000
0
1
0
$P(R_t > 1)$
Naive
Single Source ("How long does covid last?")
Single Source ("chest pain")
Multiple Sources
2020-03-28
2020-05-30
2020-09-12
2021-03-27
2021-07-24
2021-12-11

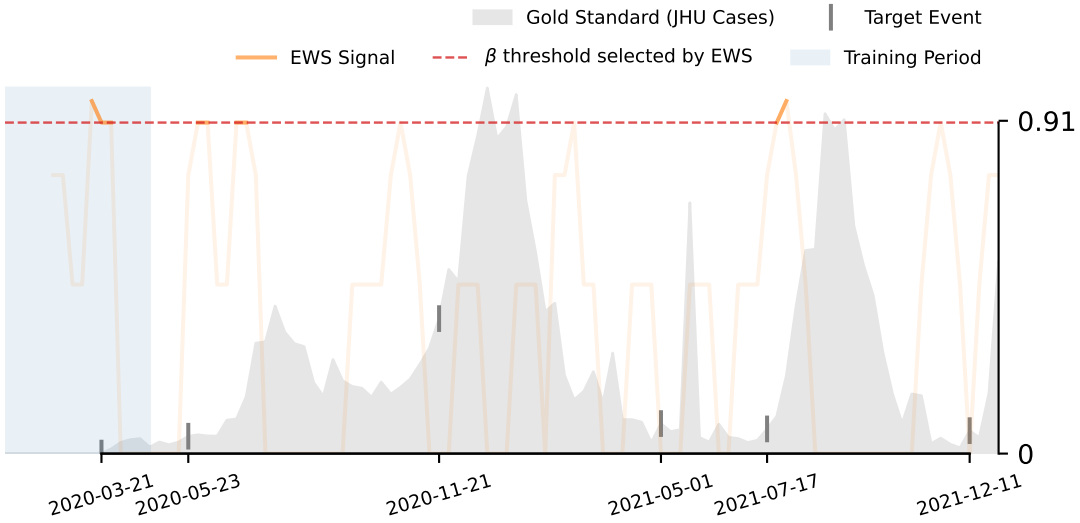
Figures S50-S139.
Visualization of the multiple sources model as a function of time. The model's output (orange) is compared against the onsets (vertical gray tick marks) of the COVID-19 reported cases (gray-filled curve). As more information becomes available, the EWS model is re-trained to select the proxies that best fit the training data available (represented by the blue shading on each Figure). A list of the selected proxies for each model, along with a performance table are also presented.

AL, Jefferson

Proxies selected by the Multiple Sources method

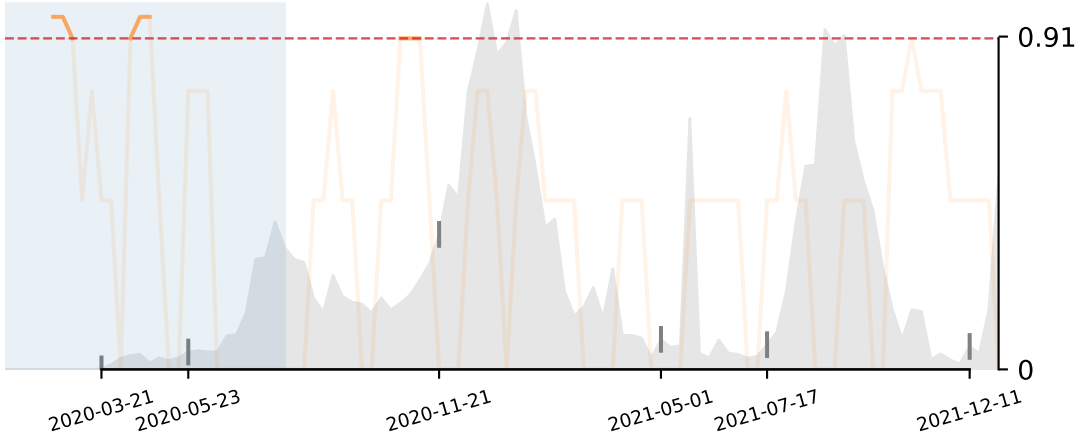
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis
(GT) Bronchitis



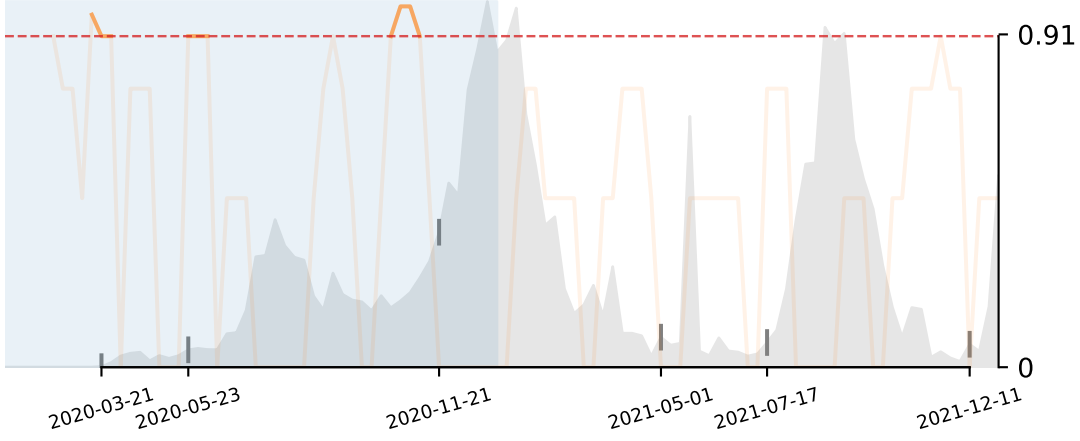
Model 2

(GT) covid
(GT) covid-19
(GT) Abdominal pain
(GT) Asphyxia
(GT) Dizziness
(GT) Vertigo



Model 3

(GT) covid
(GT) covid-19
(GT) Abdominal pain
(GT) Asphyxia
(GT) fever
(GT) covid symptoms



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	0	1	4
0.91	1	0	0	2	7	1
0.76	1	1	0	4	13	1
0.46	1	2	0	5	30	0
0.00	1	2	0	5	56	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	0	0	2	0	0	4
0.91	2	2	0	2	0	2
0.76	2	3	0	2	8	1
0.46	2	5	0	4	29	0
0.00	2	6	0	4	46	0

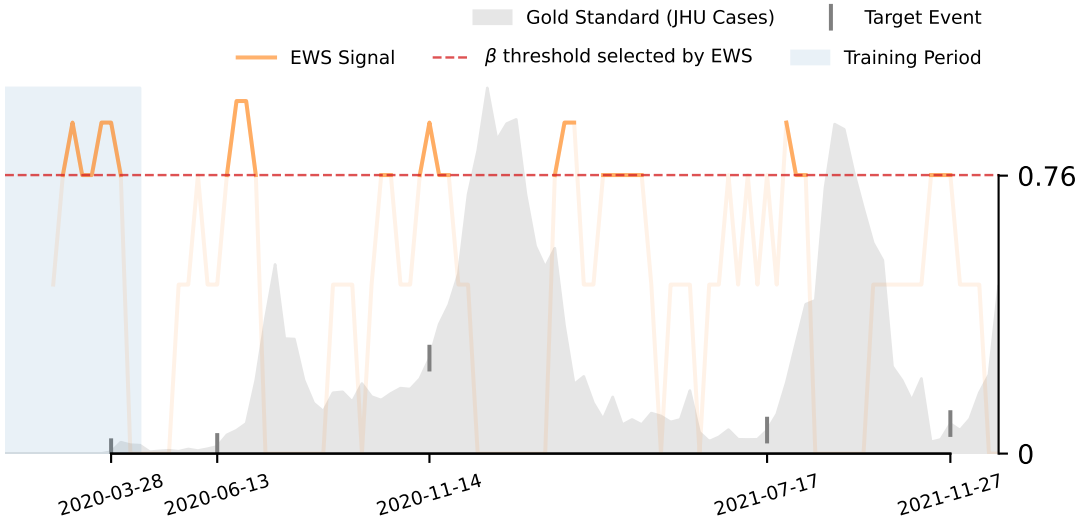
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	1	0	2	0	0	3
0.91	2	0	1	1	0	2
0.76	3	6	0	3	4	0
0.46	3	10	0	3	19	0
0.00	3	16	0	3	31	0

AL, Madison

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Chest pain
(GT) Wheeze

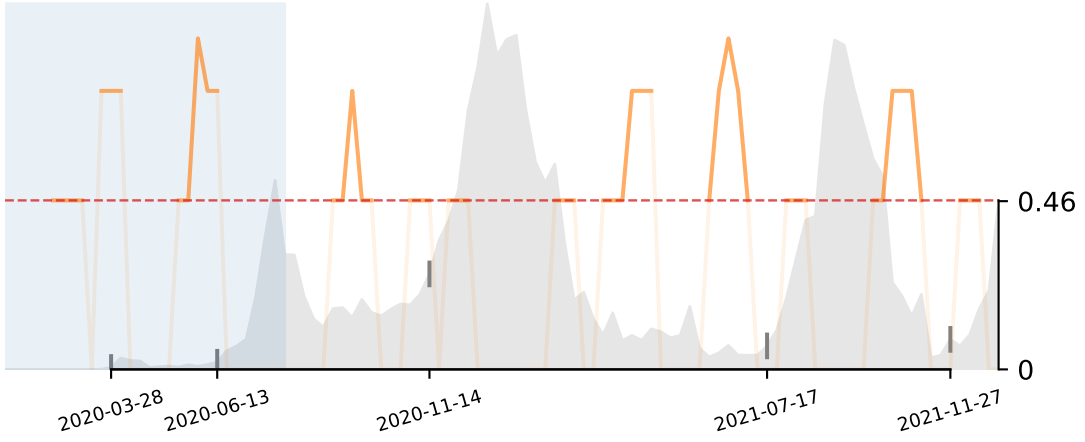


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	2	3
0.91	0	0	1	1	5	1
0.76	1	0	0	4	17	0
0.46	1	2	0	4	34	0
0.00	1	3	0	4	61	0

Model 2

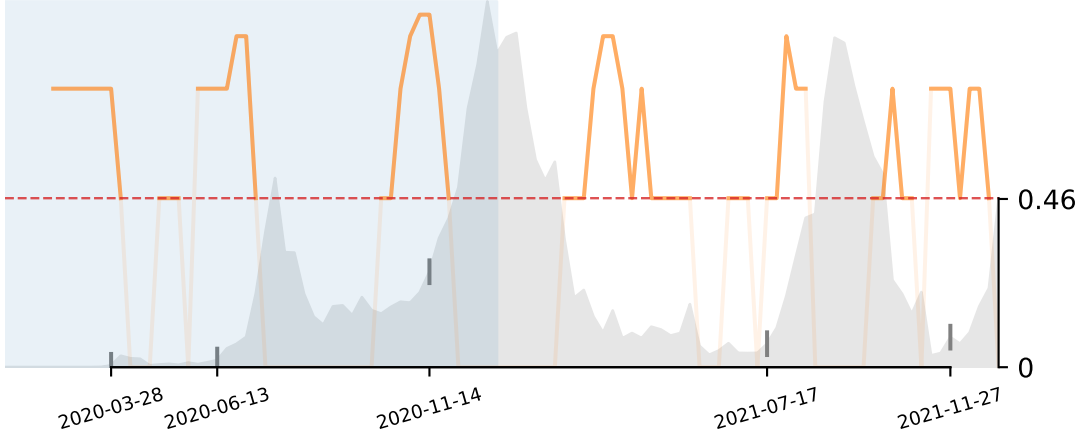
(GT) chest pain
(GT) Chest pain
(GT) Chills



β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	1	0	2
0.76	1	0	1	2	4	1
0.46	2	1	0	3	24	0
0.00	2	3	0	3	53	0

Model 3

(GT) chest pain
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Diarrhea
(GT) Otitis



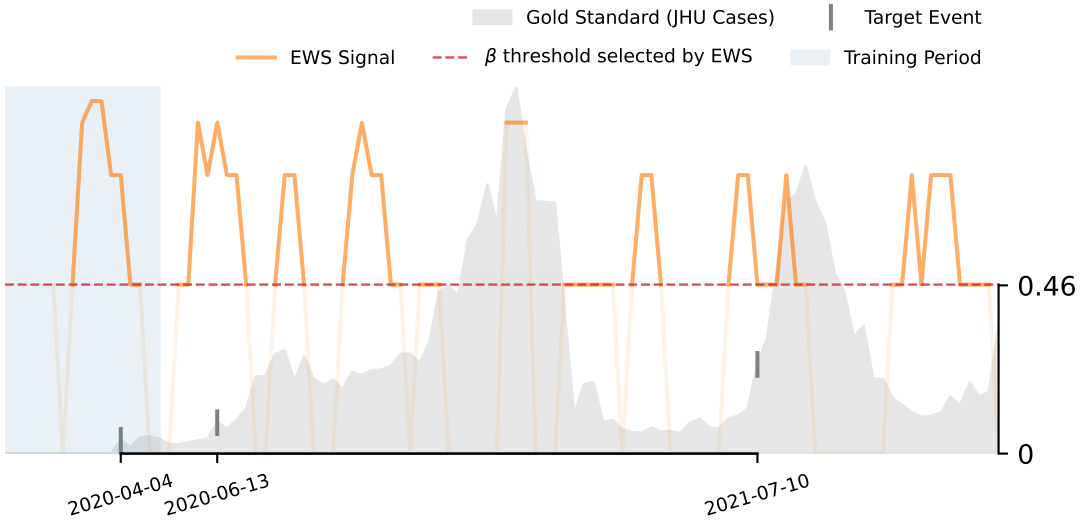
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	0	3	1
0.76	1	2	2	1	10	0
0.46	3	6	0	2	24	0
0.00	3	12	0	2	38	0

AR, Pulaski

Proxies selected by the Multiple Sources method

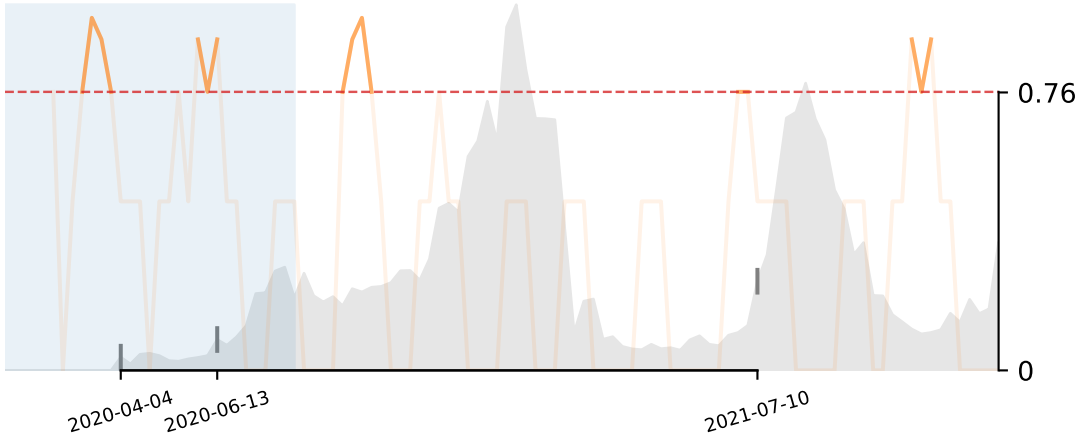
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Anxiety



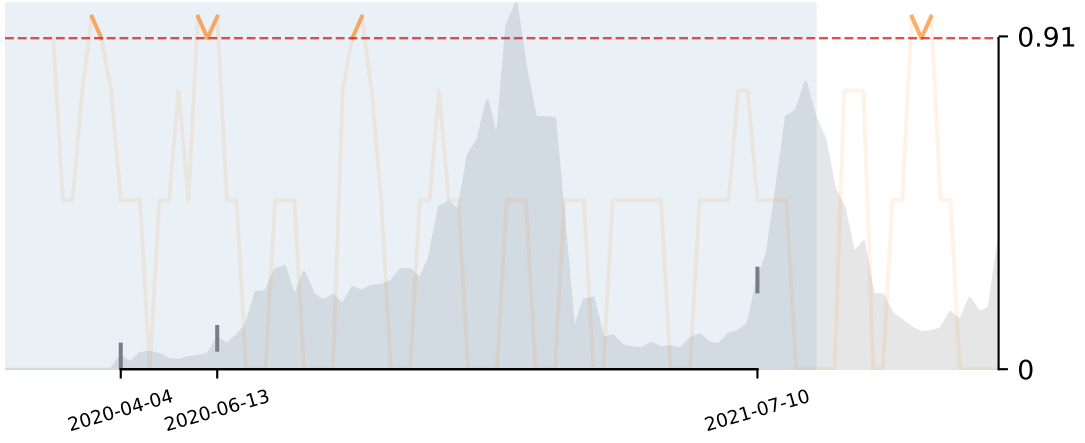
Model 2

(GT) covid
(GT) covid symptoms
(GT) fever
(GT) Anxiety
(GT) Diarrhea



Model 3

(GT) covid
(GT) covid symptoms
(GT) Nasal congestion
(GT) Anxiety
(GT) Diarrhea
(GT) fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	2
0.99	0	0	1	0	0	2
0.96	0	0	1	0	0	2
0.91	1	0	0	1	4	1
0.76	1	0	0	2	18	0
0.46	1	0	0	2	46	0
0.00	1	4	0	2	74	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	1
0.96	0	0	2	0	1	1
0.91	1	0	1	0	4	1
0.76	2	0	0	1	8	0
0.46	2	1	0	1	32	0
0.00	2	11	0	1	66	0

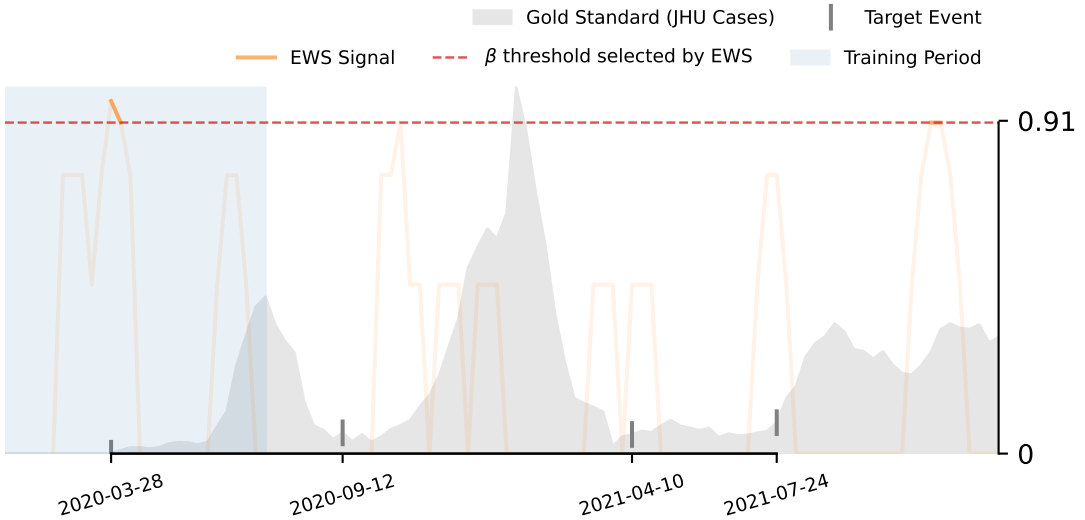
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	0
0.99	0	0	3	0	0	0
0.96	0	0	3	0	2	0
0.91	2	1	1	0	3	0
0.76	2	3	1	0	6	0
0.46	3	6	0	0	10	0
0.00	3	39	0	0	19	0

AZ, Maricopa

Proxies selected by the Multiple Sources method

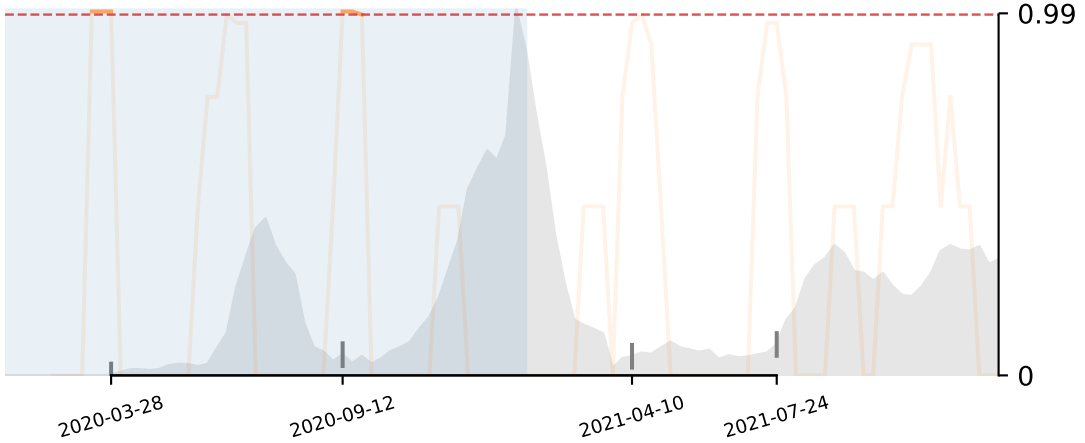
Model 1

(GT) loss of smell
(GT) chest tightness
(GT) covid-19 who
(GT) sars-cov-2
(GT) covid
(GT) covid-19



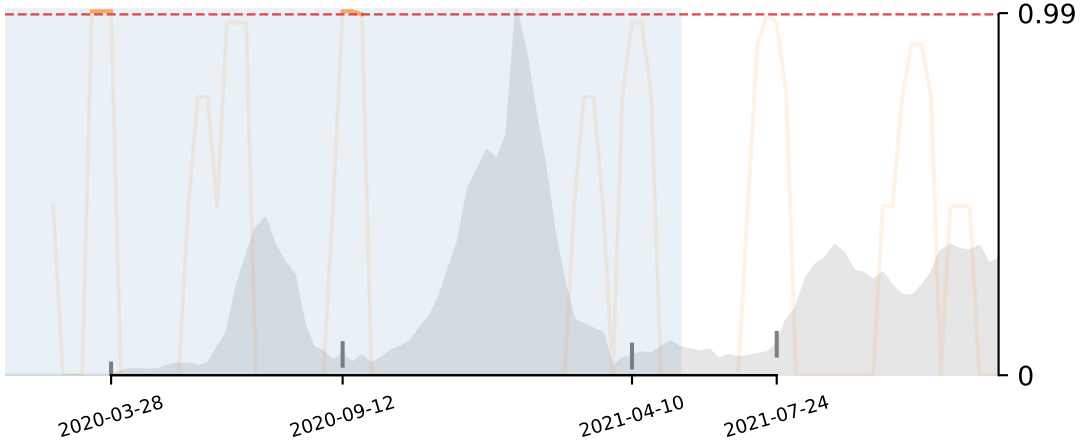
Model 2

(GT) covid symptoms
(GT) Acute bronchitis
(GT) Bronchitis
(GT) Cough
(GT) Phlegm
(GT) Chest pain



Model 3

(GT) covid symptoms
(GT) Acute bronchitis
(GT) Bronchitis
(GT) Cough
(GT) Phlegm
(GT) Chills



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	0	3
0.91	1	0	0	0	3	3
0.76	1	1	0	1	7	2
0.46	1	5	0	2	20	1
0.00	1	7	0	3	55	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	2	1	0	0	1	1
0.96	2	3	0	2	1	0
0.91	2	5	0	2	5	0
0.76	2	5	0	2	8	0
0.46	2	7	0	2	17	0
0.00	2	11	0	2	35	0

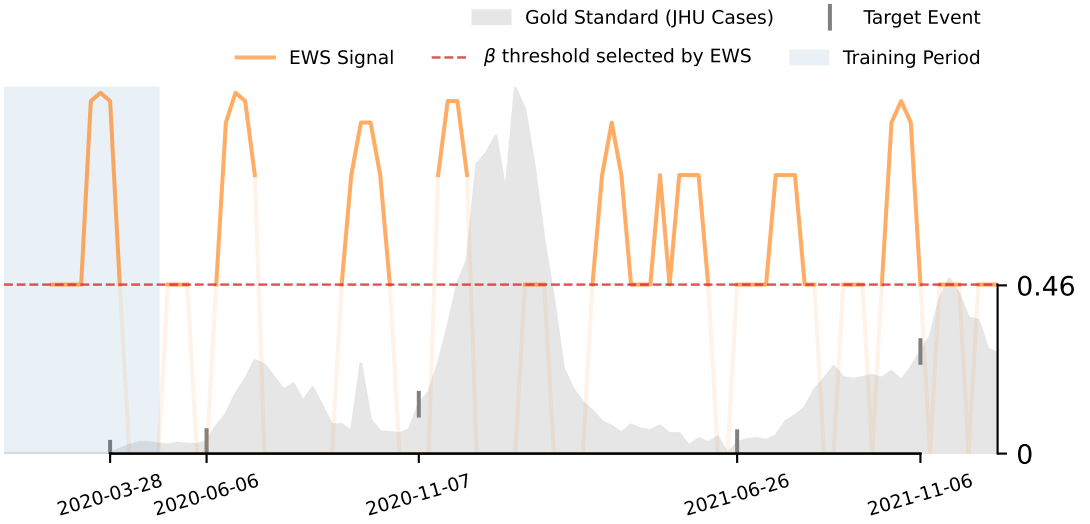
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	2	1	1	1	0	0
0.96	2	2	1	1	0	0
0.91	3	6	0	1	2	0
0.76	3	6	0	1	5	0
0.46	3	10	0	1	10	0
0.00	3	14	0	1	26	0

AZ, Pima

Proxies selected by the Multiple Sources method

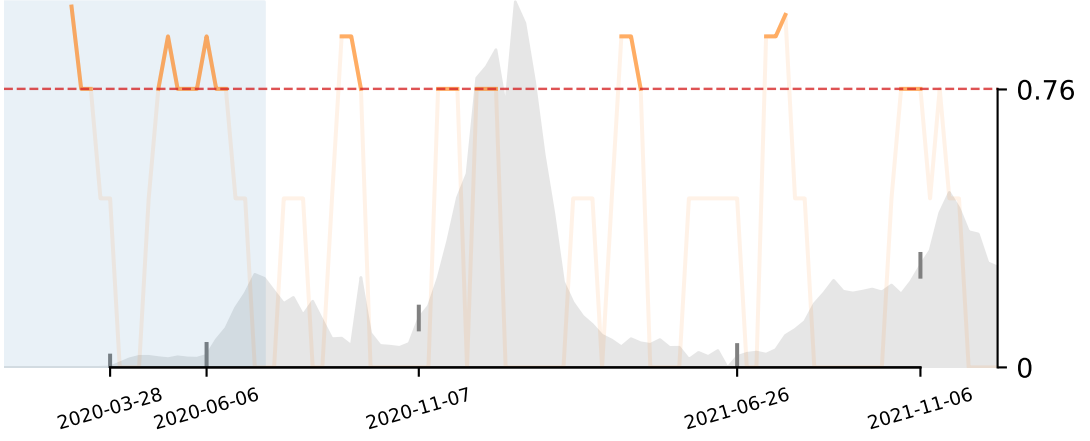
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis



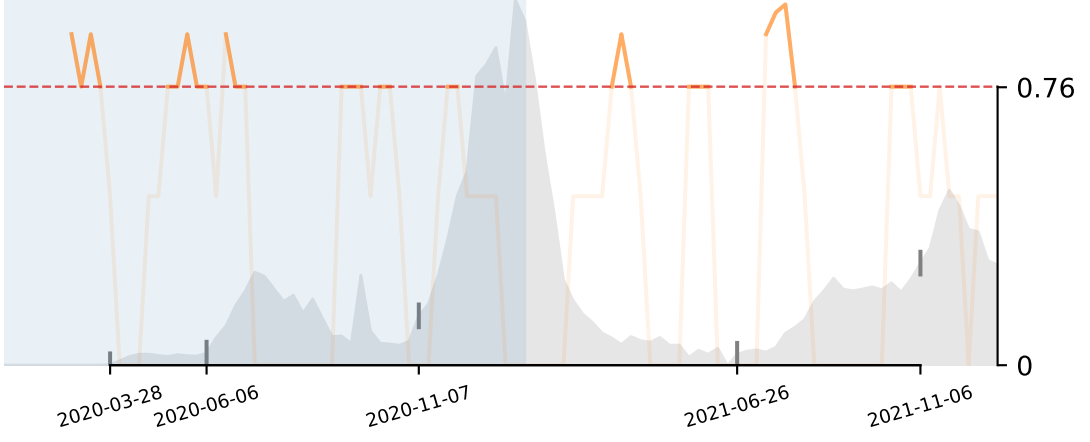
Model 2

(GT) Ageusia
(GT) Chills
(GT) Nasal congestion
Apple Mobility (driving)
Apple Mobility (transit)
(GT) covid symptoms



Model 3

(GT) Ageusia
(GT) Nasal congestion
Apple Mobility (driving)
up2date
(GT) covid-19
(GT) covid symptoms



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	1	4
0.96	1	0	0	1	4	3
0.91	1	0	0	2	6	1
0.76	1	0	0	3	16	0
0.46	1	0	0	4	39	0
0.00	1	3	0	4	61	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	0	1	3
0.91	1	0	1	0	7	3
0.76	2	0	0	2	15	1
0.46	2	3	0	3	28	0
0.00	2	6	0	3	55	0

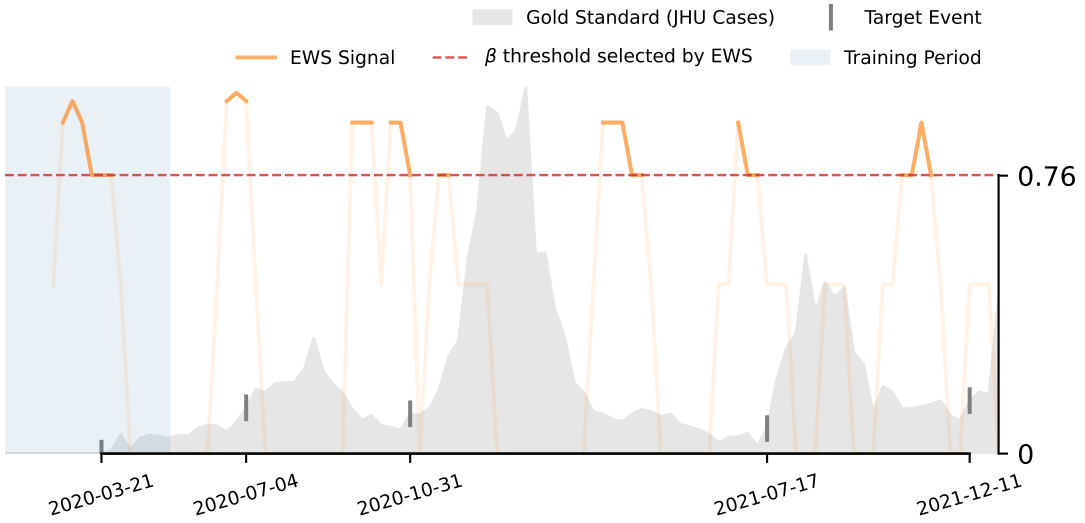
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	1	2
0.96	0	0	3	0	2	2
0.91	0	0	3	0	4	2
0.76	2	1	1	2	8	0
0.46	3	8	0	2	20	0
0.00	3	17	0	2	35	0

CA, Alameda

Proxies selected by the Multiple Sources method

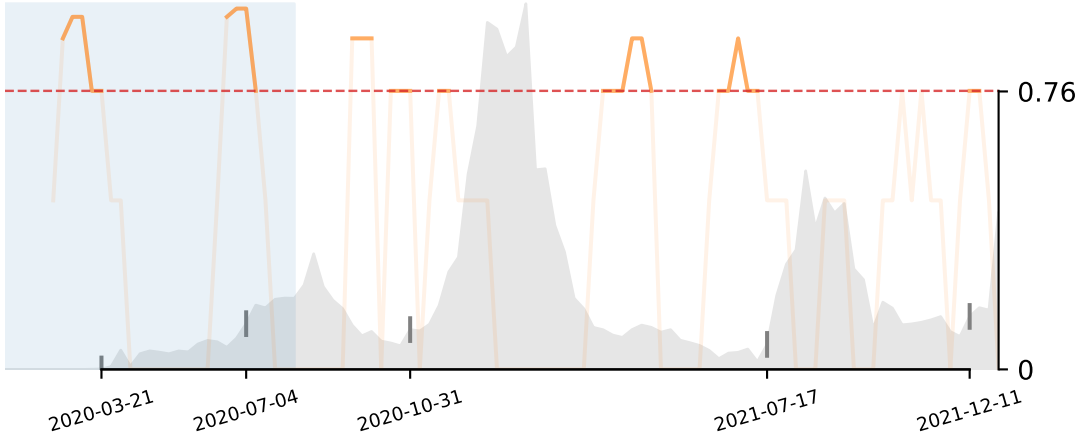
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



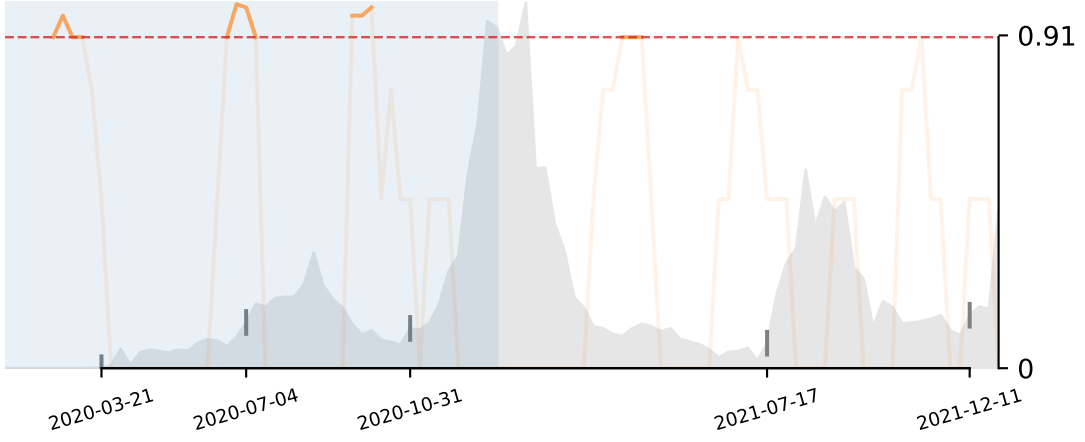
Model 2

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine



Model 3

(GT) chest pain
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Sore throat
(GT) Throat irritation
(GT) covid



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	1	0	3
0.91	1	0	0	4	3	0
0.76	1	0	0	4	8	0
0.46	1	1	0	4	25	0
0.00	1	3	0	4	58	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	0	0	3
0.91	2	0	0	2	2	1
0.76	2	0	0	3	10	0
0.46	2	1	0	3	24	0
0.00	2	5	0	3	52	0

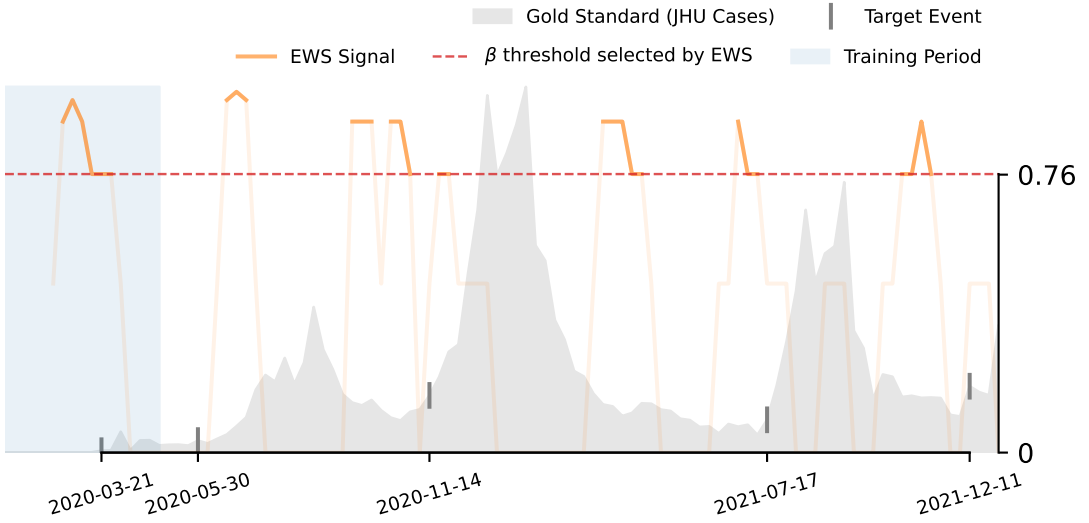
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	2	0	1	0	0	2
0.91	3	2	0	2	3	0
0.76	3	4	0	2	6	0
0.46	3	4	0	2	15	0
0.00	3	7	0	2	38	0

CA, Contra Costa

Proxies selected by the Multiple Sources method

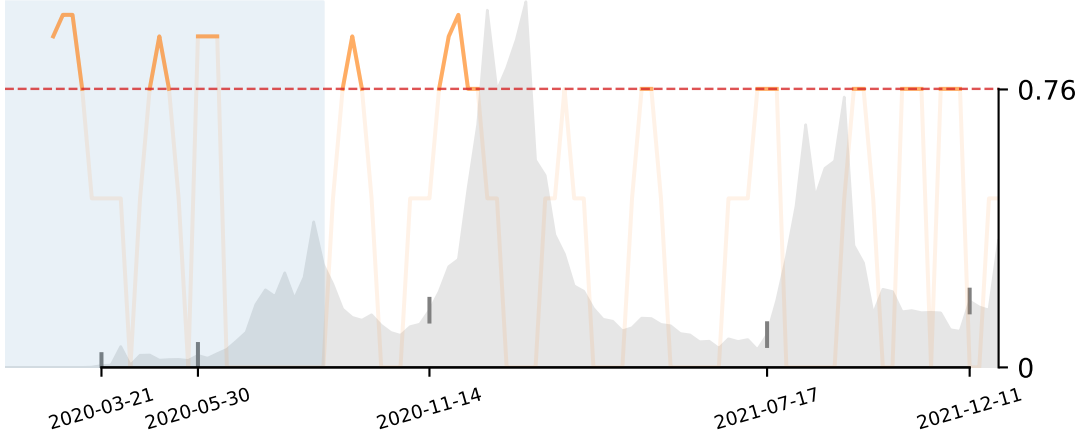
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



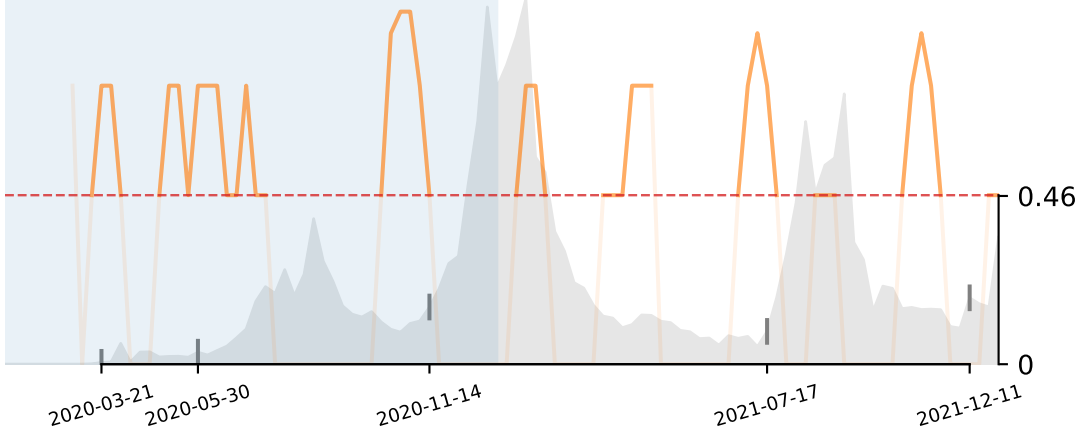
Model 2

(GT) fever
(GT) Ageusia
(GT) Chronic pain
(GT) Diarrhea
(GT) Fatigue
(GT) Otitis



Model 3

(GT) Ageusia
(GT) Asthma
(GT) loss of smell
(GT) chest tightness
Apple Mobility (transit)
(GT) chest pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	1	4
0.96	0	0	1	0	3	4
0.91	1	0	0	3	8	1
0.76	1	0	0	3	13	1
0.46	1	1	0	3	30	0
0.00	1	3	0	4	62	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	0	1	3
0.91	1	0	1	0	3	2
0.76	2	3	0	2	15	0
0.46	2	4	0	3	28	0
0.00	2	7	0	3	49	0

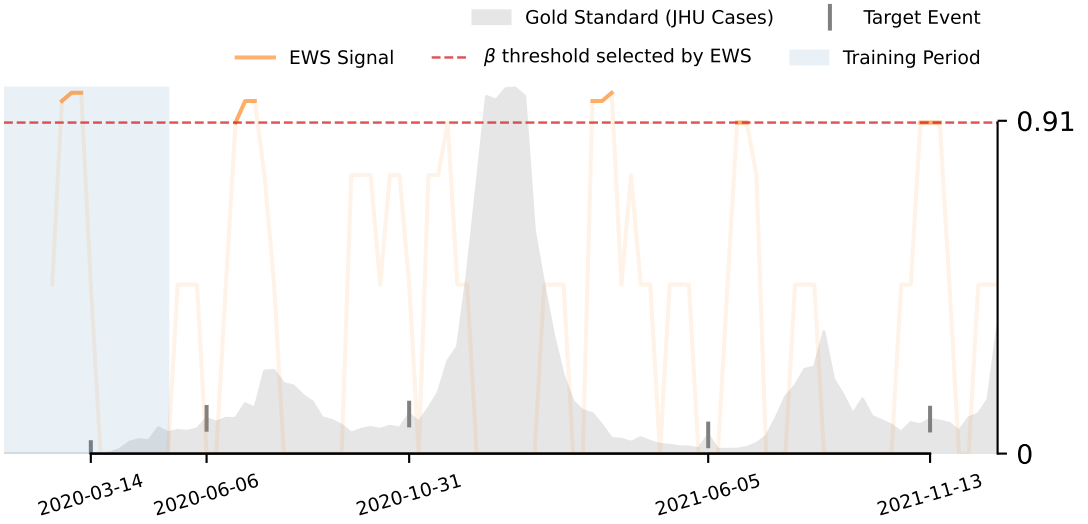
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	2	0	0
0.76	1	0	2	2	5	0
0.46	3	4	0	2	17	0
0.00	3	10	0	2	38	0

CA, Los Angeles

Proxies selected by the Multiple Sources method

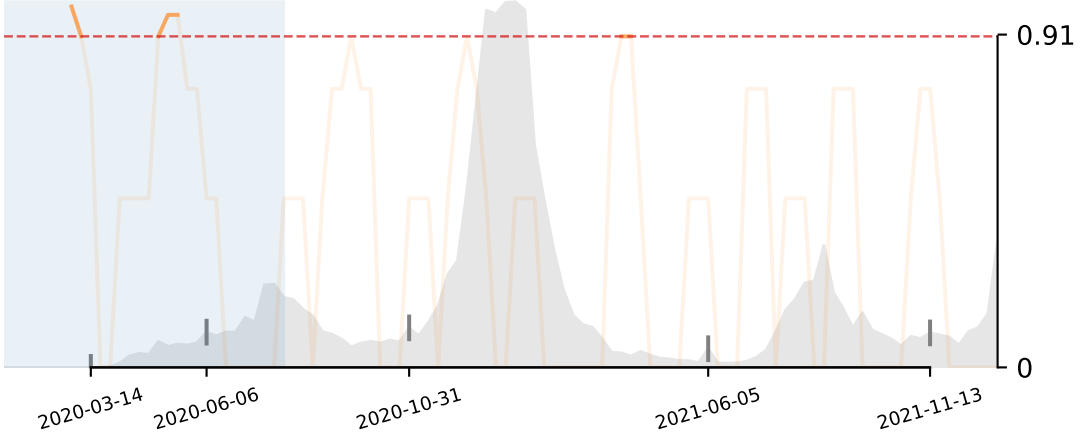
Model 1

(GT) covid
(GT) covid-19
(GT) loss taste
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who



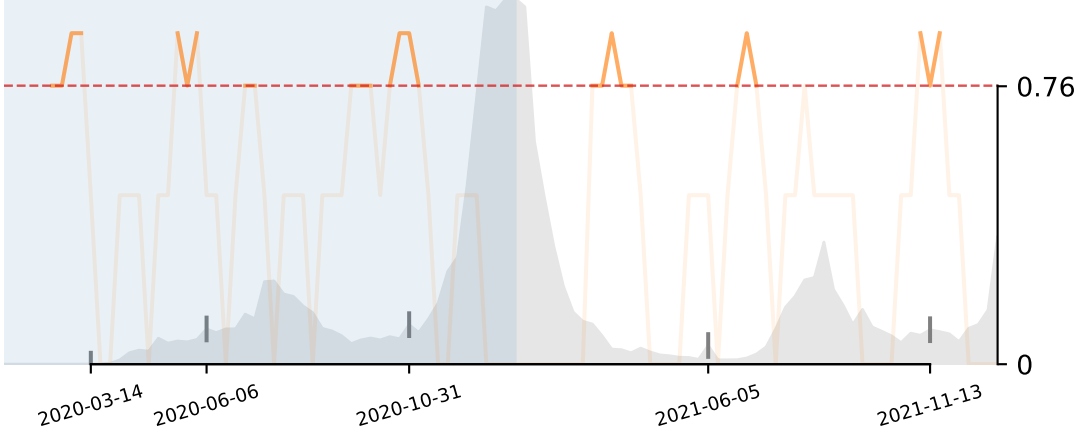
Model 2

(GT) covid symptoms
(GT) Chronic pain
(GT) Diarrhea
Apple Mobility (transit)
(GT) nose bleed
(GT) Asphyxia



Model 3

(GT) covid symptoms
(GT) nose bleed
(GT) Asphyxia
(GT) loss of smell
(GT) covid
(GT) quarantine



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	1	4
0.96	1	0	0	0	5	4
0.91	1	0	0	1	10	3
0.76	1	0	0	2	15	2
0.46	1	0	0	4	32	0
0.00	1	0	0	4	61	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	0	0	3
0.91	2	0	0	1	3	2
0.76	2	1	0	2	14	1
0.46	2	1	0	3	29	0
0.00	2	7	0	3	53	0

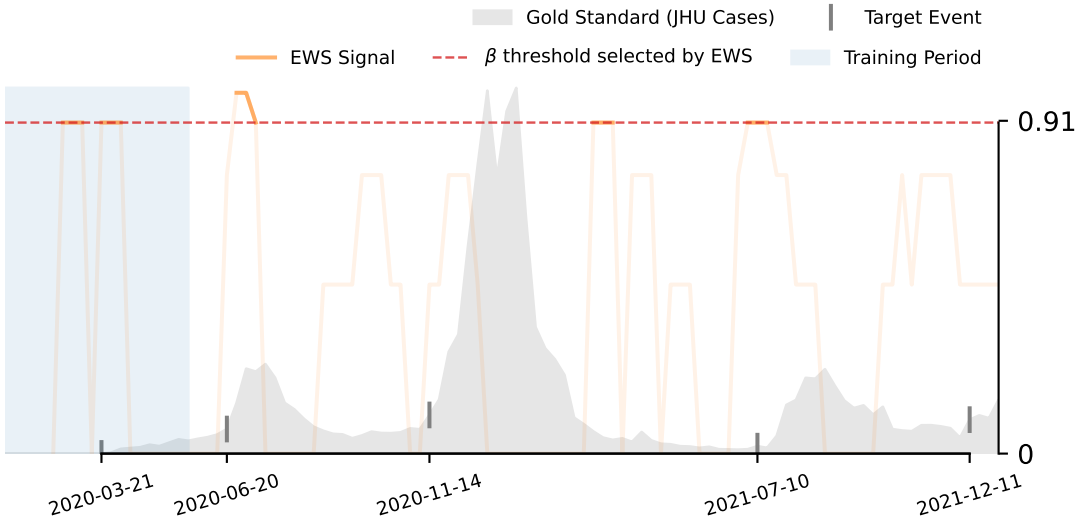
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	0	0	3	1	3	1
0.76	3	0	0	1	10	1
0.46	3	5	0	2	22	0
0.00	3	22	0	2	36	0

CA, Orange

Proxies selected by the Multiple Sources method

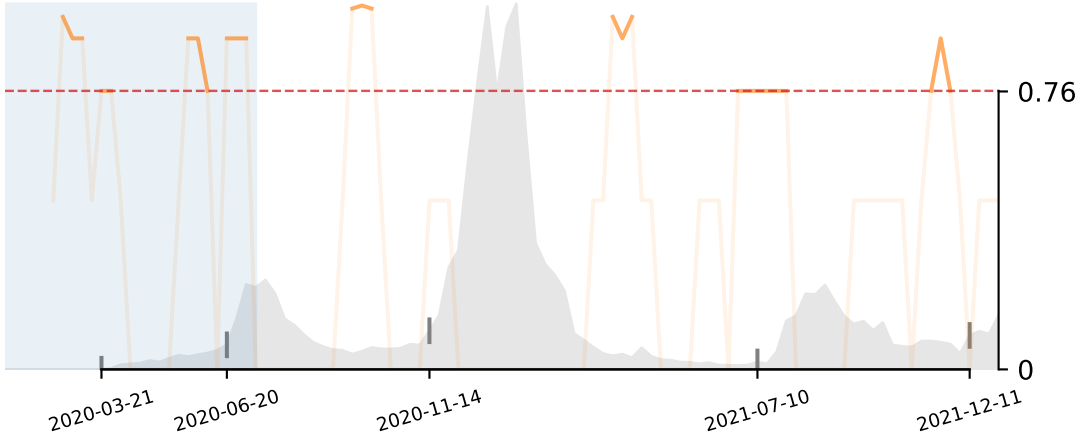
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) loss taste
(GT) chest pain
(GT) chest tightness



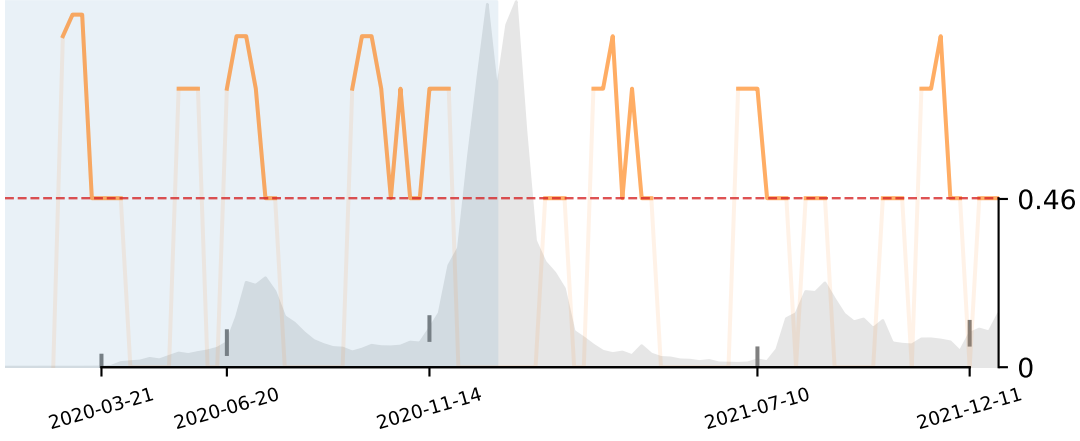
Model 2

(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Ageusia
(GT) Anosmia



Model 3

(GT) covid-19
(GT) loss of smell
(GT) covid
(GT) how long does covid last
(GT) covid symptoms
(GT) covid-19 who



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	2	3
0.96	0	0	1	0	2	3
0.91	0	0	1	1	7	2
0.76	1	2	0	4	17	0
0.46	1	2	0	4	34	0
0.00	1	2	0	4	59	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	1	3
0.99	0	0	2	1	2	2
0.96	0	0	2	1	4	2
0.91	1	0	1	2	5	1
0.76	2	2	0	3	8	0
0.46	2	3	0	3	24	0
0.00	2	6	0	3	56	0

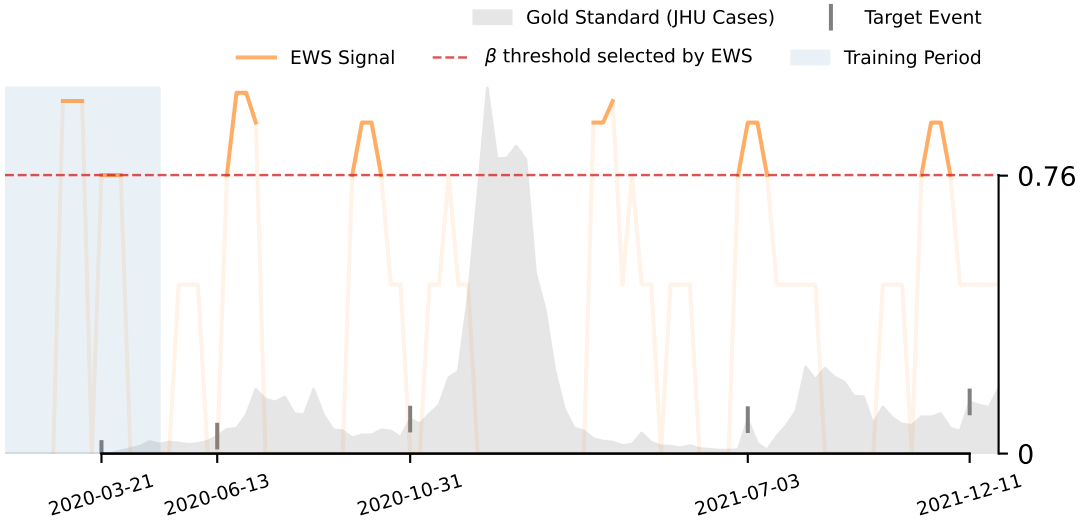
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	1	1	1
0.76	1	4	2	2	4	0
0.46	3	10	0	2	22	0
0.00	3	14	0	2	38	0

CA, Riverside

Proxies selected by the Multiple Sources method

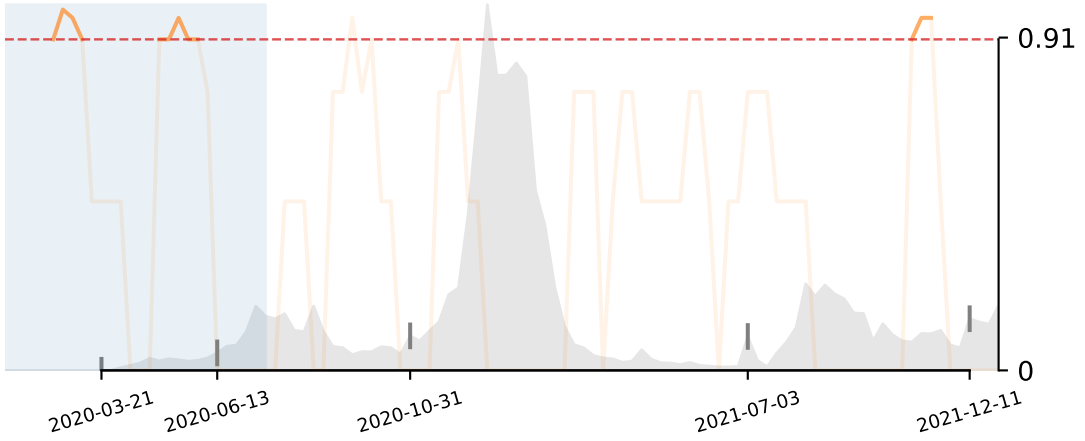
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) loss taste
(GT) chest pain
(GT) covid symptoms



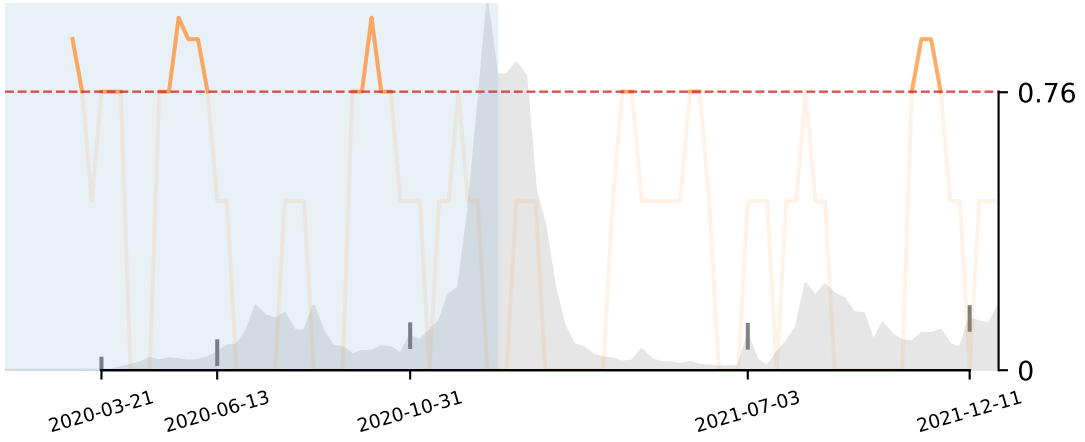
Model 2

(GT) covid symptoms
(GT) nose bleed
(GT) Ageusia
(GT) Chills
(GT) Diarrhea
(GT) Fatigue



Model 3

(GT) covid symptoms
(GT) Ageusia
(GT) nose bleed
(GT) Chest pain
(GT) loss of smell
Apple Mobility (transit)



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	2	3
0.96	0	0	1	0	3	3
0.91	1	0	0	3	7	0
0.76	1	0	0	3	11	0
0.46	1	2	0	4	31	0
0.00	1	2	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	2	0	1
0.91	2	0	0	2	1	1
0.76	2	3	0	3	12	0
0.46	2	3	0	3	27	0
0.00	2	5	0	3	55	0

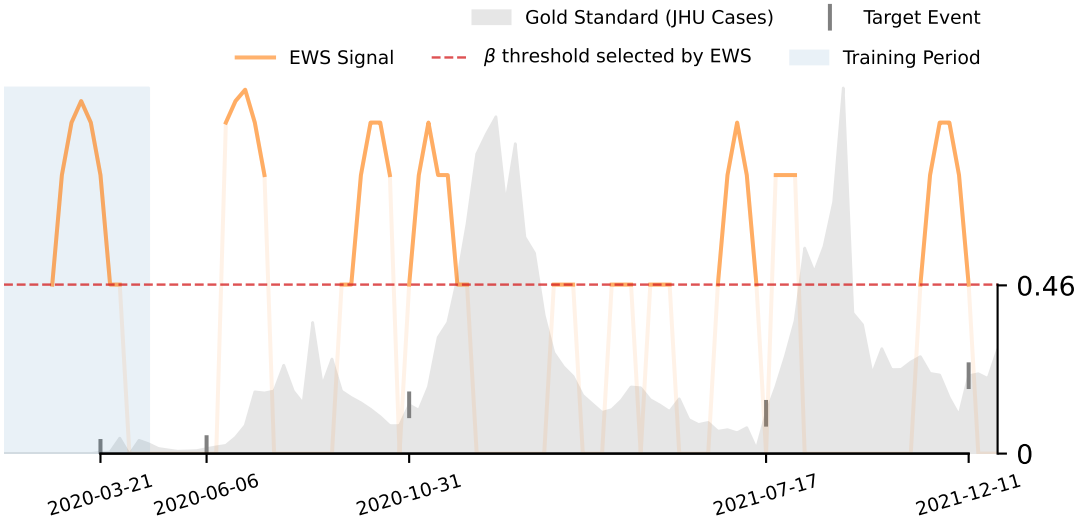
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	2	0	1	1	0	1
0.76	3	0	0	2	3	0
0.46	3	7	0	2	21	0
0.00	3	16	0	2	38	0

CA, Sacramento

Proxies selected by the Multiple Sources method

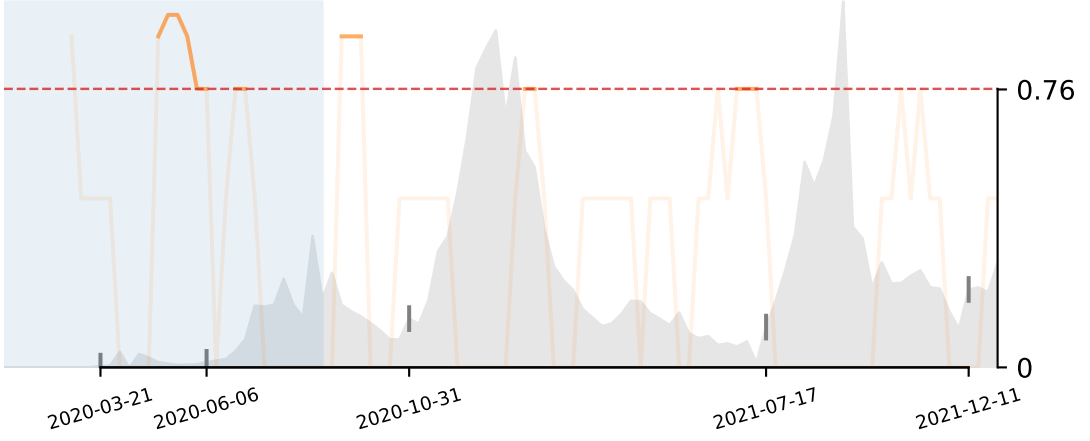
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine



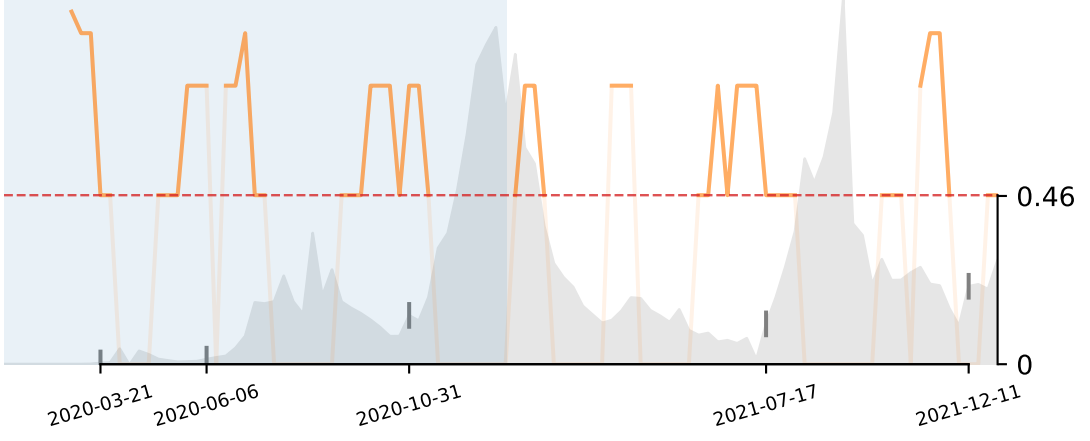
Model 2

(GT) fever
(GT) Burning Chest Pain
(GT) Otitis
Apple Mobility (transit)
(GT) Nasal congestion
(GT) Wheeze



Model 3

(GT) Burning Chest Pain
Apple Mobility (transit)
(GT) covid
(GT) covid symptoms
(GT) quarantine
(GT) fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	1	4
0.99	0	0	1	0	1	4
0.96	0	0	1	0	2	4
0.91	1	0	0	3	5	0
0.76	1	0	0	3	12	0
0.46	1	0	0	3	24	0
0.00	1	3	0	4	61	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	0	0	3
0.91	1	0	1	1	1	2
0.76	2	1	0	3	4	0
0.46	2	3	0	3	24	0
0.00	2	6	0	3	49	0

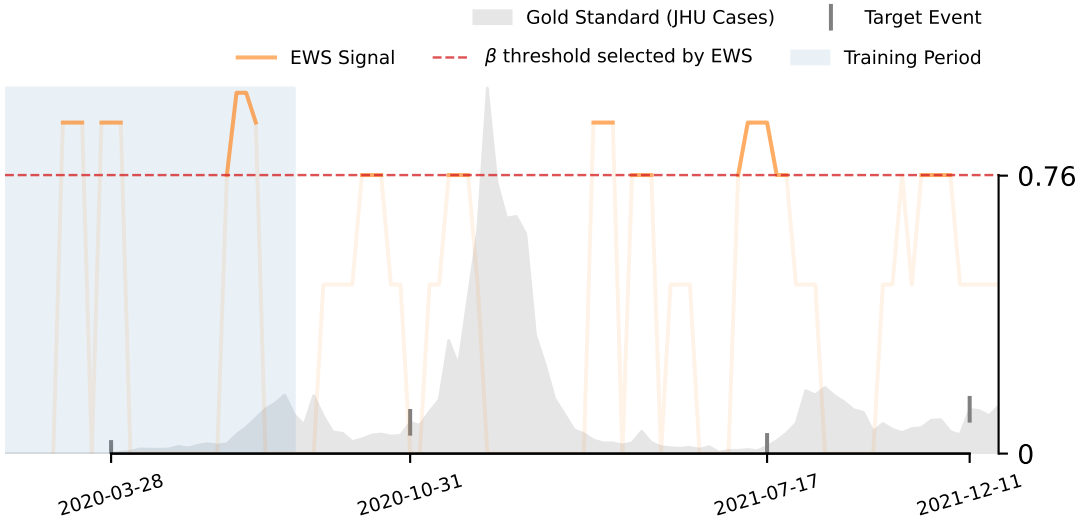
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	1	0	1
0.76	1	1	2	2	5	0
0.46	3	4	0	2	16	0
0.00	3	12	0	2	37	0

CA, San Bernardino

Proxies selected by the Multiple Sources method

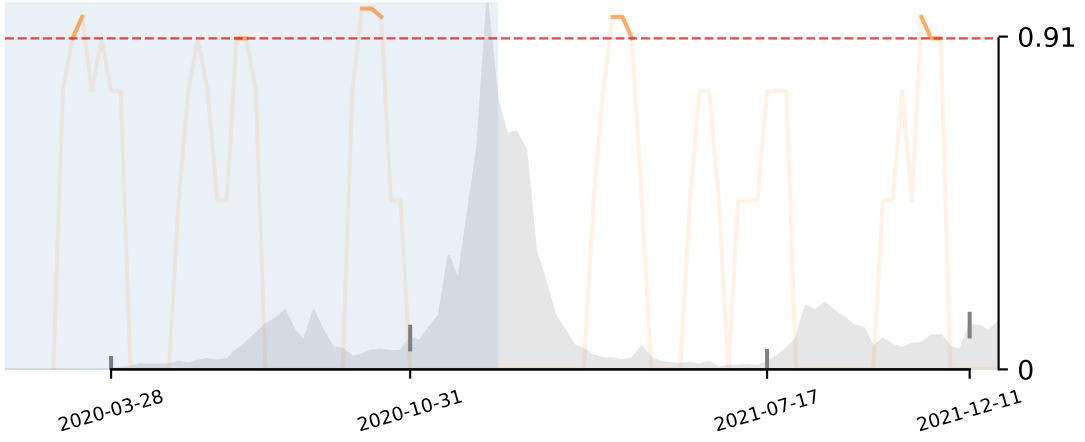
Model 1

(GT) chest tightness
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) loss taste
(GT) chest pain



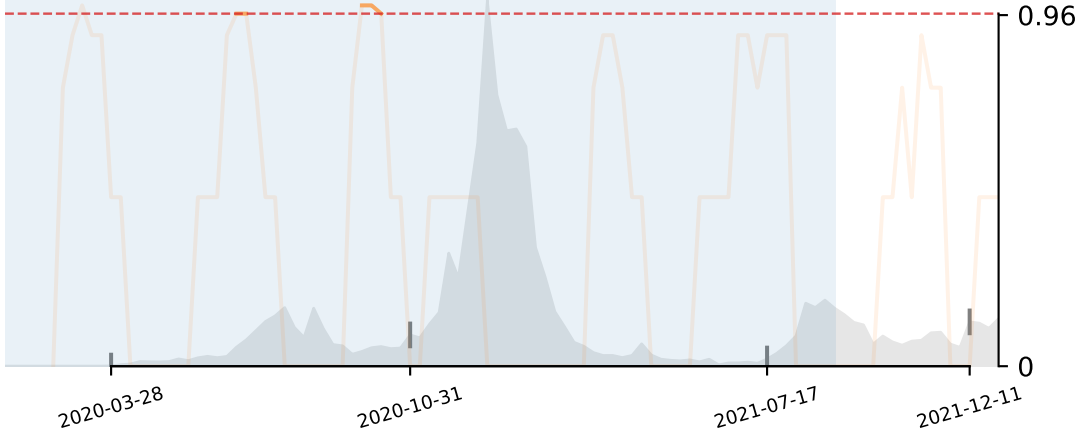
Model 2

(GT) covid
(GT) how long does covid last
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia
(GT) Bronchitis



Model 3

(GT) how long does covid last
(GT) covid
(GT) sars-cov-2
(GT) Fever
(GT) covid-19
(GT) Anosmia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	2	1	0	0	3
0.91	0	2	1	1	3	2
0.76	1	5	0	3	12	0
0.46	1	6	0	3	29	0
0.00	1	6	0	3	52	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	1	1	1	1	2	1
0.91	2	1	0	1	3	1
0.76	2	4	0	2	8	0
0.46	2	10	0	2	13	0
0.00	2	13	0	2	38	0

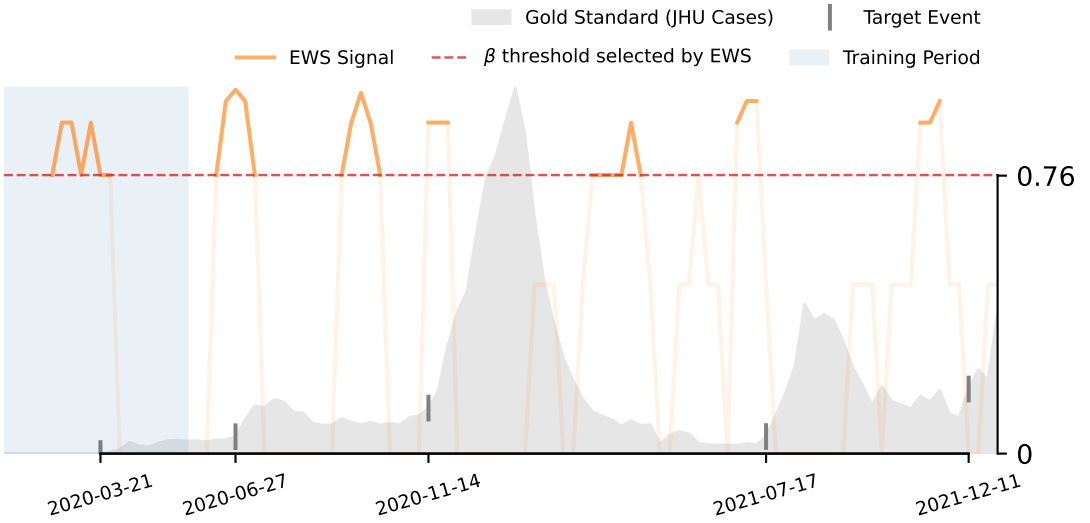
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	2	1	1	0	0	1
0.91	2	3	1	1	0	0
0.76	3	8	0	1	1	0
0.46	3	13	0	1	6	0
0.00	3	30	0	1	10	0

CA, San Diego

Proxies selected by the Multiple Sources method

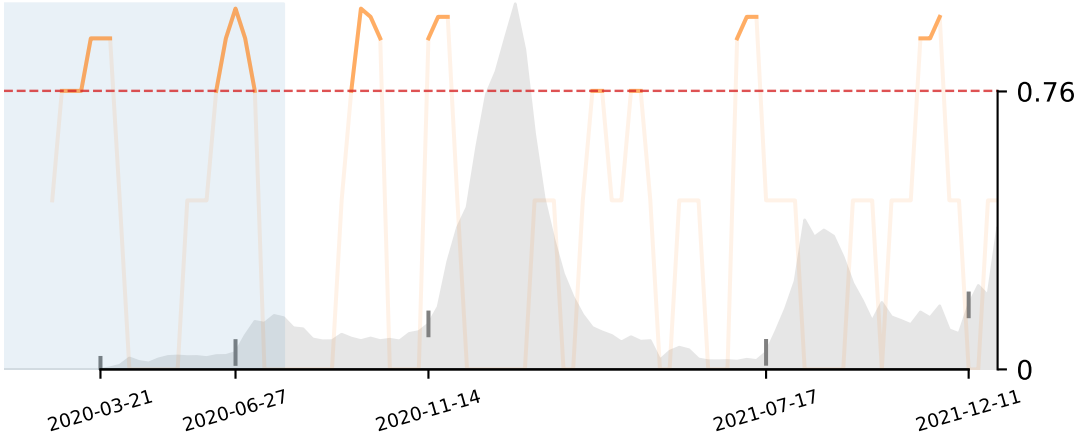
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Ageusia
(GT) Anosmia



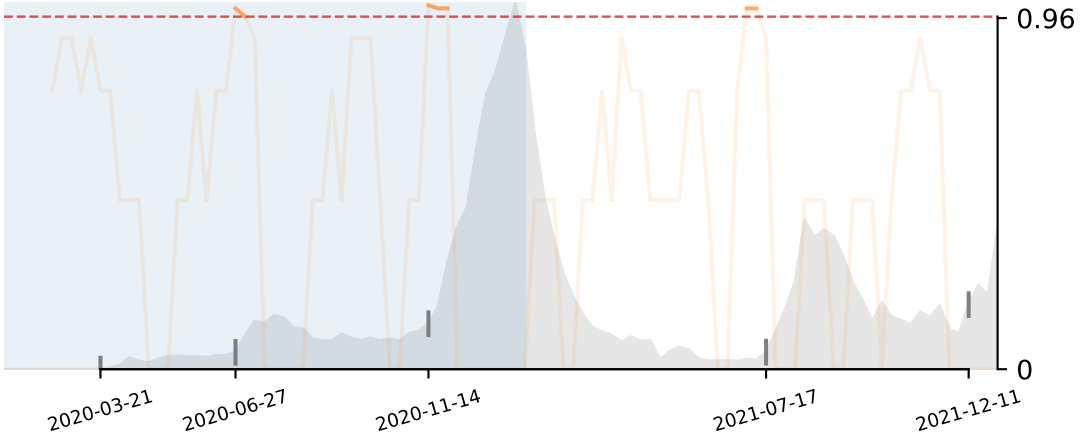
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) sars-cov-2
(GT) Acute bronchitis
(GT) Ageusia



Model 3

(GT) covid-19
(GT) covid
(GT) covid symptoms
(GT) Fever
(GT) Wheeze
(GT) Asphyxia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	1	0	3
0.99	0	0	1	1	1	3
0.96	0	0	1	3	2	1
0.91	0	0	1	4	6	0
0.76	1	0	0	4	14	0
0.46	1	2	0	4	28	0
0.00	1	2	0	4	58	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	1	3
0.96	1	0	1	3	3	0
0.91	1	0	1	3	3	0
0.76	2	2	0	3	8	0
0.46	2	3	0	3	30	0
0.00	2	6	0	3	53	0

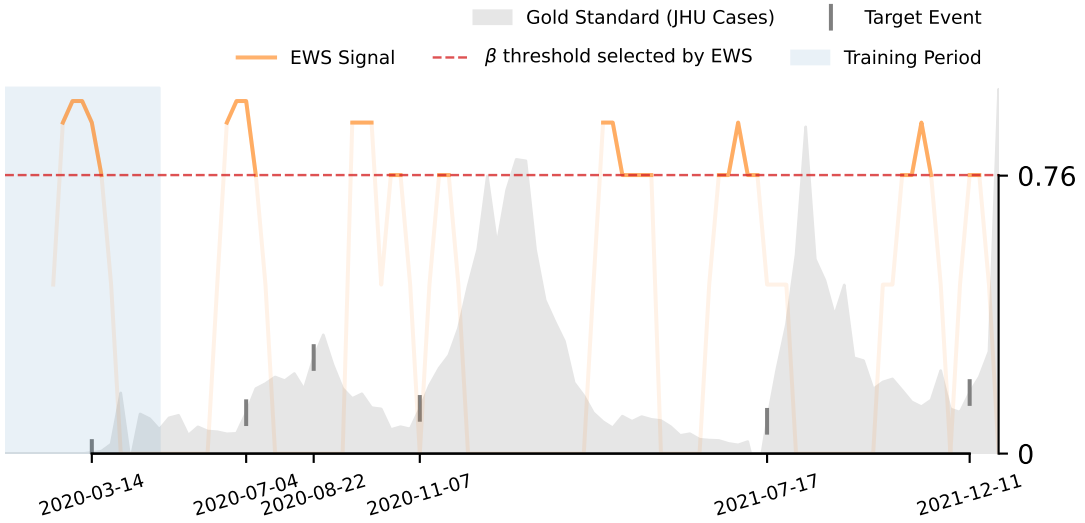
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	1	0	1
0.96	2	2	1	1	0	1
0.91	2	3	1	2	1	0
0.76	3	7	0	2	7	0
0.46	3	10	0	2	24	0
0.00	3	19	0	2	35	0

CA, San Francisco

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine

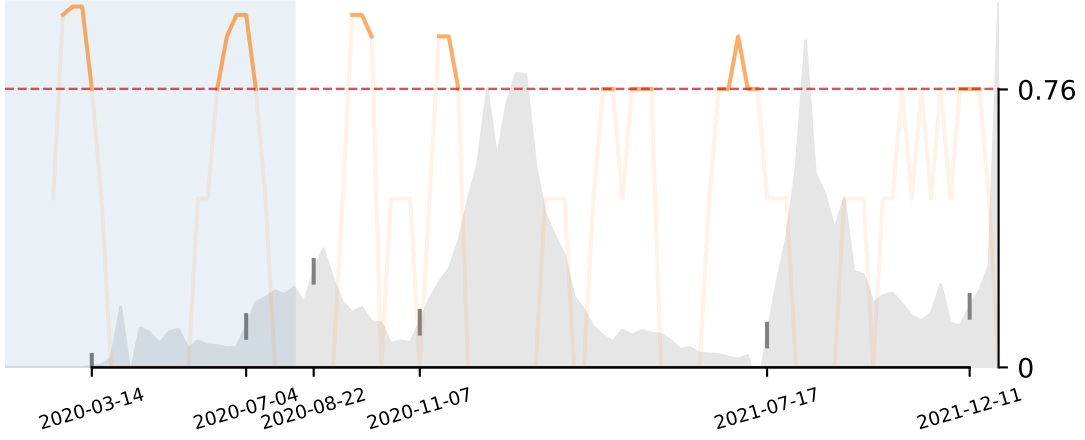


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	1	0	4
0.91	1	0	0	4	3	1
0.76	1	0	0	5	11	0
0.46	1	1	0	5	19	0
0.00	1	2	0	5	52	0

Model 2

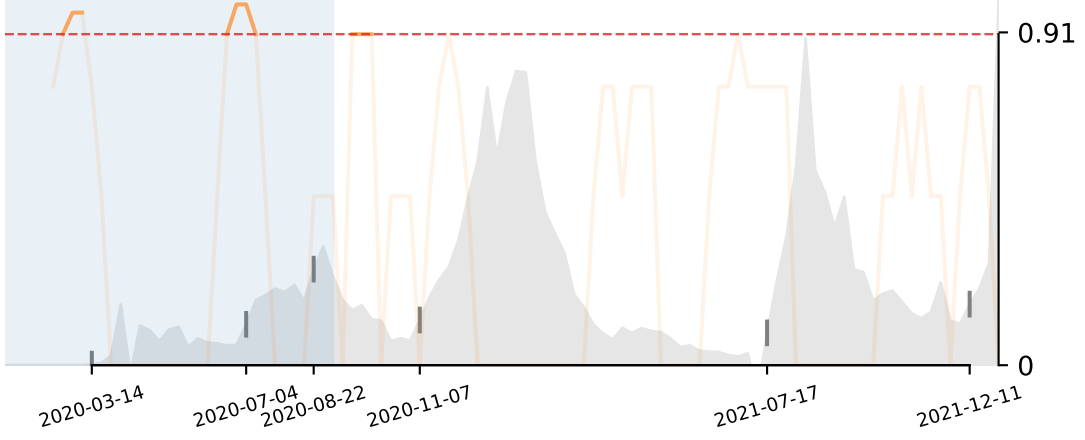
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	1	0	1	1	1	3
0.91	2	0	0	2	3	2
0.76	2	0	0	3	11	1
0.46	2	1	0	3	26	1
0.00	2	4	0	4	50	0

Model 3

(GT) Asthma
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine



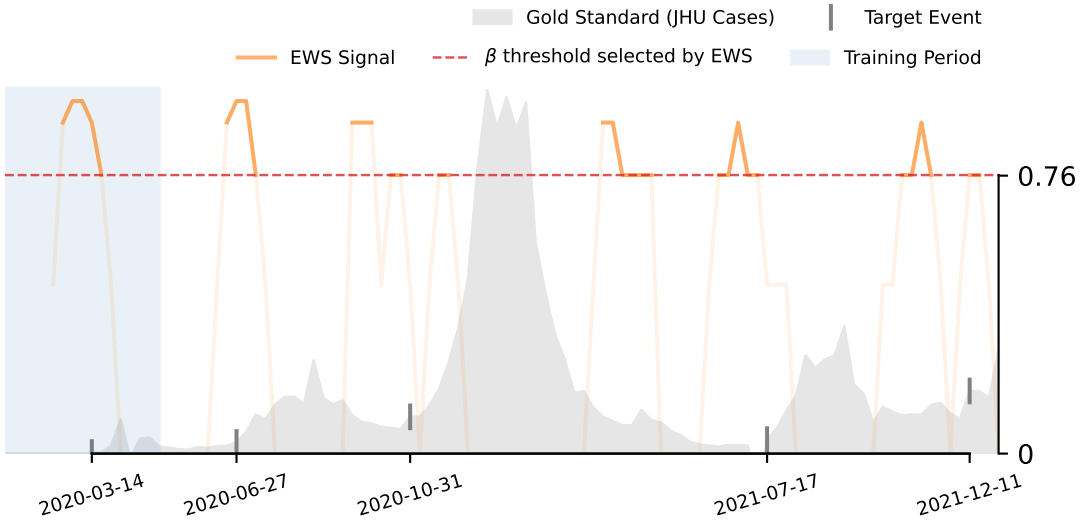
β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	1	0	2	0	0	3
0.91	2	0	1	2	2	1
0.76	2	1	1	3	13	0
0.46	2	1	1	3	20	0
0.00	3	5	0	3	48	0

CA, Santa Clara

Proxies selected by the Multiple Sources method

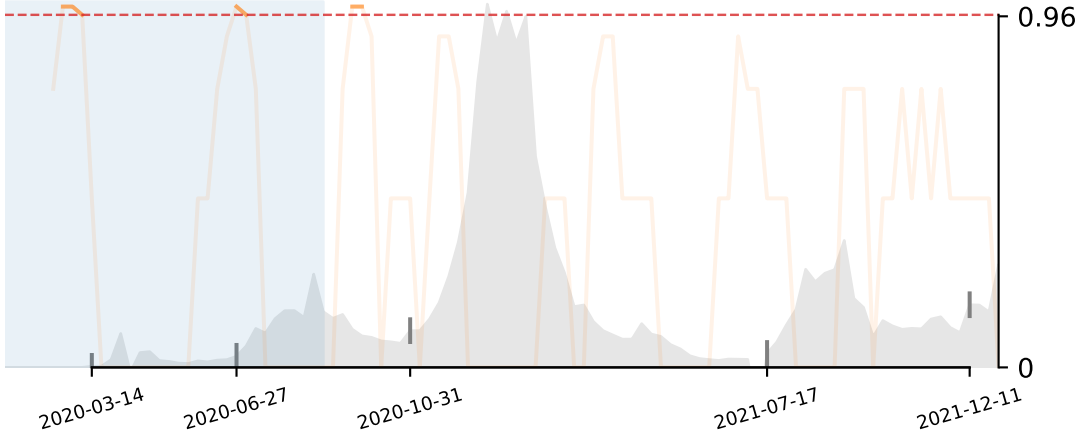
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine



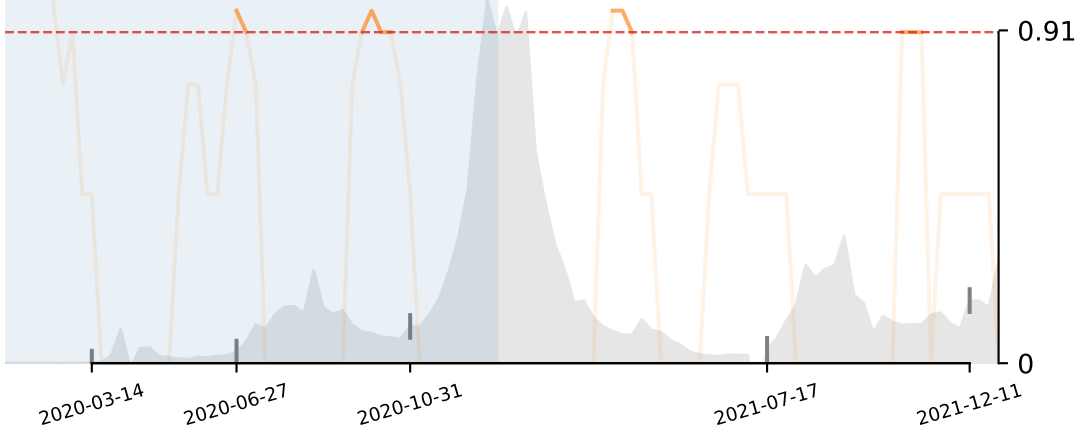
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Acute bronchitis



Model 3

(GT) chest pain
(GT) covid symptoms
(GT) Anosmia
(GT) Fever
(GT) Otitis
up2date



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	1	3
0.91	1	0	0	4	3	0
0.76	1	0	0	4	12	0
0.46	1	1	0	4	21	0
0.00	1	2	0	4	59	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	1	0	2
0.96	2	0	0	1	0	2
0.91	2	1	0	2	4	1
0.76	2	1	0	3	11	0
0.46	2	2	0	3	25	0
0.00	2	2	0	3	49	0

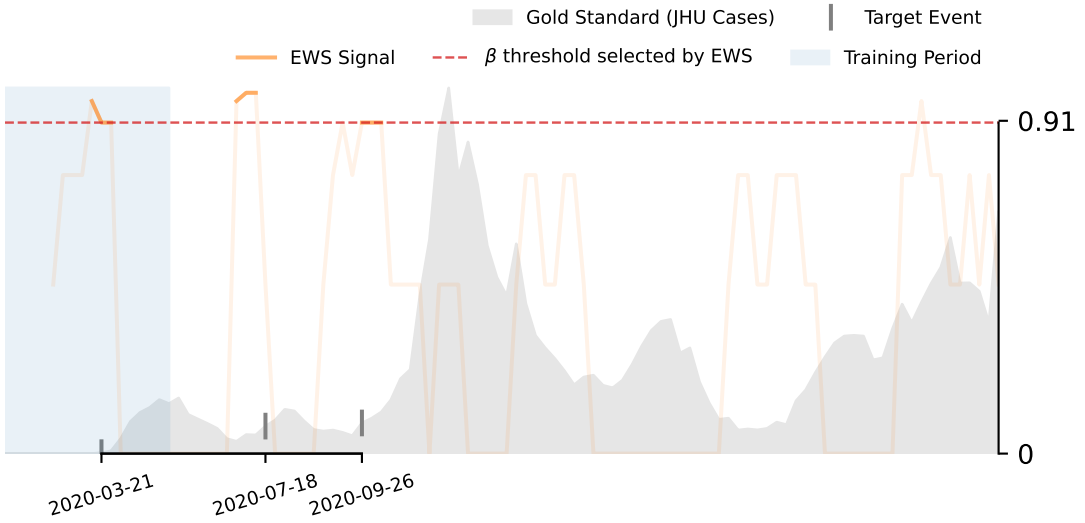
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	0	2	0	2	2
0.91	3	0	0	1	4	1
0.76	3	2	0	2	5	0
0.46	3	5	0	2	11	0
0.00	3	6	0	2	38	0

CO, Arapahoe

Proxies selected by the Multiple Sources method

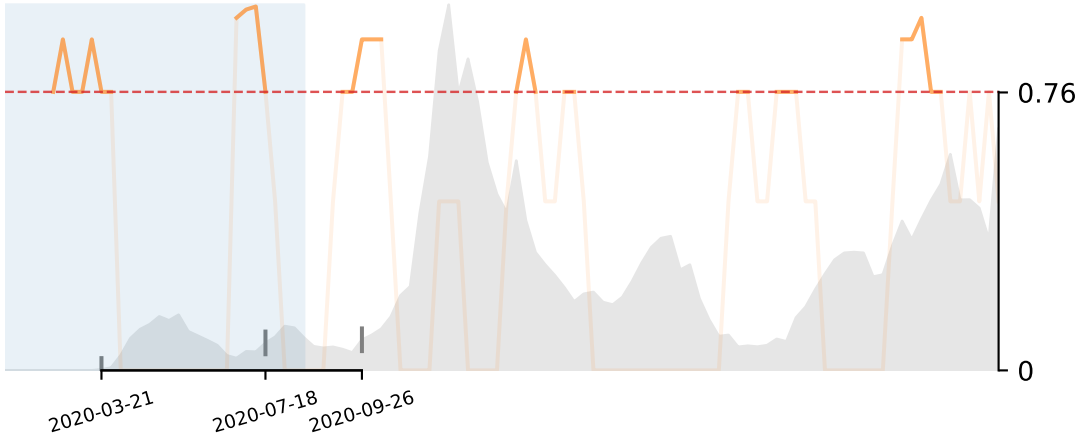
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) sars-cov-2



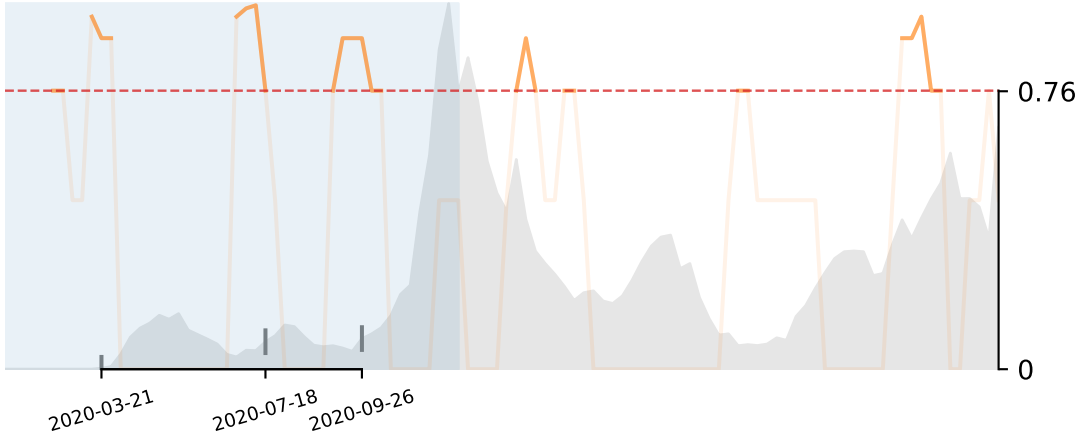
Model 2

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis



Model 3

(GT) covid
(GT) how long does covid last
(GT) covid symptoms
(GT) Bronchitis
(GT) quarantine
(GT) Acute bronchitis



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	2
0.99	0	0	1	1	0	1
0.96	0	0	1	1	1	1
0.91	1	0	0	2	3	0
0.76	1	1	0	2	18	0
0.46	1	1	0	2	38	0
0.00	1	2	0	2	72	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	1
0.99	1	0	1	0	0	1
0.96	1	0	1	0	1	1
0.91	1	0	1	1	6	0
0.76	2	0	0	1	19	0
0.46	2	2	0	1	37	0
0.00	2	3	0	1	66	0

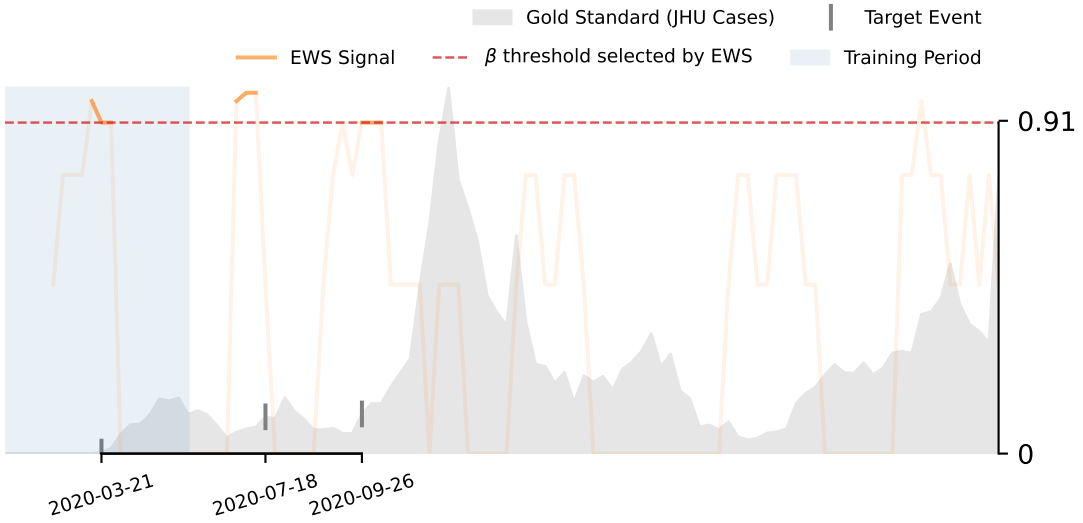
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	0
0.99	1	0	2	0	0	0
0.96	1	0	2	0	1	0
0.91	2	0	1	0	4	0
0.76	3	1	0	0	13	0
0.46	3	4	0	0	29	0
0.00	3	8	0	0	56	0

CO, Denver

Proxies selected by the Multiple Sources method

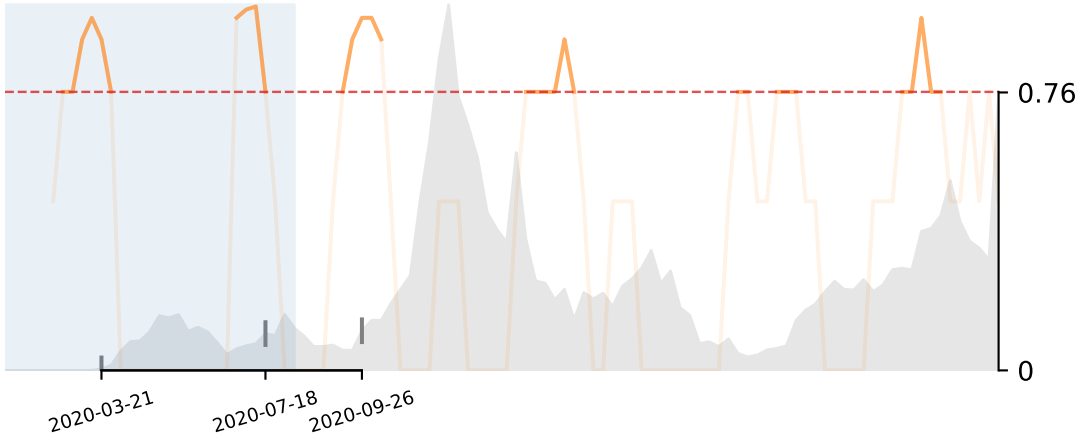
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) sars-cov-2



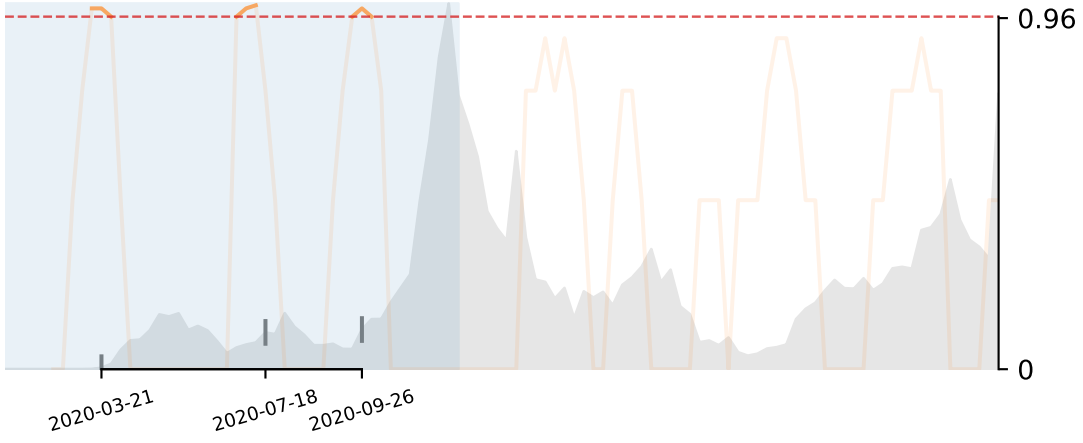
Model 2

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis



Model 3

(GT) covid
(GT) how long does covid last
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Ageusia
(GT) Anosmia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	2
0.99	0	0	1	1	0	1
0.96	0	0	1	1	1	1
0.91	1	0	0	2	3	0
0.76	1	1	0	2	18	0
0.46	1	1	0	2	38	0
0.00	1	2	0	2	70	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	1
0.99	1	0	1	0	0	1
0.96	1	0	1	1	2	0
0.91	2	0	0	1	4	0
0.76	2	0	0	1	20	0
0.46	2	1	0	1	41	0
0.00	2	3	0	1	66	0

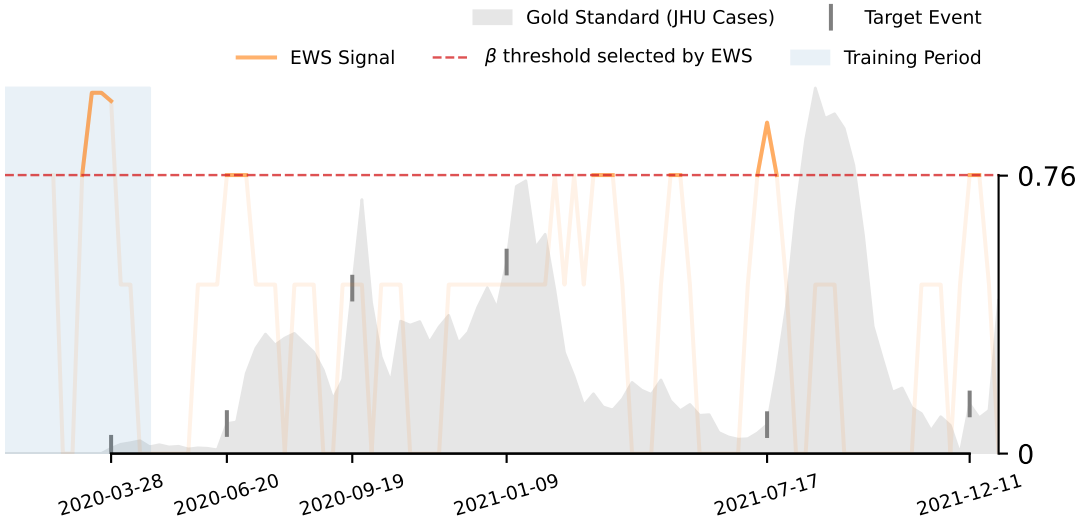
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	0
0.99	1	0	2	0	0	0
0.96	3	0	0	0	0	0
0.91	3	2	0	0	5	0
0.76	3	2	0	0	18	0
0.46	3	3	0	0	33	0
0.00	3	5	0	0	56	0

FL, Alachua

Proxies selected by the Multiple Sources method

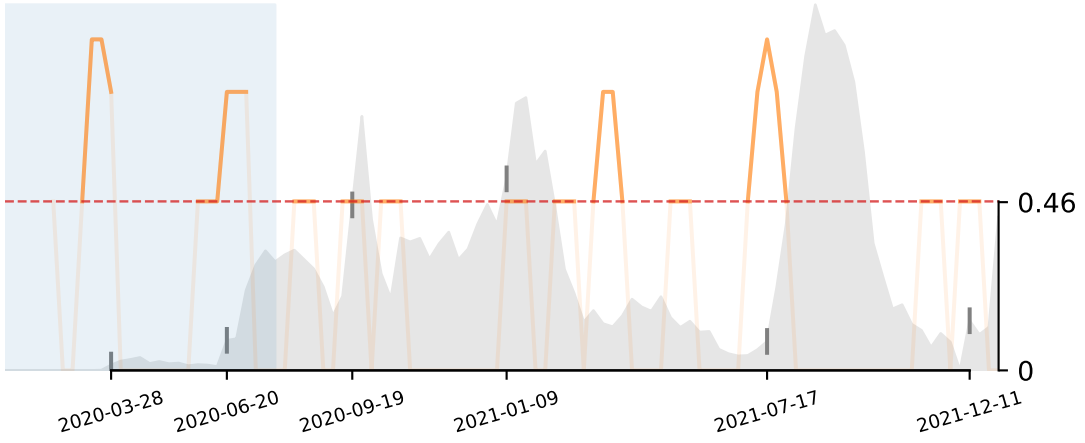
Model 1

(GT) covid
(GT) covid-19
(GT) quarantine
(GT) Wheeze
(GT) Anxiety
(GT) Cough



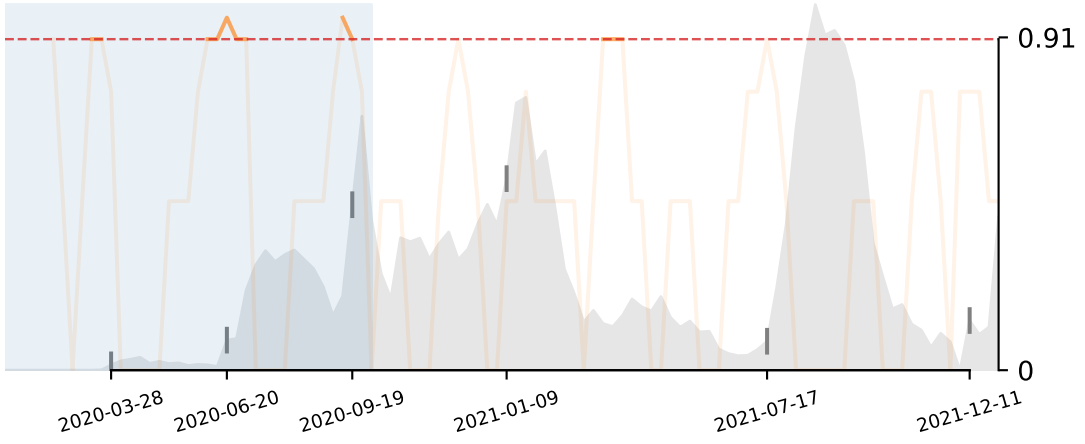
Model 2

(GT) covid
(GT) covid-19
(GT) Cough



Model 3

(GT) covid-19
(GT) Cough
(GT) covid
(GT) covid symptoms
(GT) Chest pain
(GT) Fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	1	0	0	0	0	5
0.91	1	0	0	1	0	4
0.76	1	0	0	3	11	2
0.46	1	1	0	5	32	0
0.00	1	3	0	5	53	0

β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	1	0	3
0.76	1	0	1	1	3	3
0.46	2	2	0	4	19	0
0.00	2	3	0	4	47	0

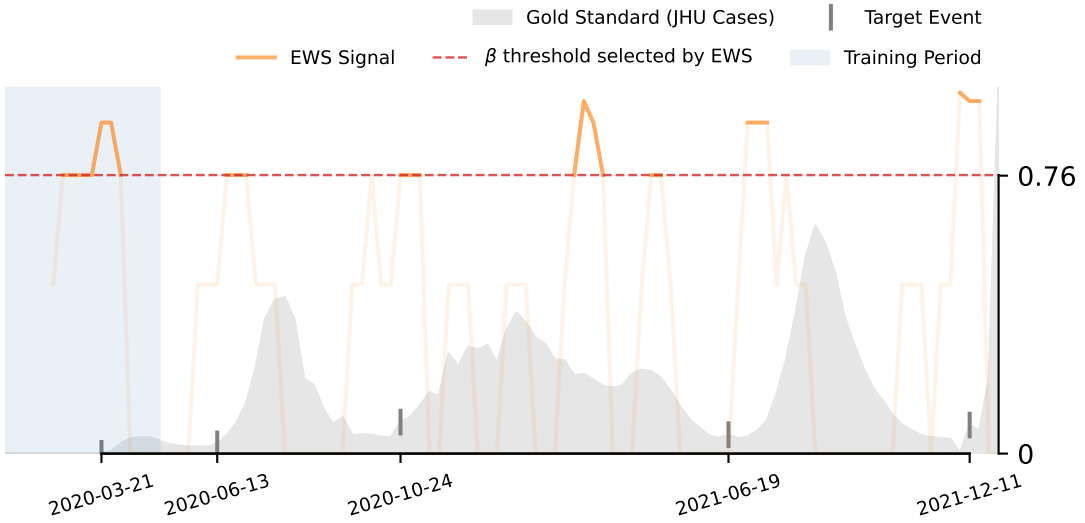
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	0	3	0	0	3
0.91	2	0	1	2	3	1
0.76	3	3	0	3	6	0
0.46	3	4	0	3	28	0
0.00	3	9	0	3	44	0

FL, Broward

Proxies selected by the Multiple Sources method

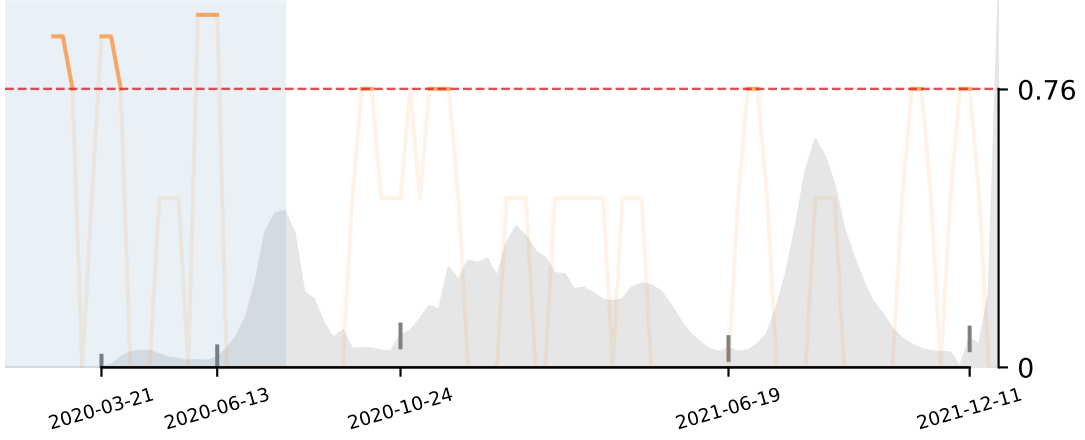
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



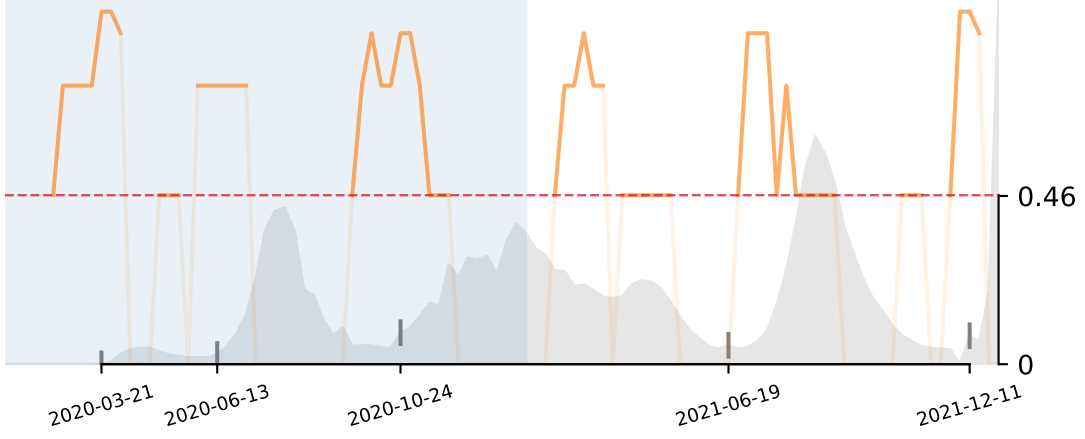
Model 2

(GT) covid symptoms
(GT) covid-19 who
(GT) Ageusia
(GT) Diarrhea
(GT) Otitis



Model 3

(GT) covid symptoms
(GT) Ageusia
(GT) covid-19 who
(GT) chest pain
(GT) covid
(GT) covid-19



Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	1	2	3
0.91	0	0	1	1	6	2
0.76	1	1	0	2	16	0
0.46	1	2	0	4	32	0
0.00	1	3	0	4	60	0

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
0.99	0	0	2	0	0	3
0.96	0	0	2	0	0	3
0.91	1	0	1	0	0	3
0.76	2	2	0	2	6	0
0.46	2	3	0	2	27	0
0.00	2	5	0	3	53	0

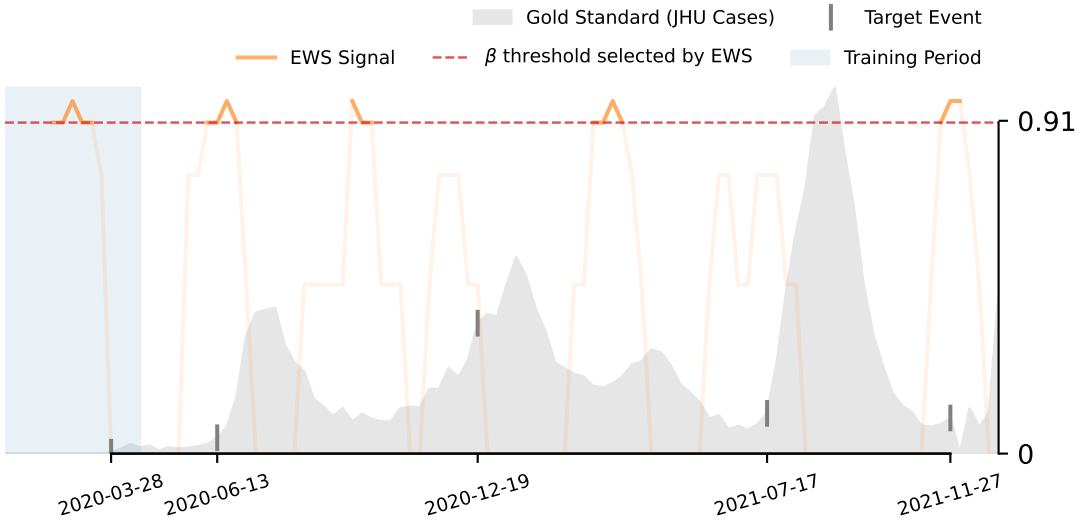
β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	1	0	1
0.91	1	1	2	1	5	0
0.76	2	3	1	1	10	0
0.46	3	7	0	2	24	0
0.00	3	14	0	2	35	0

FL, Hillsborough

Proxies selected by the Multiple Sources method

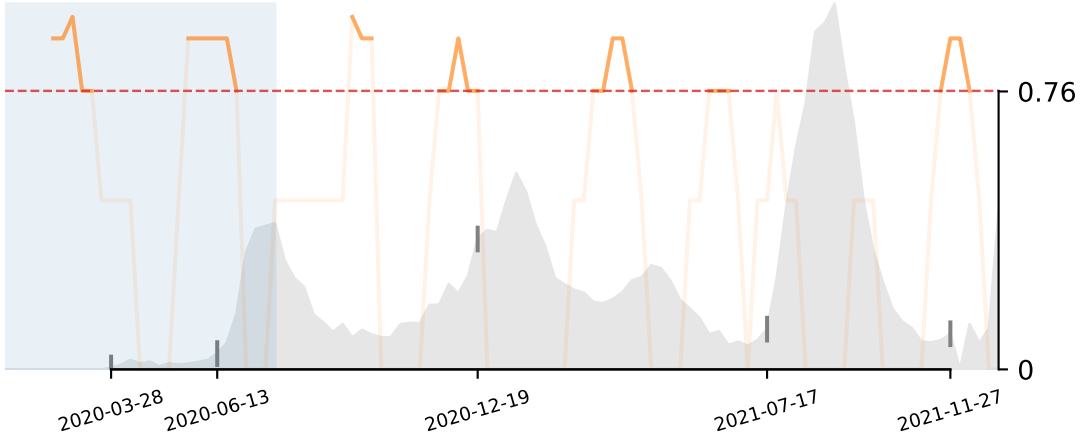
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Ageusia
(GT) Anosmia



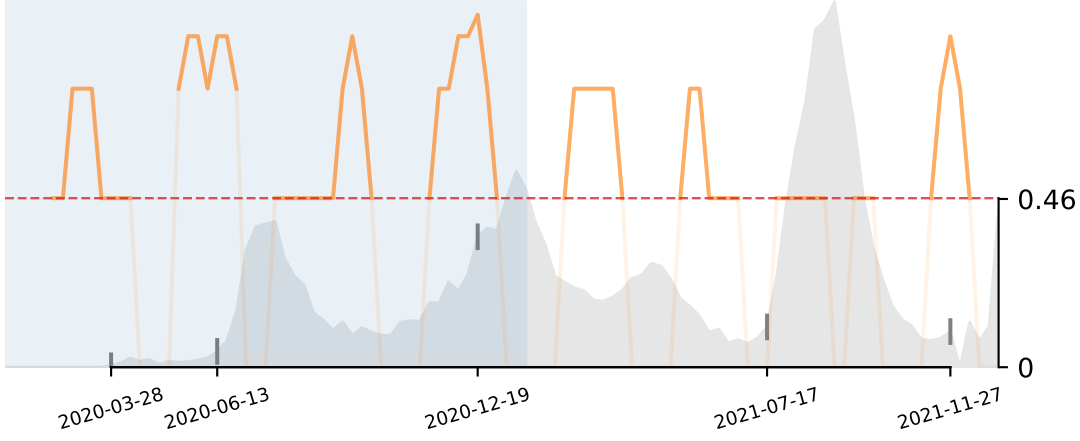
Model 2

(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Ageusia
(GT) Anosmia
(GT) Asphyxia



Model 3

(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Asphyxia
(GT) nose bleed
(GT) loss taste



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	4	2
0.91	1	0	0	2	10	2
0.76	1	2	0	4	13	0
0.46	1	2	0	4	28	0
0.00	1	2	0	4	61	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	0	1	3
0.91	1	0	1	2	6	1
0.76	2	3	0	3	11	0
0.46	2	4	0	3	29	0
0.00	2	7	0	3	54	0

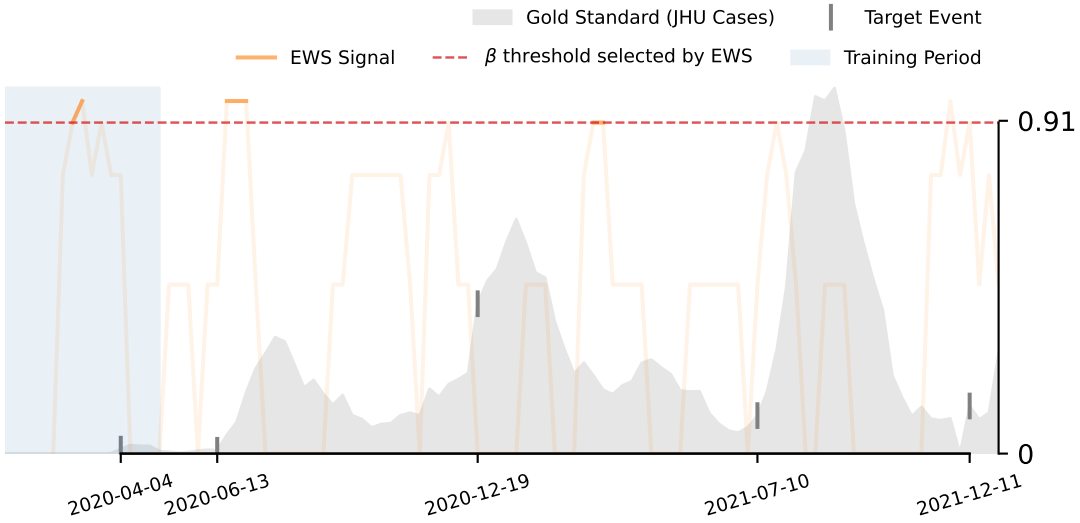
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	1	0	1
0.76	2	2	1	1	8	1
0.46	3	6	0	2	21	0
0.00	3	20	0	2	35	0

FL, Lake

Proxies selected by the Multiple Sources method

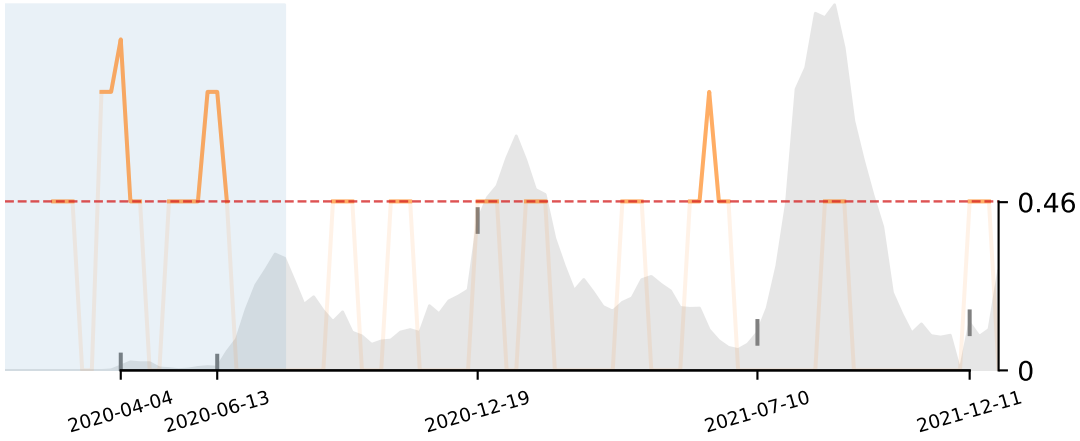
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who



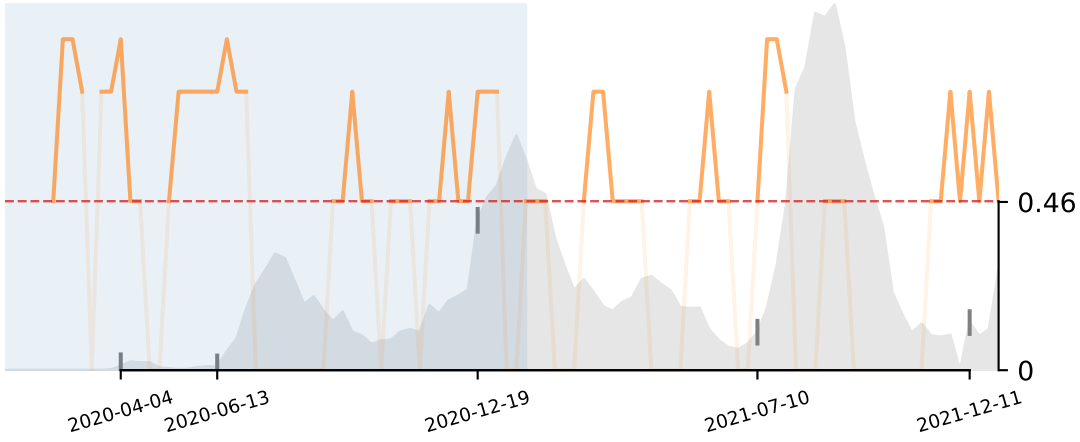
Model 2

(GT) chest pain
(GT) covid-19 who
(GT) Cardiac arrest



Model 3

(GT) Cardiac arrest
(GT) how long does covid last
(GT) covid
(GT) covid-19 who
(GT) covid-19
(GT) chest pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	3	2
0.91	1	0	0	2	6	0
0.76	1	1	0	2	16	0
0.46	1	2	0	4	34	0
0.00	1	2	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	0	0	3
0.76	1	0	1	1	0	2
0.46	2	0	0	3	20	0
0.00	2	7	0	3	53	0

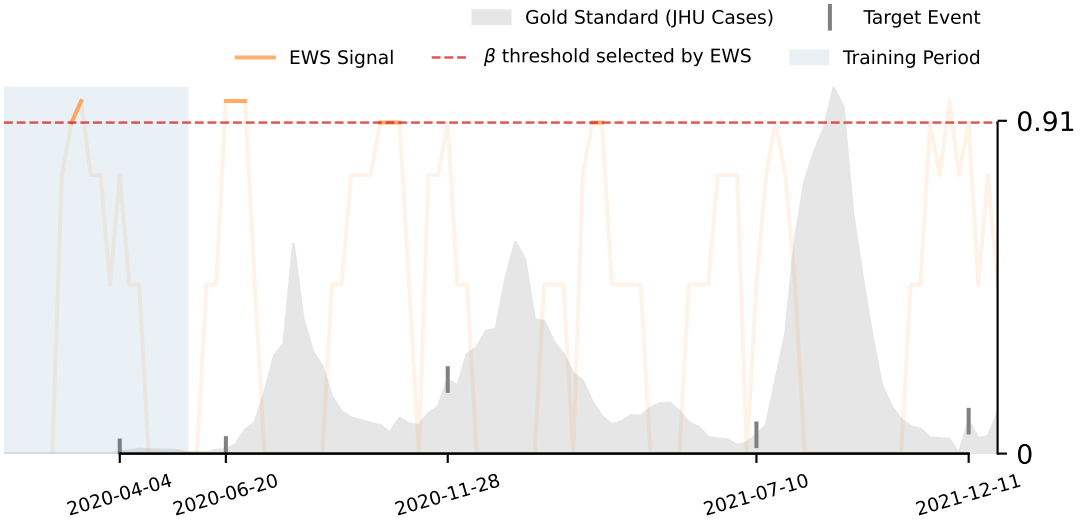
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	0	0	3	0	2	1
0.76	1	3	2	2	6	0
0.46	3	8	0	2	19	0
0.00	3	21	0	2	35	0

FL, Marion

Proxies selected by the Multiple Sources method

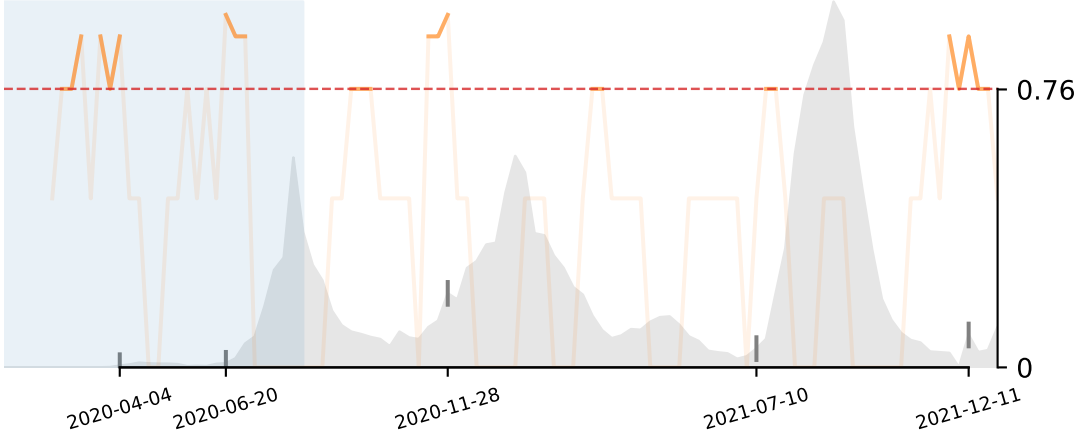
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) nose bleed



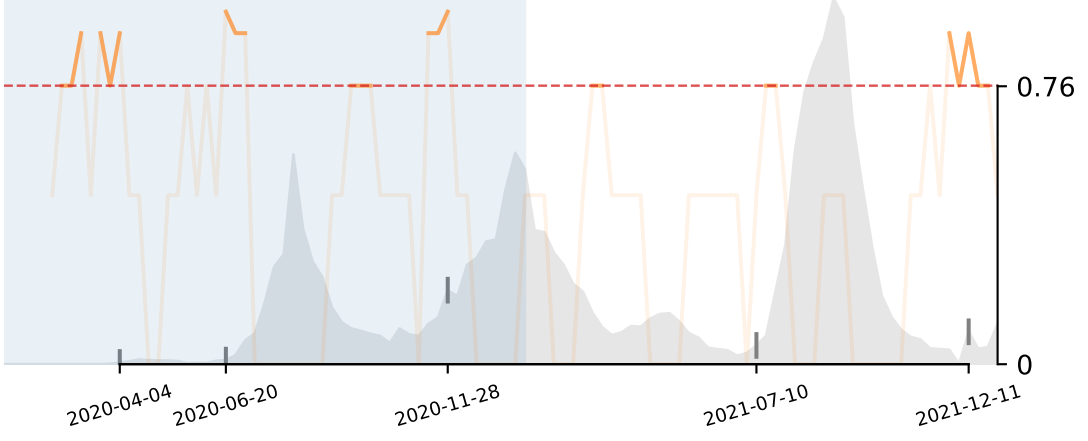
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) covid-19 who
(GT) Dizziness



Model 3

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Dizziness
(GT) covid-19 who



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	2	2	2
0.91	1	0	0	3	6	0
0.76	1	1	0	4	13	0
0.46	1	2	0	4	29	0
0.00	1	4	0	4	59	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	1	0	2
0.91	1	0	1	2	0	1
0.76	2	2	0	2	9	0
0.46	2	4	0	3	28	0
0.00	2	9	0	3	51	0

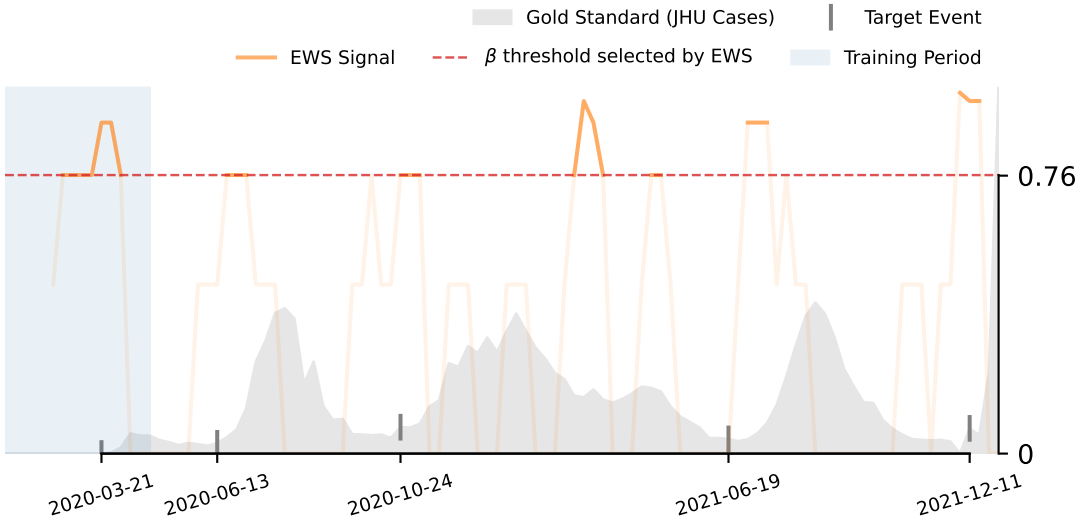
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	2	0	1	1	0	1
0.76	3	2	0	1	6	0
0.46	3	7	0	2	19	0
0.00	3	20	0	2	35	0

FL, Miami-Dade

Proxies selected by the Multiple Sources method

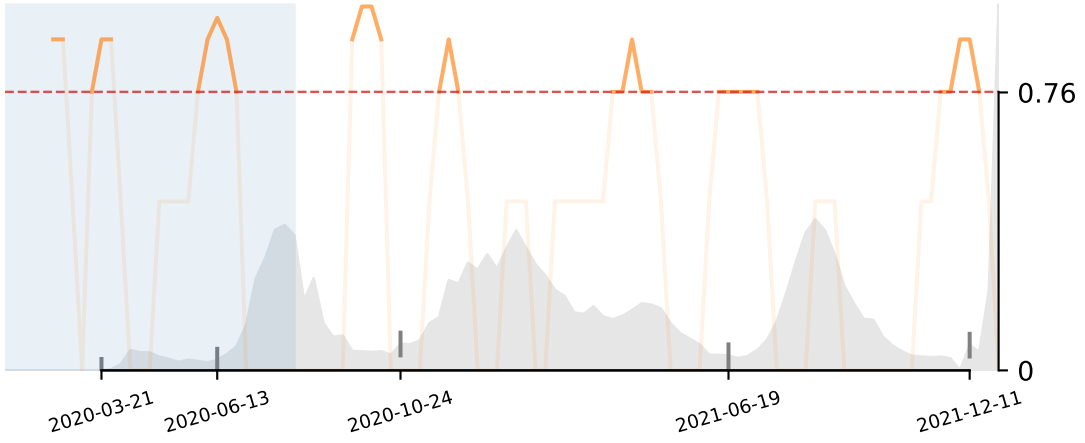
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



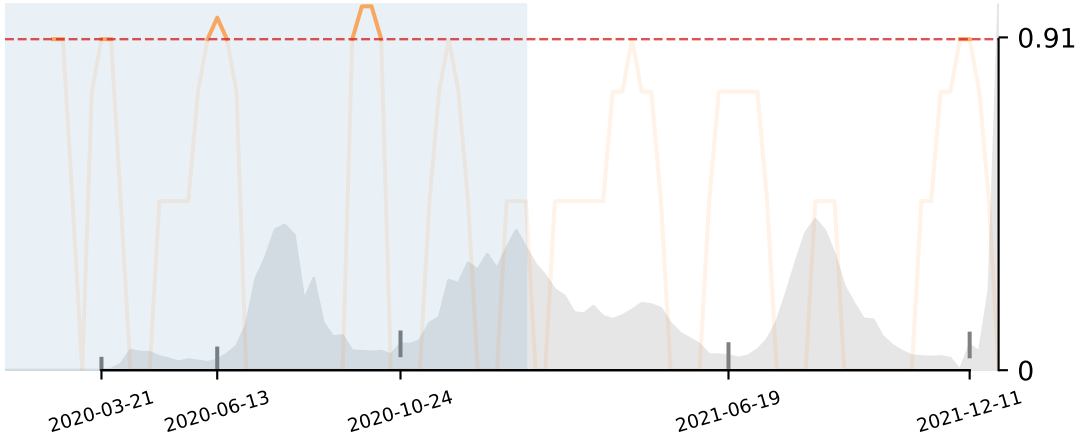
Model 2

(GT) covid symptoms
(GT) covid-19 who
(GT) Ageusia
(GT) Anosmia
(GT) Chest pain
(GT) Fatigue



Model 3

(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia
(GT) covid-19 who
(GT) Chest pain
(GT) Fatigue



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	1	2	3
0.91	0	0	1	1	6	2
0.76	1	1	0	2	16	0
0.46	1	2	0	4	32	0
0.00	1	3	0	4	60	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	1	0	2
0.99	0	0	2	1	0	2
0.96	0	0	2	1	0	2
0.91	1	0	1	2	2	1
0.76	2	3	0	3	12	0
0.46	2	4	0	3	29	0
0.00	2	7	0	3	52	0

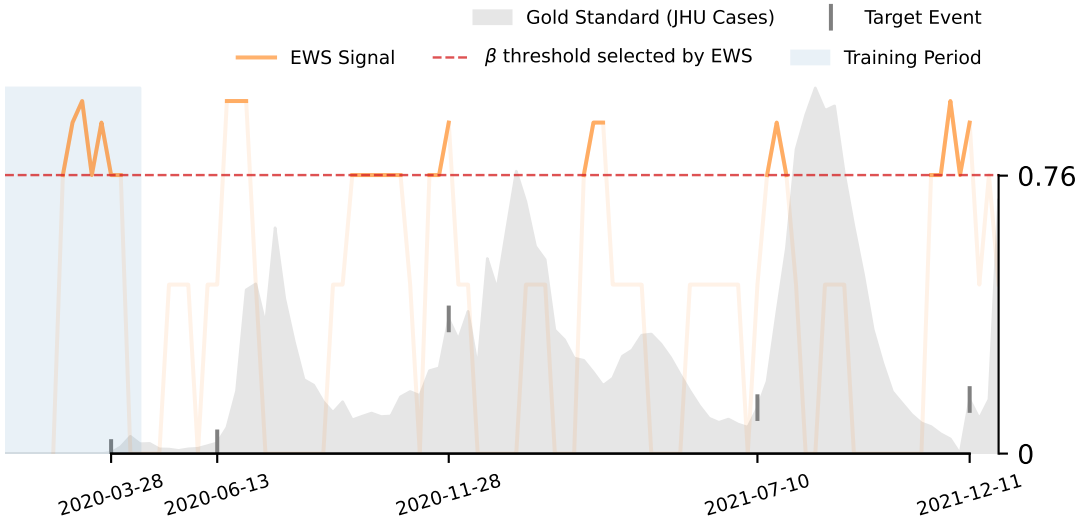
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	1	0	2	0	0	2
0.91	2	0	1	1	1	1
0.76	3	5	0	2	9	0
0.46	3	8	0	2	21	0
0.00	3	16	0	2	35	0

FL, Orange

Proxies selected by the Multiple Sources method

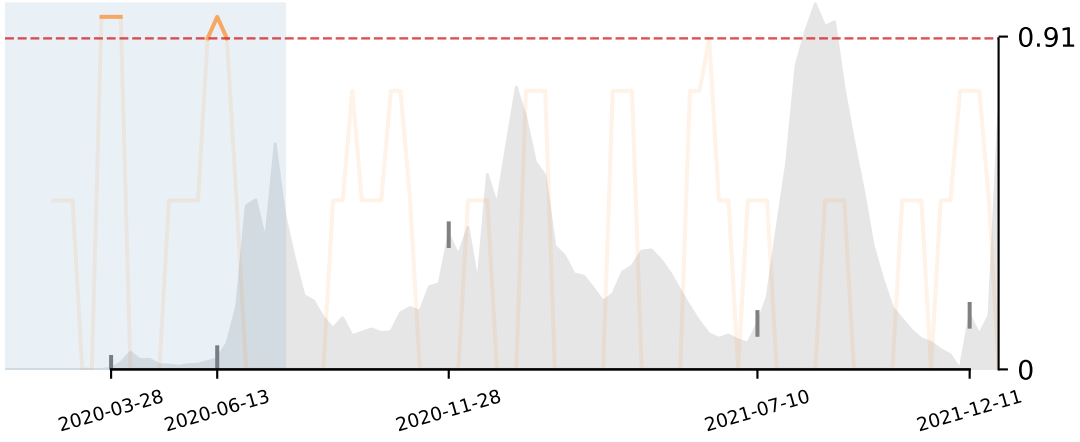
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who



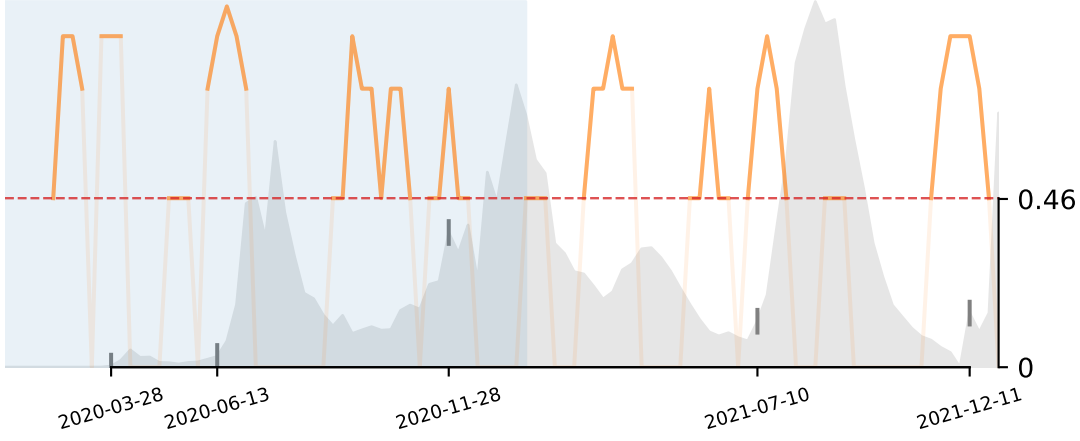
Model 2

(GT) chest pain
(GT) covid-19 who
(GT) Ageusia
(GT) Anosmia
(GT) Hyperventilation



Model 3

(GT) chest pain
(GT) covid
(GT) covid-19 who
(GT) Ageusia
(GT) Anosmia
(GT) covid-19



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	3	2
0.91	1	0	0	2	6	0
0.76	1	0	0	2	14	0
0.46	1	2	0	4	33	0
0.00	1	2	0	4	61	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	3
0.96	0	0	2	0	0	3
0.91	2	1	0	1	0	2
0.76	2	2	0	3	9	0
0.46	2	2	0	3	23	0
0.00	2	6	0	3	53	0

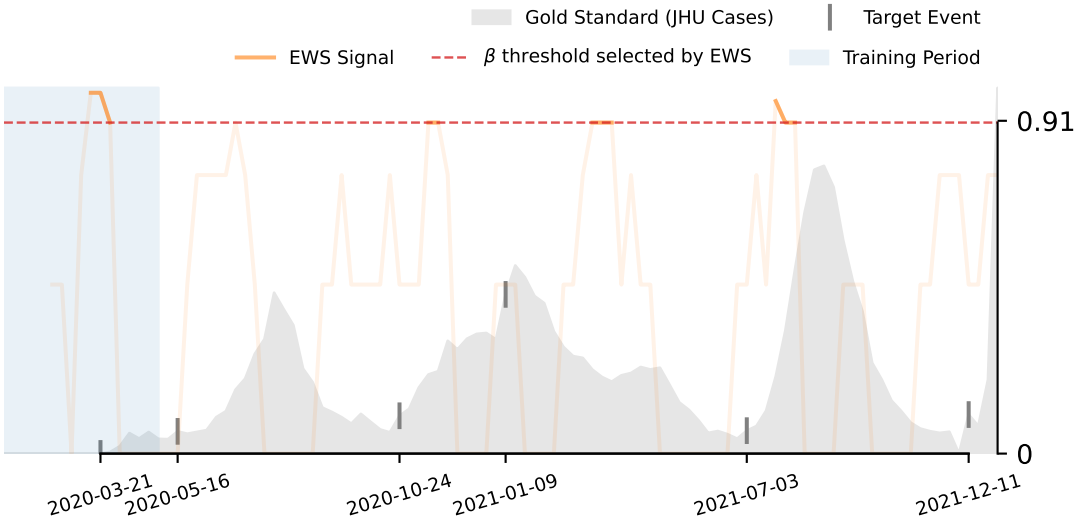
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	1	3	0	0	2
0.91	0	1	3	1	2	0
0.76	2	5	1	2	8	0
0.46	3	10	0	2	17	0
0.00	3	18	0	2	35	0

FL, Palm Beach

Proxies selected by the Multiple Sources method

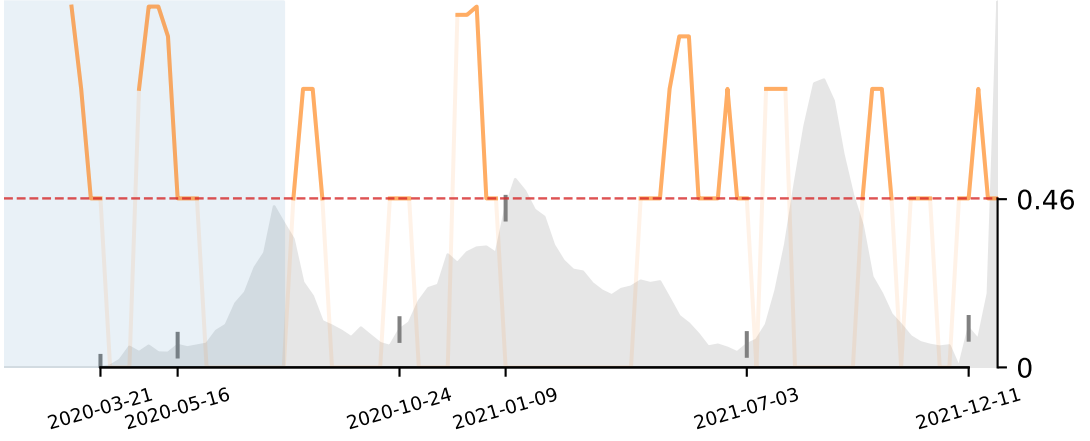
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine



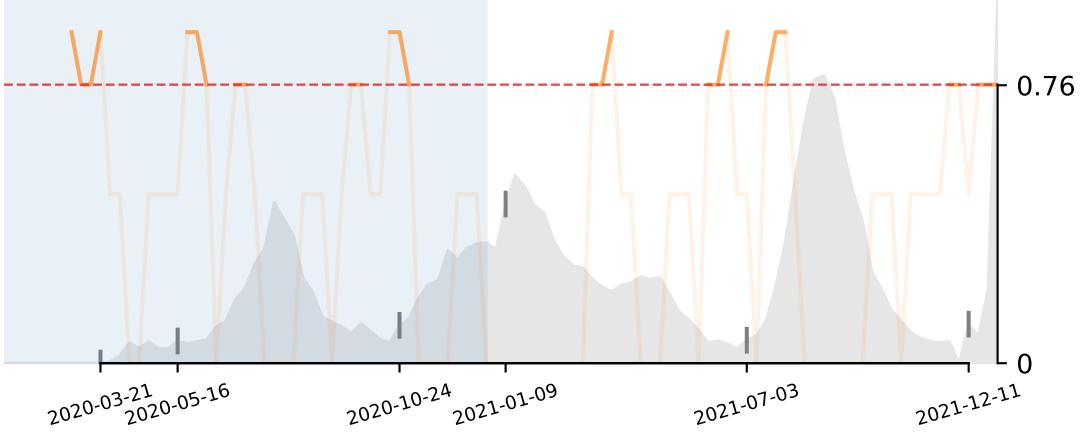
Model 2

(GT) fever
(GT) Chronic pain
(GT) Fatigue
Apple Mobility (driving)
Apple Mobility (walking)
Apple Mobility (transit)



Model 3

Apple Mobility (walking)
(GT) covid-19
(GT) fever
(GT) Acute bronchitis
(GT) Ageusia
(GT) Anosmia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	1	0	0	0	1	5
0.91	1	0	0	0	9	5
0.76	1	1	0	3	19	0
0.46	1	1	0	4	36	0
0.00	1	2	0	5	57	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	1	0	3
0.96	2	0	0	1	0	3
0.91	2	0	0	2	1	2
0.76	2	0	0	2	10	1
0.46	2	0	0	4	20	0
0.00	2	2	0	4	46	0

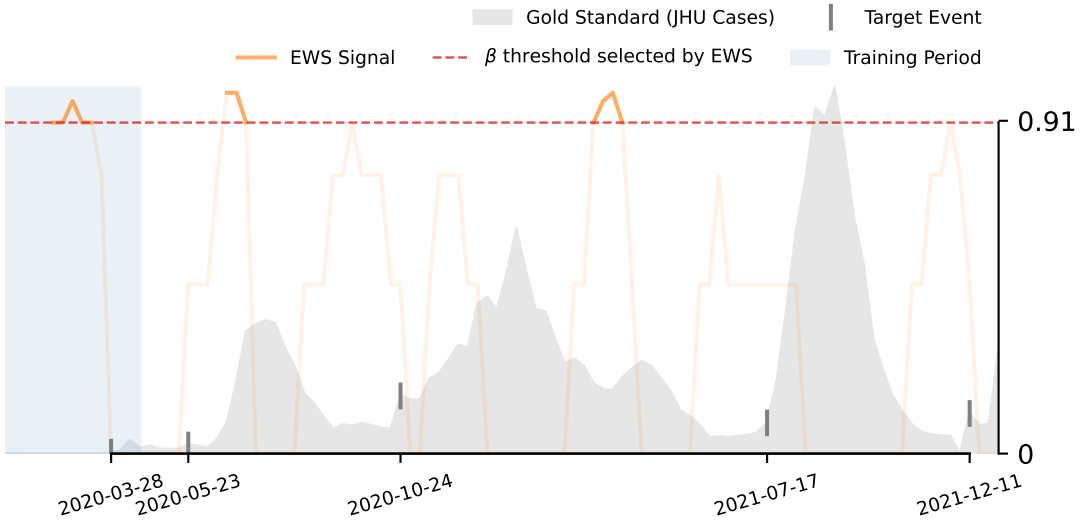
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	0	3	0	0	3
0.91	0	0	3	1	3	2
0.76	2	2	1	2	9	1
0.46	2	7	1	2	17	1
0.00	3	18	0	3	37	0

FL, Pinellas

Proxies selected by the Multiple Sources method

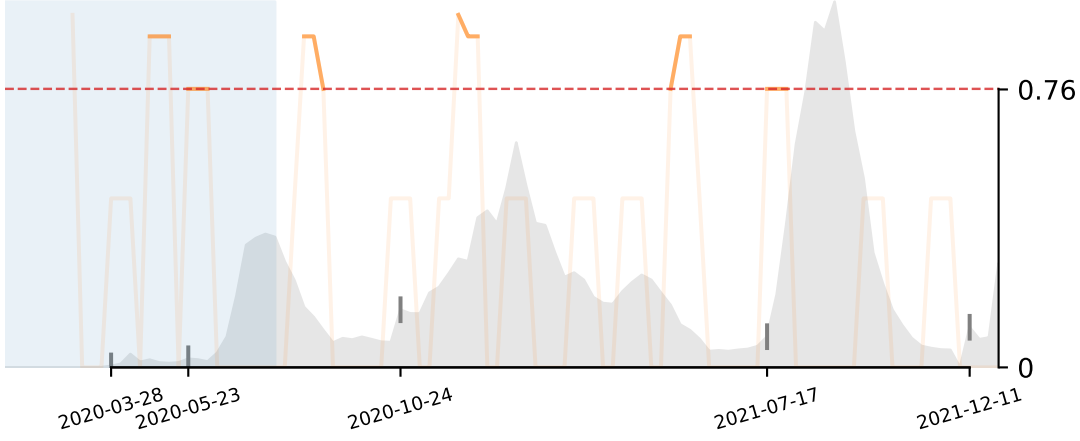
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Acute bronchitis
(GT) Anosmia



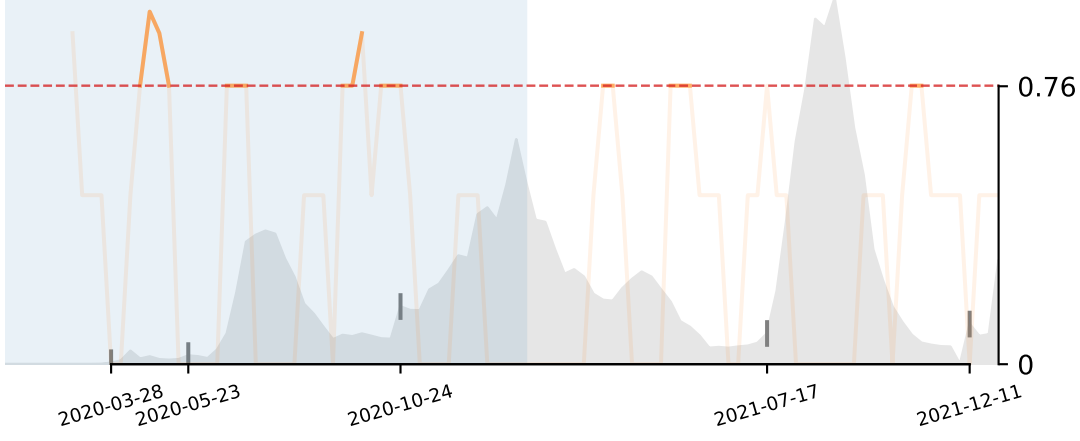
Model 2

(GT) fever
Apple Mobility (driving)
Apple Mobility (walking)
Apple Mobility (transit)
(GT) Otitis



Model 3

Apple Mobility (walking)
(GT) covid
(GT) Anosmia
(GT) Dizziness
(GT) Vertigo
Apple Mobility (driving)



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	3	4
0.96	0	0	1	0	4	4
0.91	1	0	0	2	7	2
0.76	1	2	0	3	12	1
0.46	1	2	0	4	27	0
0.00	1	2	0	4	63	0

β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	3
0.96	0	0	2	0	1	3
0.91	1	0	1	0	7	3
0.76	2	0	0	1	11	2
0.46	2	2	0	3	28	0
0.00	2	4	0	3	54	0

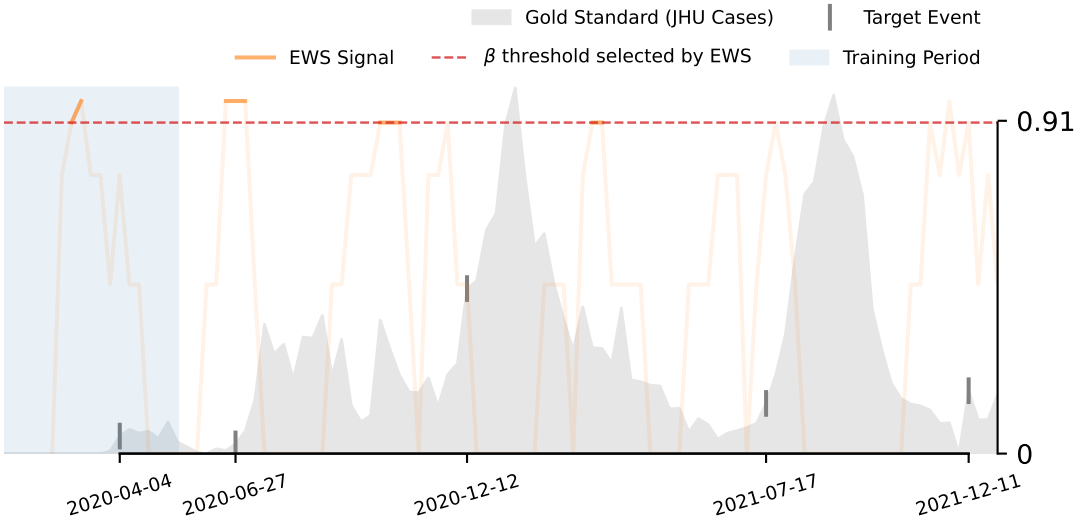
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	0	0	2
0.76	3	0	0	2	5	0
0.46	3	6	0	2	17	0
0.00	3	14	0	2	35	0

FL, Sumter

Proxies selected by the Multiple Sources method

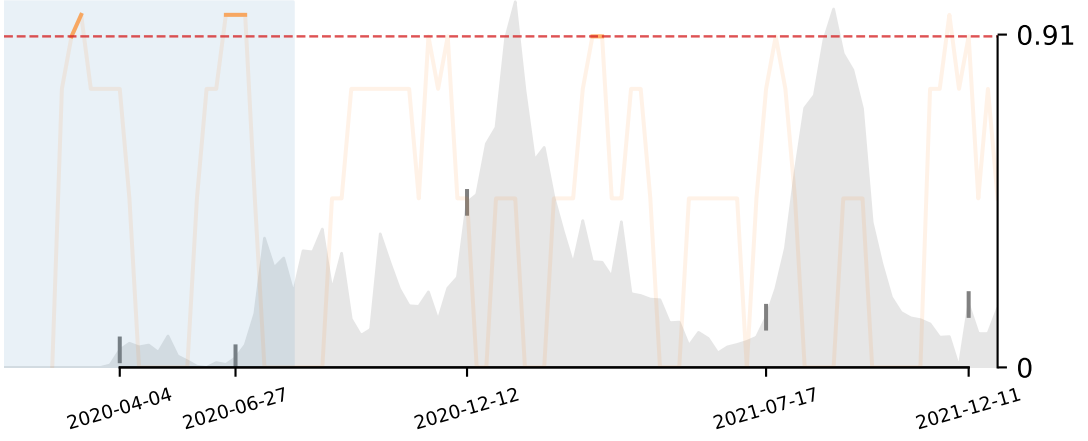
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) nose bleed



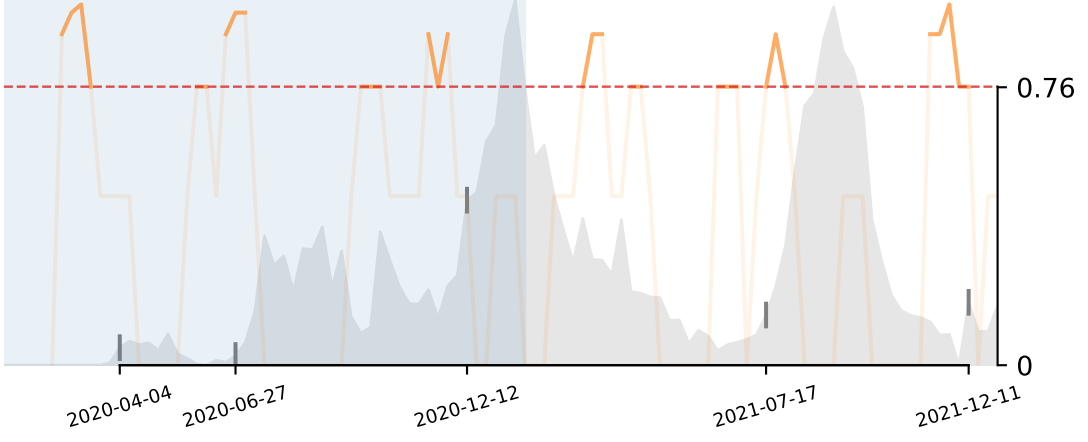
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) Otitis



Model 3

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Otitis
(GT) Pneumonia
(GT) quarantine



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	2	1	2
0.91	1	0	0	3	7	0
0.76	1	1	0	4	13	0
0.46	1	2	0	4	28	0
0.00	1	4	0	4	58	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	1	0	2
0.91	2	1	0	2	3	0
0.76	2	2	0	3	14	0
0.46	2	3	0	3	33	0
0.00	2	5	0	3	52	0

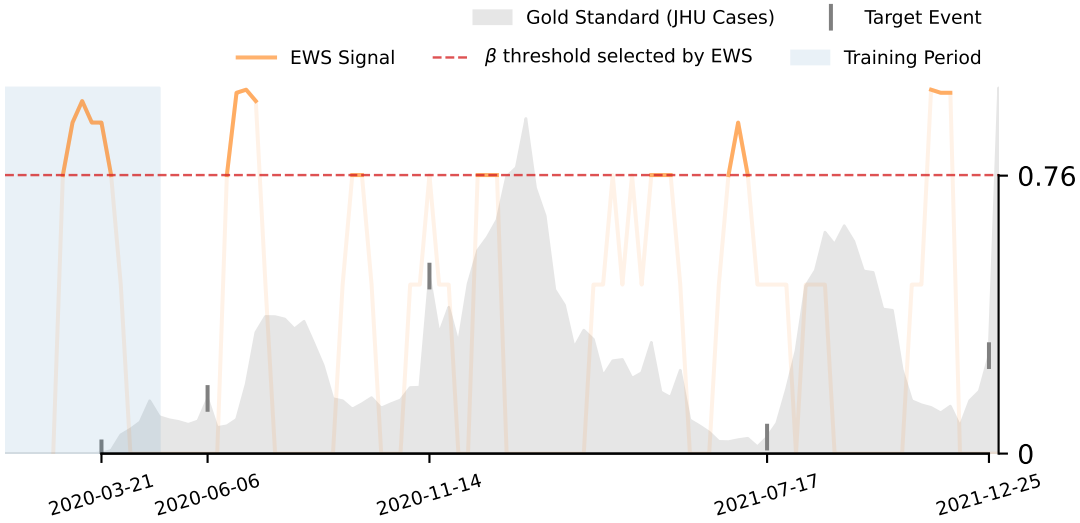
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	1	0	1
0.96	1	0	2	1	0	1
0.91	2	2	1	1	3	0
0.76	3	3	0	2	7	0
0.46	3	6	0	2	19	0
0.00	3	17	0	2	35	0

GA, DeKalb

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness
(GT) covid-19 who

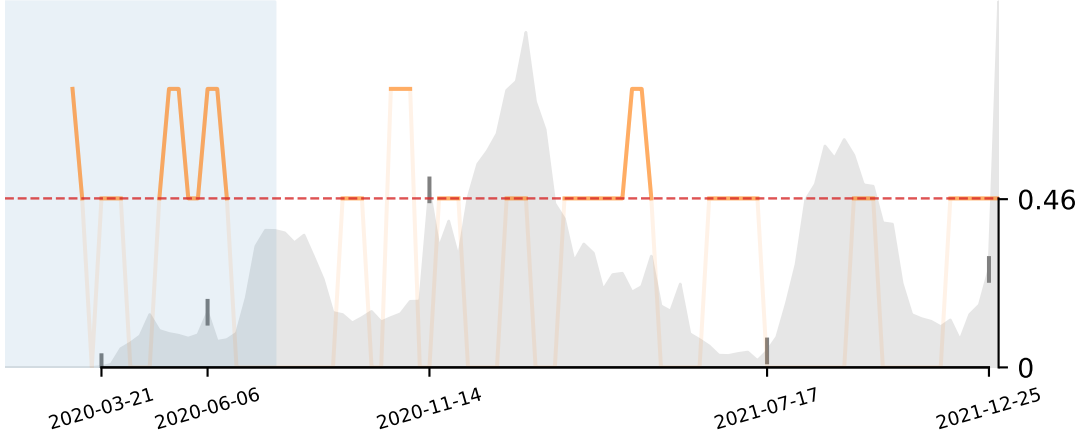


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	1	1	3
0.99	0	0	1	1	2	3
0.96	0	0	1	1	3	3
0.91	1	0	0	2	3	2
0.76	1	0	0	3	14	0
0.46	1	1	0	3	30	0
0.00	1	2	0	4	61	0

Model 2

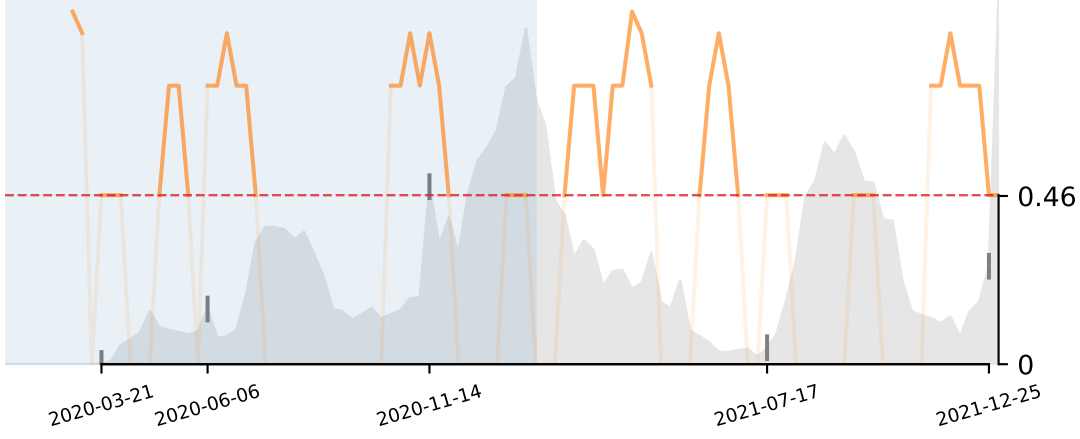
(GT) Ageusia
(GT) Chills
(GT) Otitis
Apple Mobility (transit)



β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	3
0.91	0	0	2	0	0	3
0.76	0	0	2	1	2	2
0.46	2	1	0	3	23	0
0.00	2	5	0	3	54	0

Model 3

(GT) Ageusia
(GT) Otitis
(GT) how long does covid last
Apple Mobility (transit)
(GT) covid
(GT) covid-19



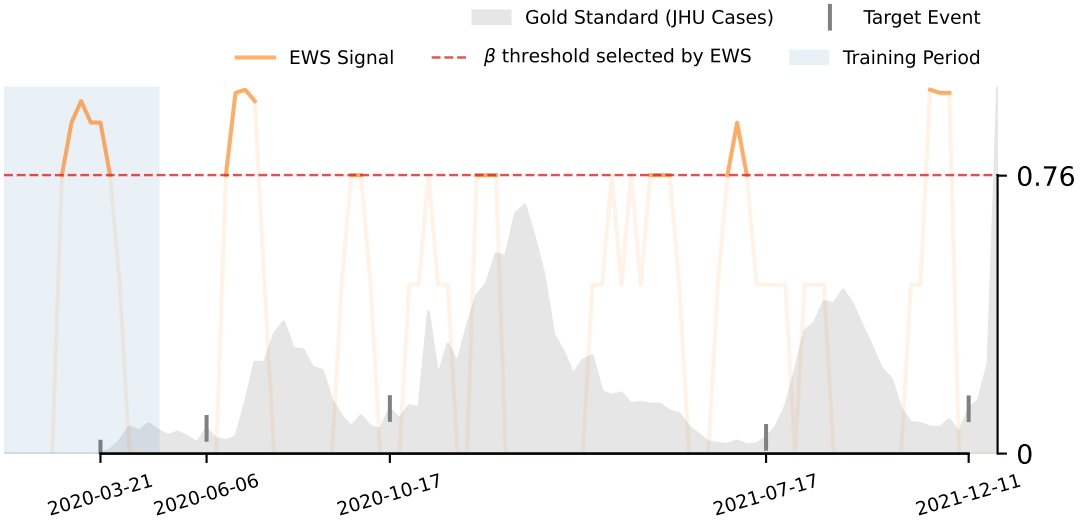
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	1	2
0.91	1	0	2	2	2	0
0.76	2	1	1	2	8	0
0.46	3	5	0	2	17	0
0.00	3	13	0	2	34	0

GA, Fulton

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness
(GT) covid-19 who

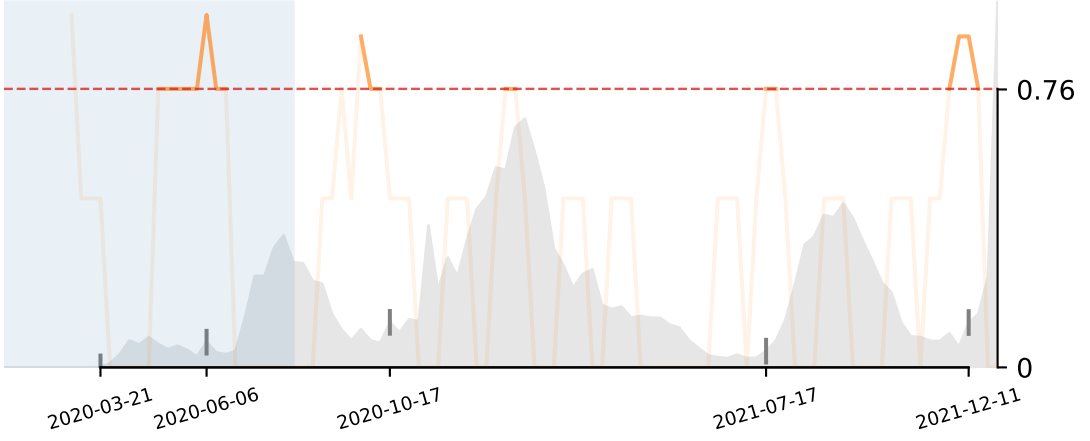


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	1	1	3
0.99	0	0	1	1	2	3
0.96	0	0	1	1	3	3
0.91	1	0	0	2	3	2
0.76	1	0	0	3	13	0
0.46	1	1	0	3	28	0
0.00	1	2	0	4	61	0

Model 2

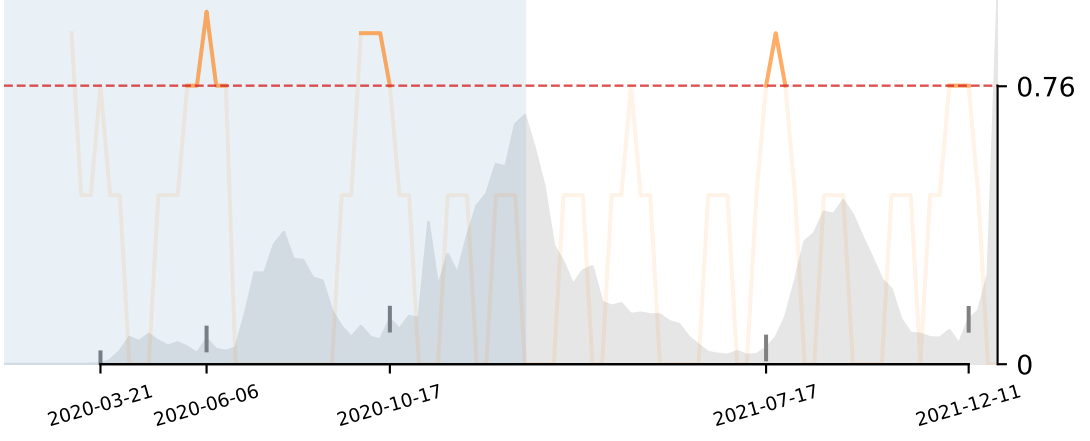
(GT) Ageusia
(GT) Anosmia
(GT) Diarrhea
(GT) Fatigue
(GT) Otitis
Apple Mobility (transit)



β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	0	0	3
0.91	2	0	0	2	0	1
0.76	2	0	0	3	4	0
0.46	2	3	0	3	24	0
0.00	2	3	0	3	52	0

Model 3

(GT) Ageusia
(GT) Anosmia
(GT) Diarrhea
(GT) Otitis
(GT) Hyperventilation
Apple Mobility (transit)



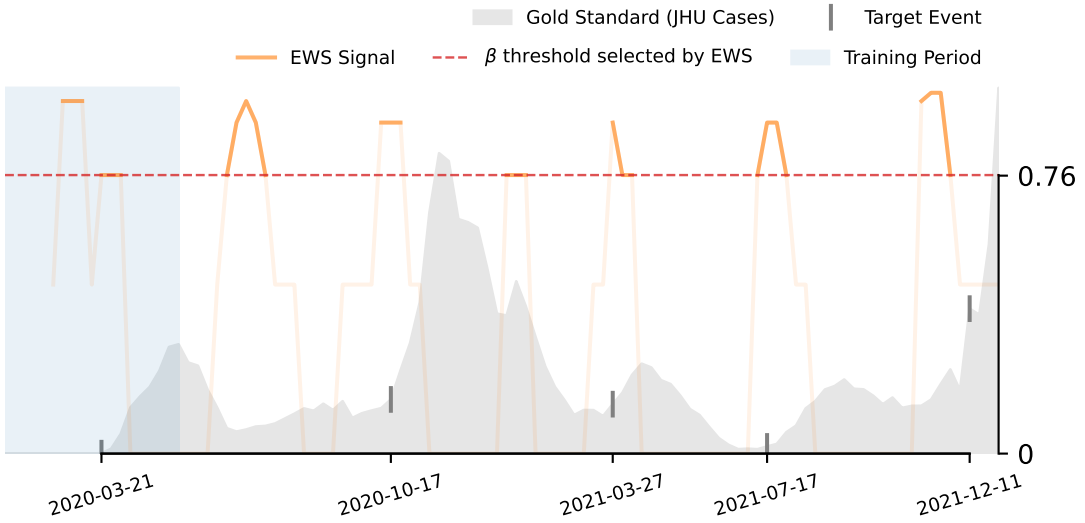
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	0	1	1
0.76	3	0	0	2	3	0
0.46	3	2	0	2	17	0
0.00	3	14	0	2	35	0

IL, Cook

Proxies selected by the Multiple Sources method

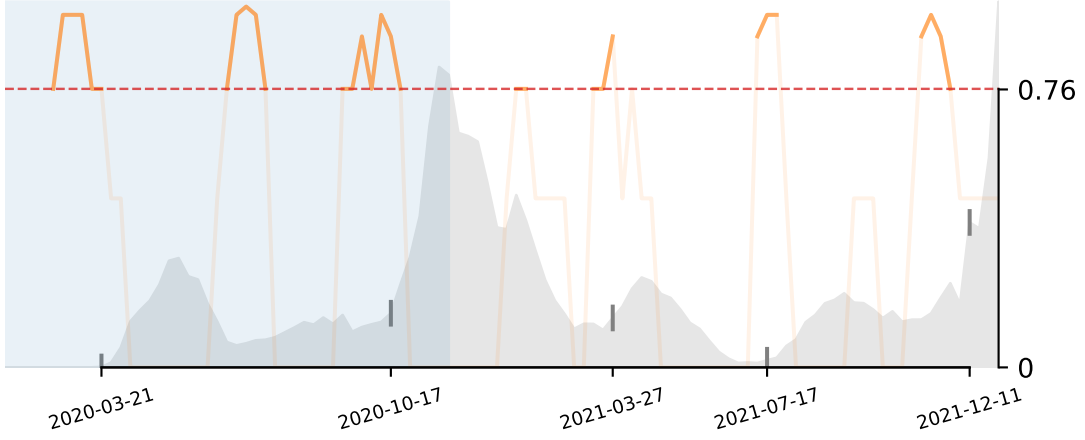
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



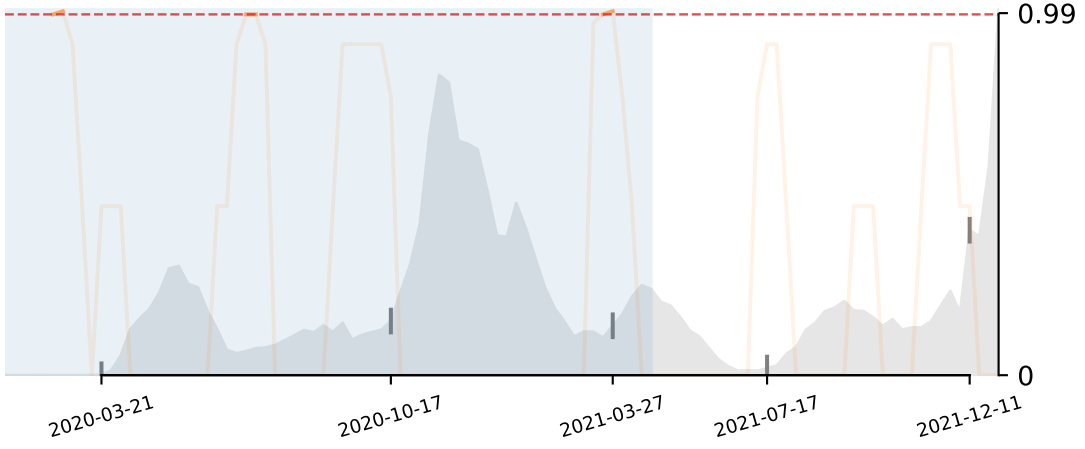
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis



Model 3

(GT) chest pain
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia
(GT) Bronchitis
(GT) Cough



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	1	1	3
0.91	1	0	0	4	5	0
0.76	1	0	0	4	13	0
0.46	1	2	0	4	24	0
0.00	1	3	0	4	57	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	1	2	2	1	1
0.91	2	3	0	3	1	0
0.76	2	3	0	3	4	0
0.46	2	8	0	3	17	0
0.00	2	11	0	3	36	0

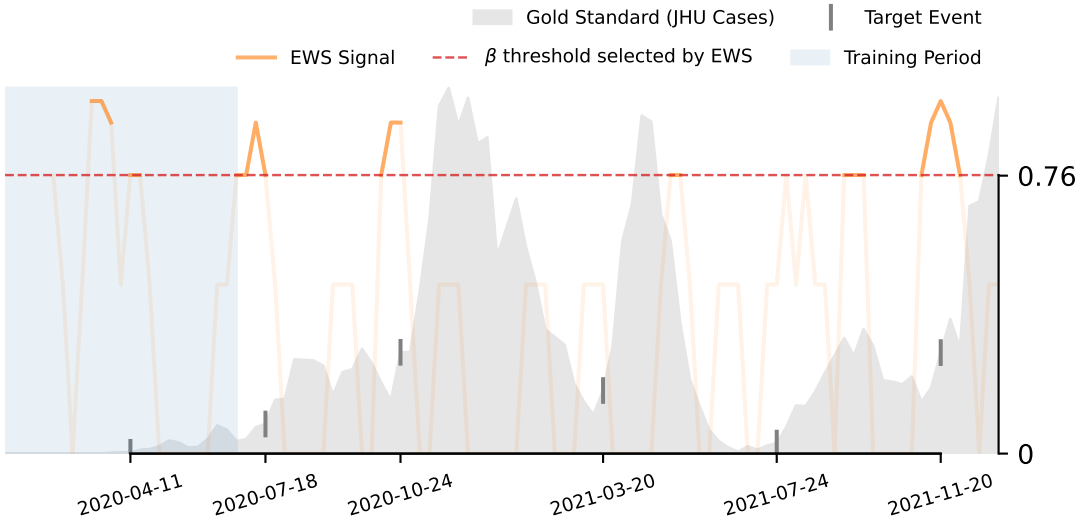
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	2	0	1	0	0	2
0.96	2	3	1	0	0	2
0.91	2	3	1	2	1	0
0.76	3	6	0	2	1	0
0.46	3	7	0	2	5	0
0.00	3	13	0	2	22	0

IL, Peoria

Proxies selected by the Multiple Sources method

Model 1

(GT) covid-19
(GT) covid symptoms
(GT) Abdominal pain
(GT) covid
(GT) Vertigo
(GT) Anxiety

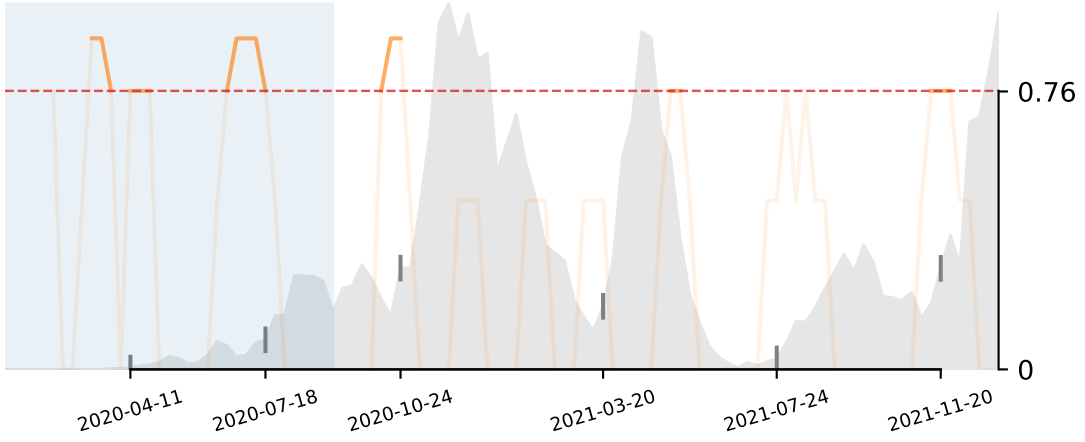


Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	1	0	4
0.91	1	0	0	3	1	2
0.76	1	0	0	3	9	1
0.46	1	3	0	5	25	0
0.00	1	8	0	5	48	0

Model 2

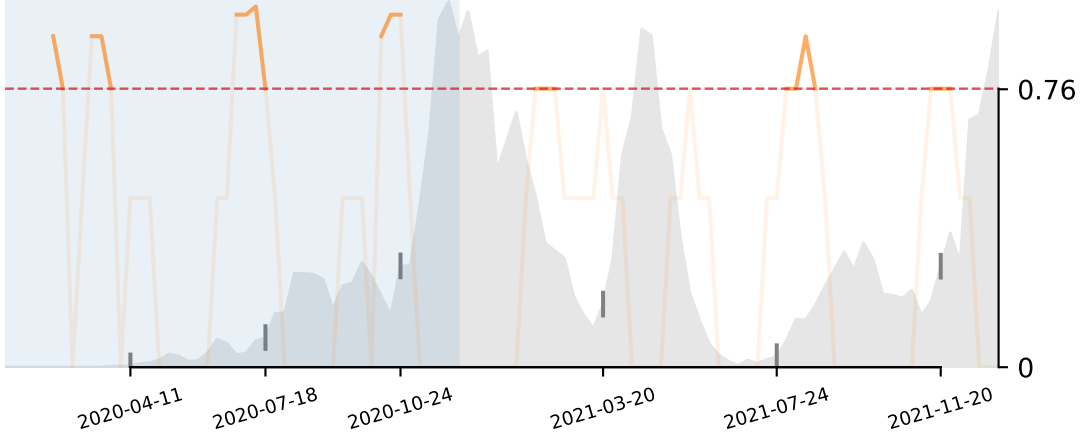
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Anxiety
(GT) Chronic pain



β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	4
0.96	0	0	2	0	0	4
0.91	0	0	2	1	0	3
0.76	2	0	0	2	5	1
0.46	2	3	0	4	18	0
0.00	2	6	0	4	41	0

Model 3

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Anxiety
(GT) Cough
(GT) Phlegm



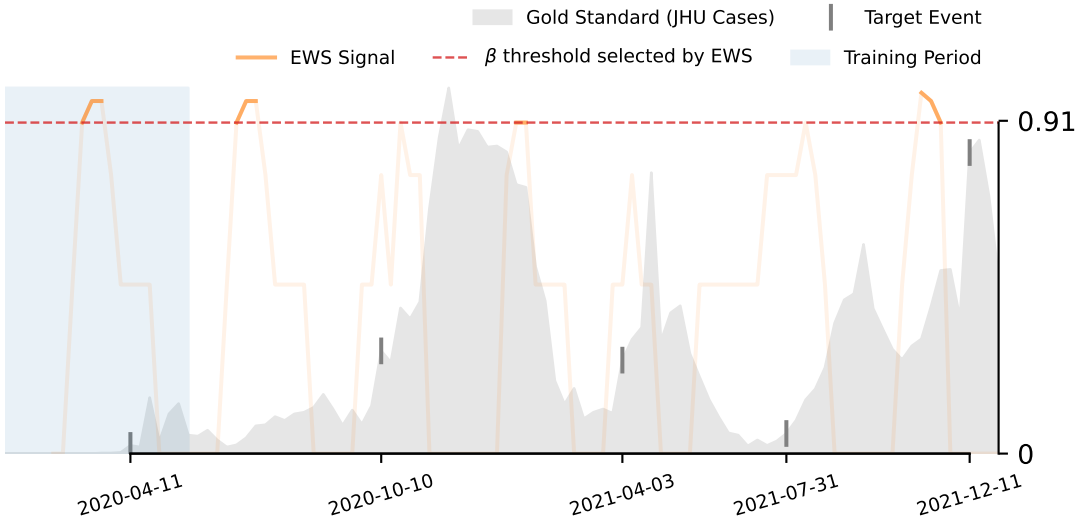
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	1	0	2	0	0	3
0.91	2	0	1	0	1	3
0.76	3	1	0	2	7	0
0.46	3	2	0	3	17	0
0.00	3	10	0	3	35	0

IN, LaPorte

Proxies selected by the Multiple Sources method

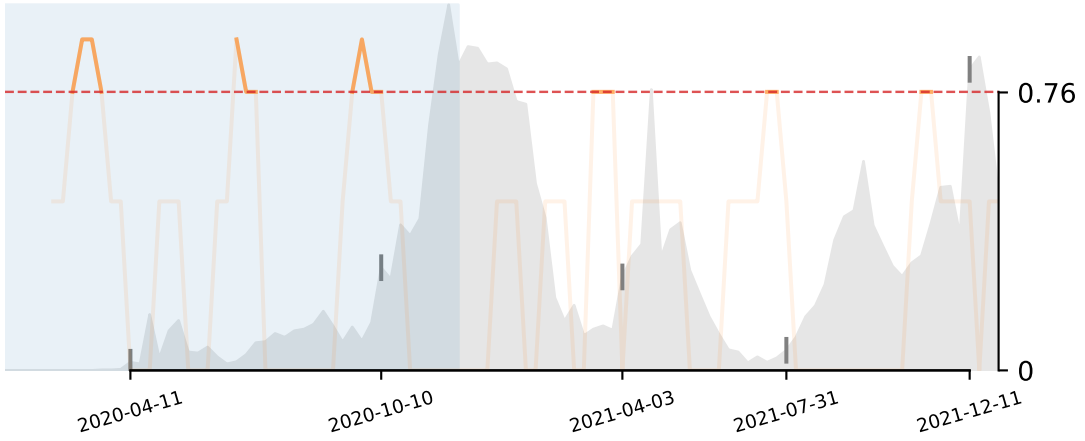
Model 1

(GT) covid
(GT) how long does covid last
(GT) quarantine
(GT) covid-19 who
(GT) fever
(GT) Chronic pain



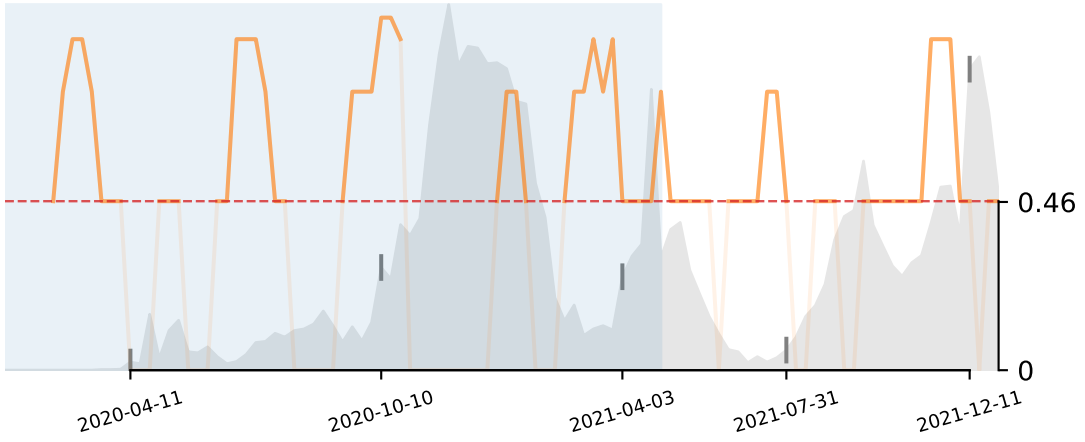
Model 2

(GT) covid
(GT) quarantine
(GT) Otitis
(GT) chest pain



Model 3

(GT) chest pain
(GT) Otitis
(GT) covid
(GT) loss smell
(GT) loss of smell
(GT) covid symptoms



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	1	2	3
0.91	1	0	0	1	7	1
0.76	1	1	0	3	14	0
0.46	1	1	0	4	30	0
0.00	1	4	0	4	56	0

β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	3
0.91	0	0	2	0	0	3
0.76	2	2	0	3	0	0
0.46	2	5	0	3	13	0
0.00	2	14	0	3	35	0

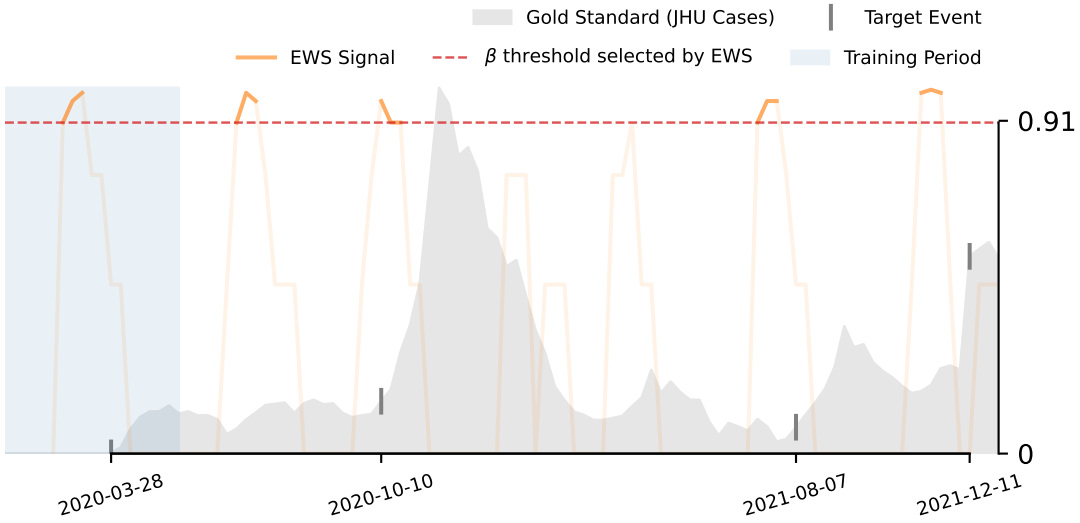
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	1	2	1	0	1
0.76	2	7	1	2	0	0
0.46	3	13	0	2	15	0
0.00	3	27	0	2	21	0

IN, Lake

Proxies selected by the Multiple Sources method

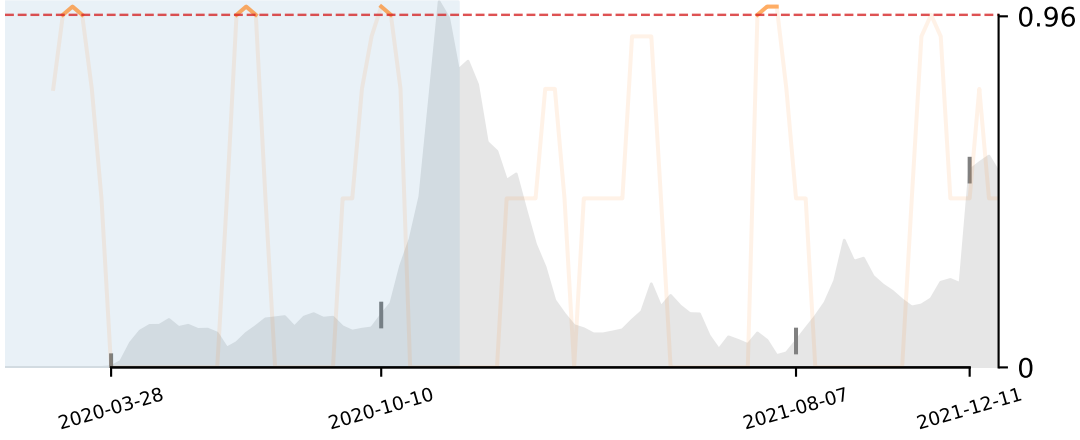
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine



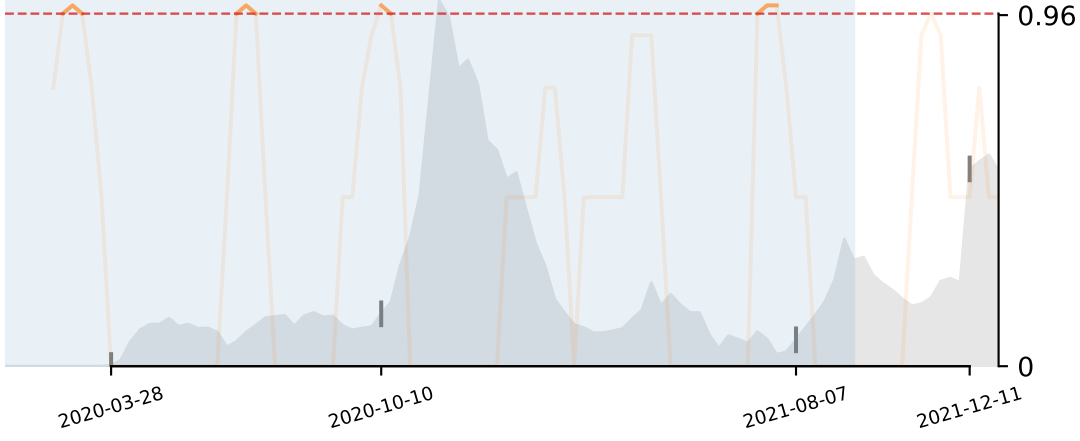
Model 2

(GT) Wheeze
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis



Model 3

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Wheeze
(GT) quarantine
(GT) Acute bronchitis



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	1	0	2
0.99	0	0	1	1	1	2
0.96	1	0	0	3	2	0
0.91	1	0	0	3	6	0
0.76	1	1	0	3	12	0
0.46	1	1	0	3	27	0
0.00	1	2	0	3	64	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	1	0	1
0.96	2	1	0	2	0	0
0.91	2	5	0	2	3	0
0.76	2	5	0	2	6	0
0.46	2	7	0	2	20	0
0.00	2	9	0	2	42	0

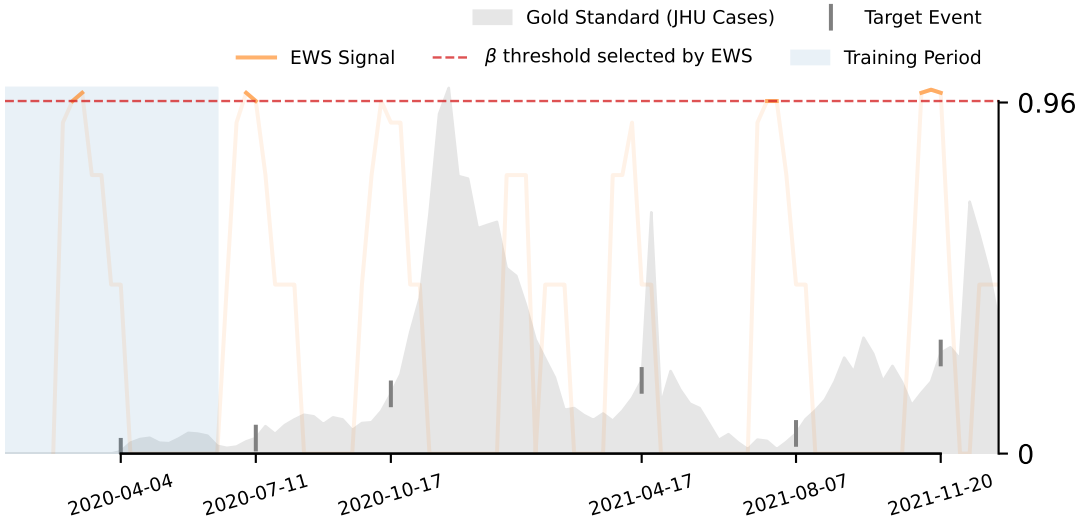
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	3	1	0	1	0	0
0.91	3	5	0	1	0	0
0.76	3	8	0	1	1	0
0.46	3	12	0	1	3	0
0.00	3	26	0	1	8	0

IN, Porter

Proxies selected by the Multiple Sources method

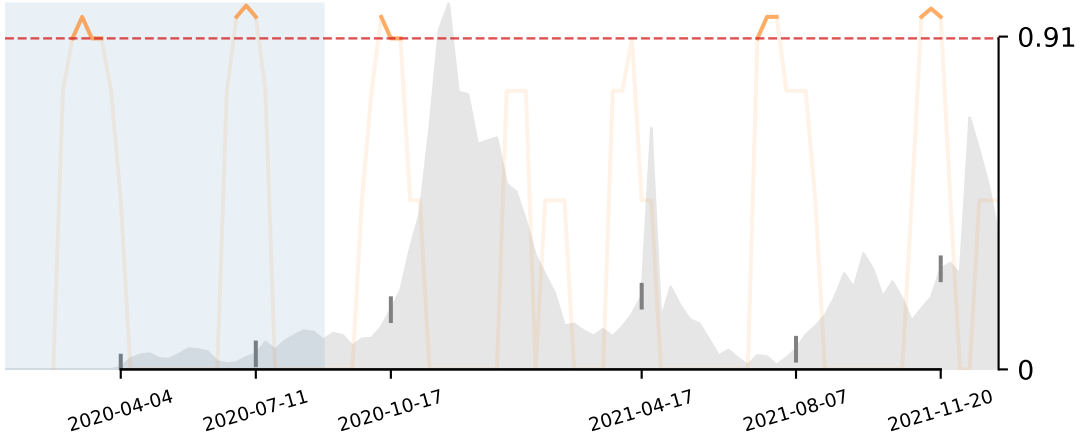
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine



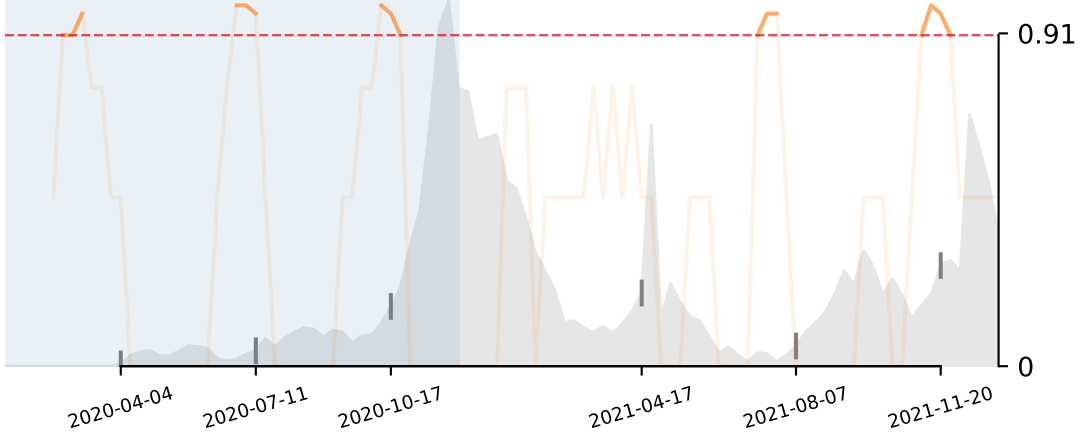
Model 2

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who



Model 3

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) chest pain
(GT) loss smell



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	1	0	4
0.99	0	0	1	2	0	3
0.96	1	0	0	4	0	1
0.91	1	1	0	5	1	0
0.76	1	2	0	5	5	0
0.46	1	2	0	5	19	0
0.00	1	2	0	5	49	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	1	0	1	1	0	3
0.96	1	0	1	3	0	1
0.91	2	0	0	4	1	0
0.76	2	1	0	4	5	0
0.46	2	3	0	4	16	0
0.00	2	3	0	4	42	0

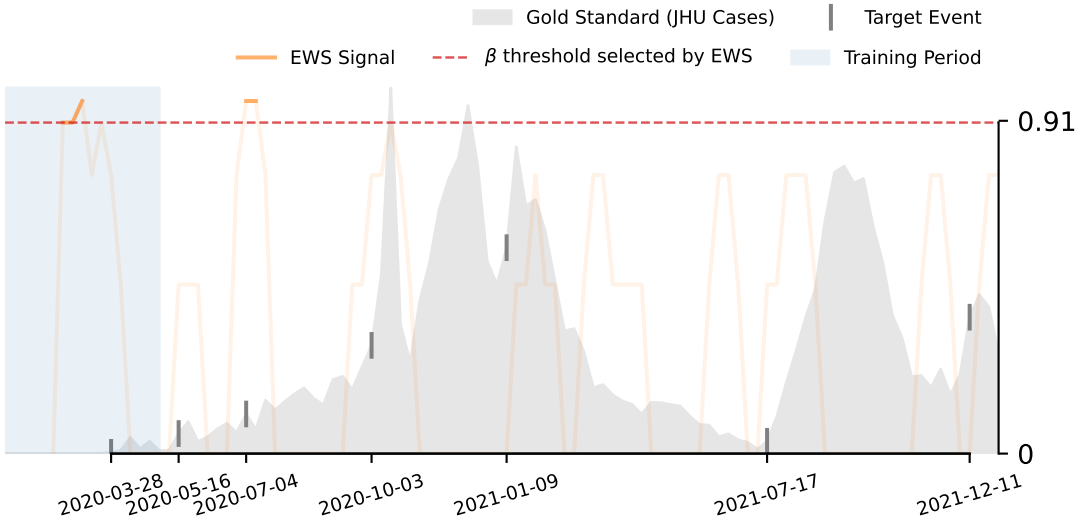
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	1	0	2
0.96	2	0	1	2	0	1
0.91	3	0	0	2	1	1
0.76	3	3	0	3	4	0
0.46	3	3	0	3	19	0
0.00	3	6	0	3	35	0

KY, Fayette

Proxies selected by the Multiple Sources method

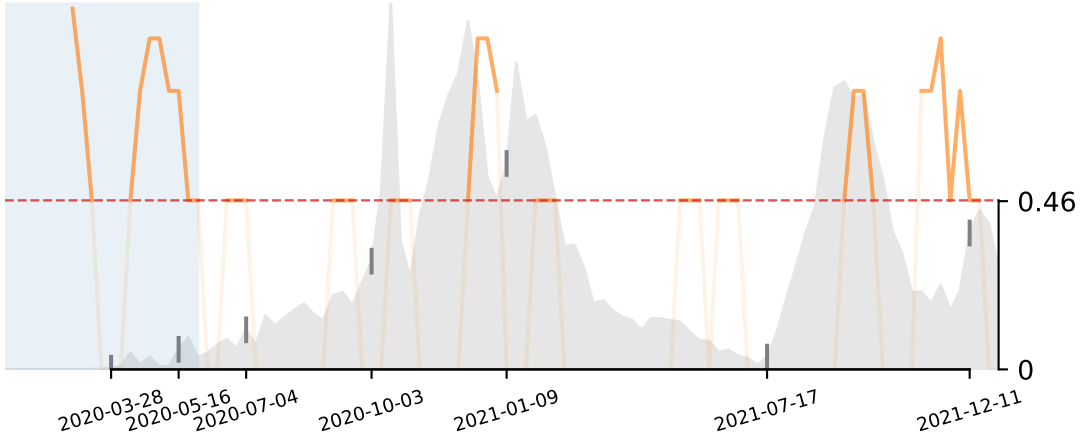
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) nose bleed
(GT) fever



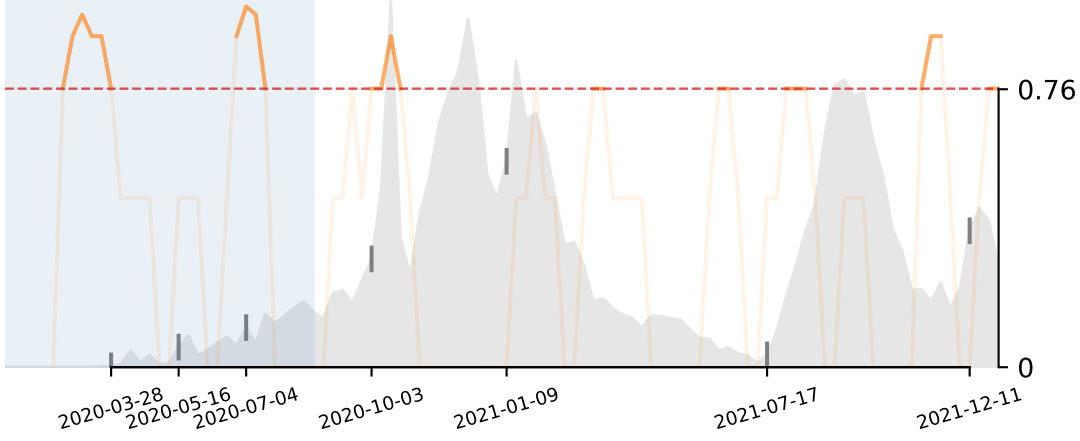
Model 2

(GT) fever
(GT) Abdominal pain
Apple Mobility (driving)
Apple Mobility (walking)
Apple Mobility (transit)



Model 3

(GT) Abdominal pain
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	6
0.99	0	0	1	0	0	6
0.96	0	0	1	1	1	5
0.91	1	0	0	1	2	4
0.76	1	1	0	4	13	2
0.46	1	1	0	5	26	0
0.00	1	2	0	6	50	0

β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	5
0.96	1	0	1	0	0	5
0.91	1	0	1	2	0	3
0.76	2	0	0	2	2	3
0.46	2	0	0	5	14	0
0.00	2	3	0	5	50	0

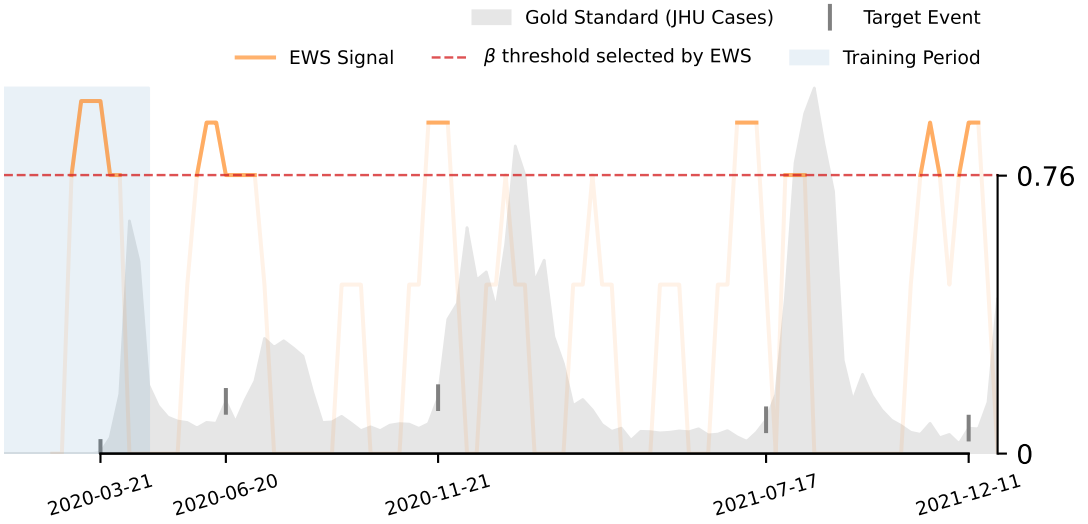
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	4
0.99	0	0	3	0	0	4
0.96	1	0	2	0	0	4
0.91	2	1	1	1	1	2
0.76	2	1	1	3	11	1
0.46	2	3	1	3	27	0
0.00	3	7	0	4	44	0

LA, Jefferson

Proxies selected by the Multiple Sources method

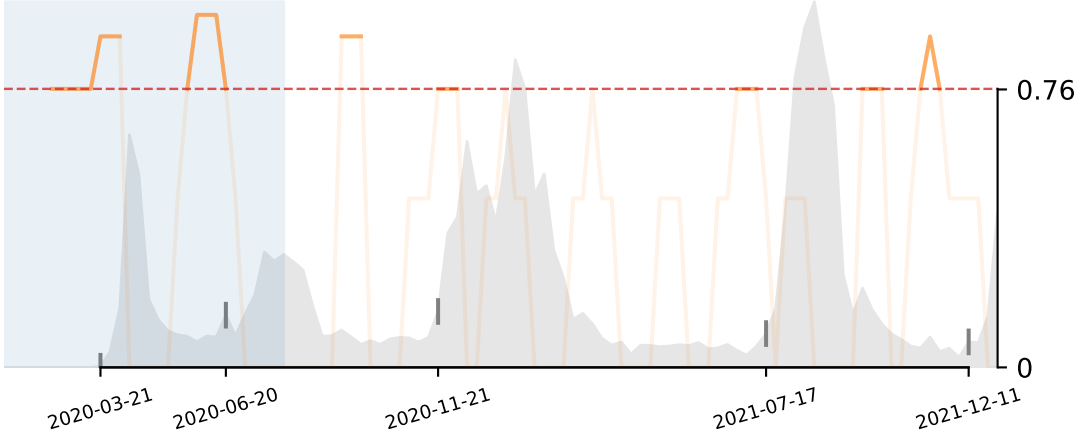
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



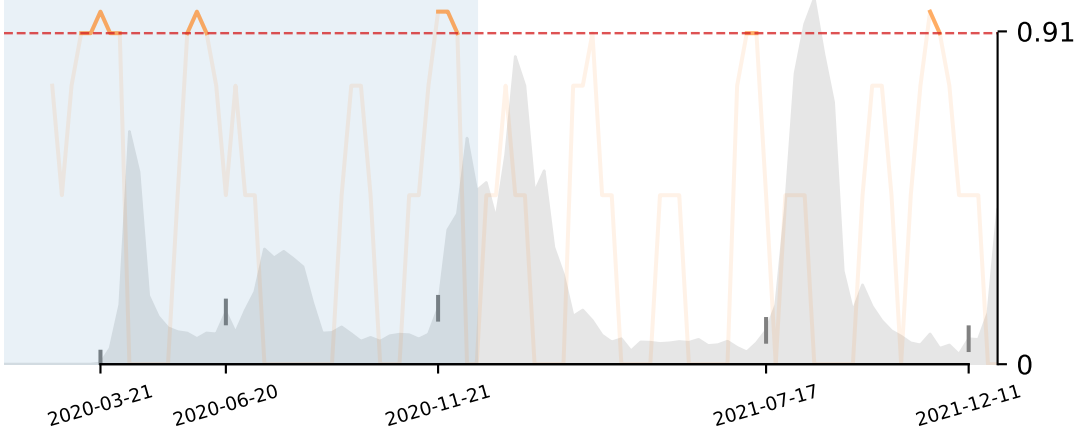
Model 2

(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Diarrhea
(GT) Otitis



Model 3

(GT) covid-19
(GT) fever
(GT) Otitis
(GT) Chills
(GT) chest pain
(GT) covid



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	0	4
0.91	1	0	0	4	2	0
0.76	1	0	0	4	10	0
0.46	1	2	0	4	27	0
0.00	1	2	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	0	0	3
0.91	1	0	1	1	3	2
0.76	2	2	0	3	10	0
0.46	2	3	0	3	25	0
0.00	2	5	0	3	53	0

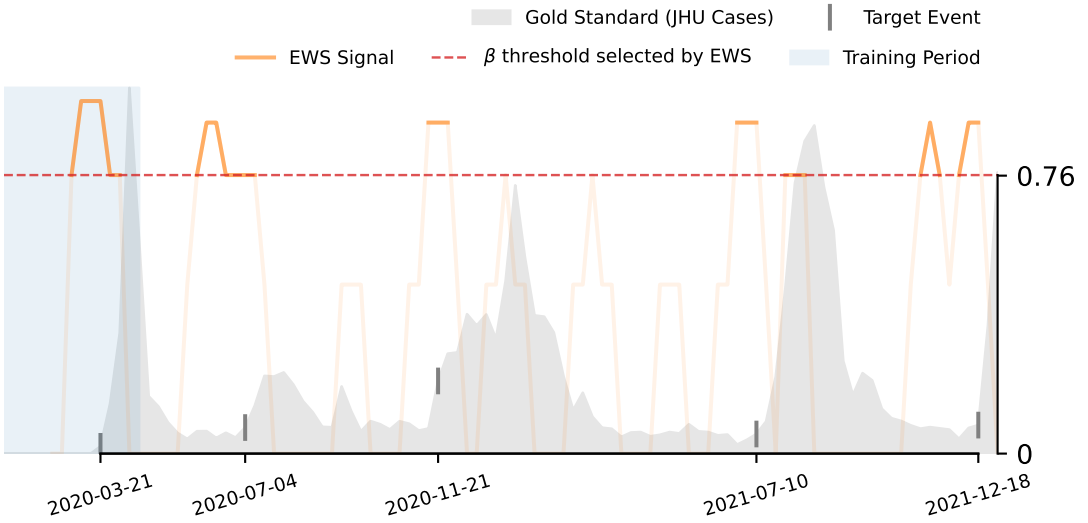
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	1	0	1
0.91	3	1	0	2	1	0
0.76	3	4	0	2	6	0
0.46	3	8	0	2	21	0
0.00	3	13	0	2	40	0

LA, Orleans

Proxies selected by the Multiple Sources method

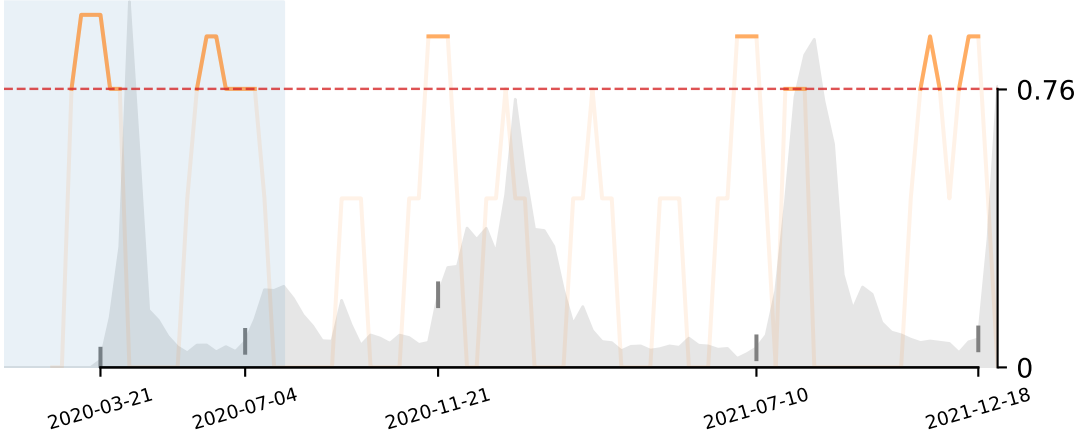
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



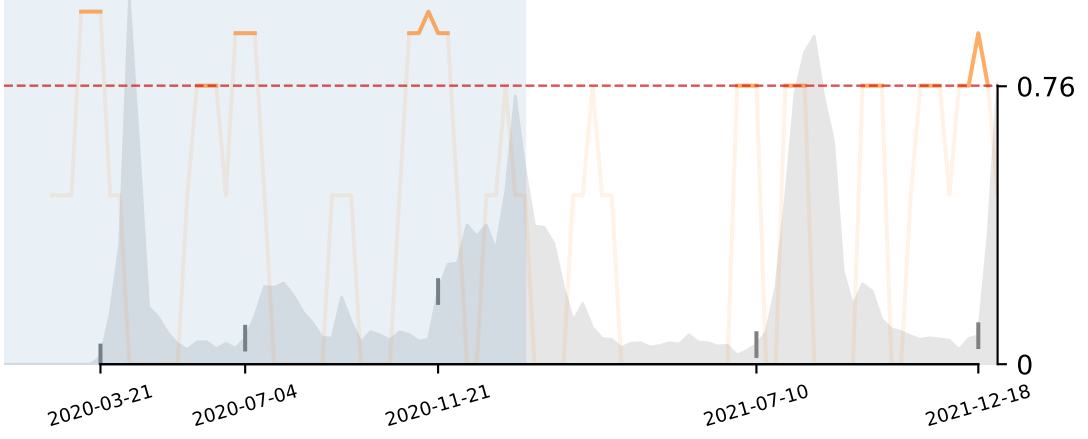
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



Model 3

(GT) covid
(GT) covid-19
(GT) quarantine
(GT) fever
(GT) Abdominal pain
(GT) Diarrhea



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	0	4
0.91	1	0	0	4	1	0
0.76	1	0	0	4	7	0
0.46	1	2	0	4	26	0
0.00	1	2	0	4	61	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	0	0	3
0.91	1	0	1	3	1	0
0.76	2	0	0	3	6	0
0.46	2	4	0	3	24	0
0.00	2	6	0	3	53	0

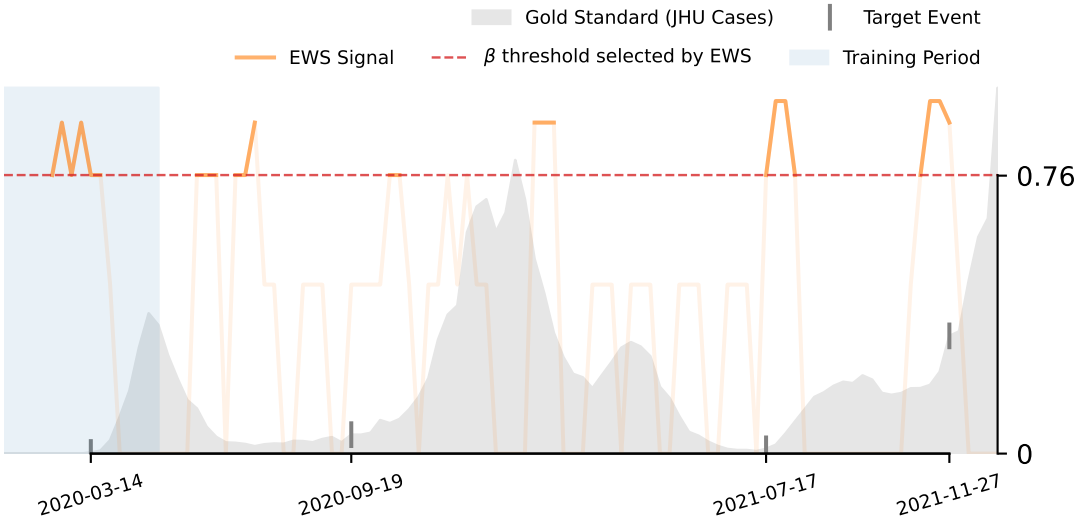
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	2	0	1	1	0	1
0.76	3	2	0	2	8	0
0.46	3	4	0	2	14	0
0.00	3	17	0	2	35	0

MA, Middlesex

Proxies selected by the Multiple Sources method

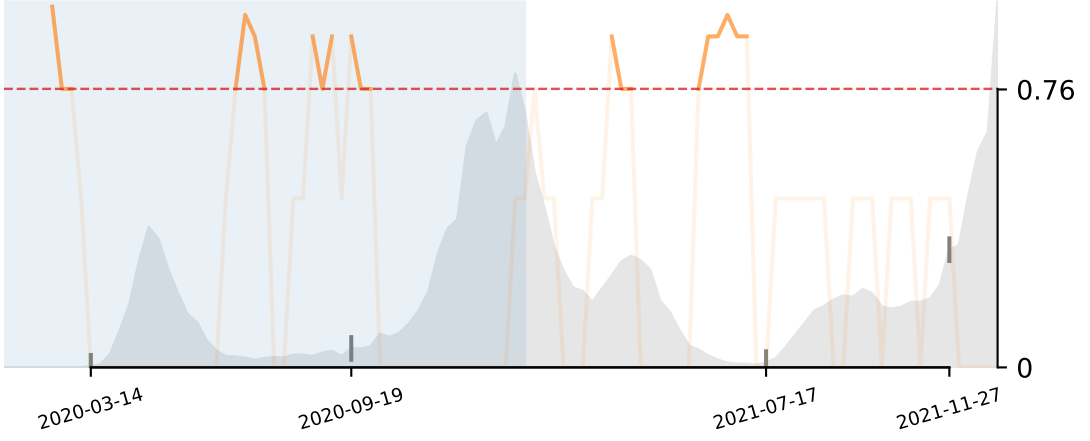
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who



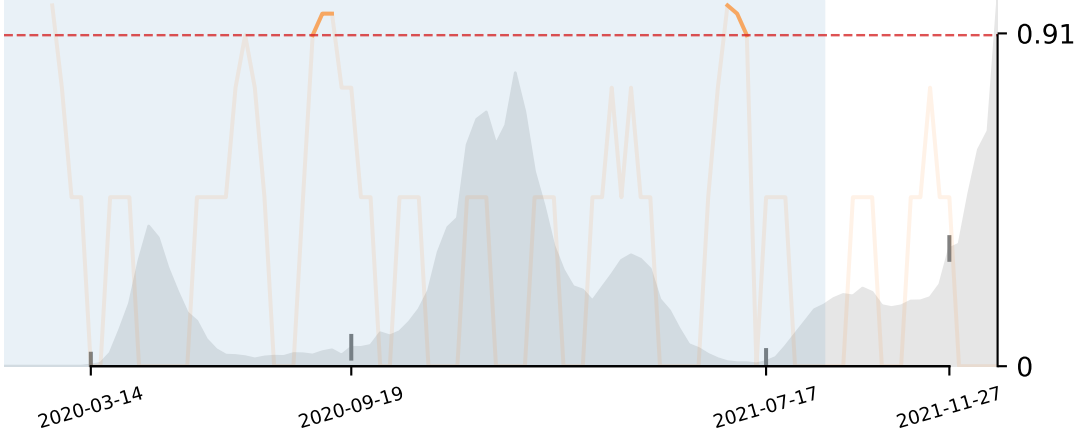
Model 2

(GT) Viral pneumonia
(GT) covid-19
(GT) Anosmia
(GT) Burning Chest Pain
(GT) Cardiac arrest
(GT) Hyperventilation



Model 3

(GT) Burning Chest Pain
(GT) Viral pneumonia
(GT) covid-19
(GT) Asphyxia
(GT) Hyperventilation
(GT) chest pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	2	1
0.91	0	0	1	1	6	1
0.76	1	0	0	2	16	1
0.46	1	1	0	3	37	0
0.00	1	2	0	3	66	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	1	0	1	1	0	1
0.91	1	1	1	1	1	1
0.76	2	2	0	1	5	1
0.46	2	6	0	2	18	0
0.00	2	11	0	2	35	0

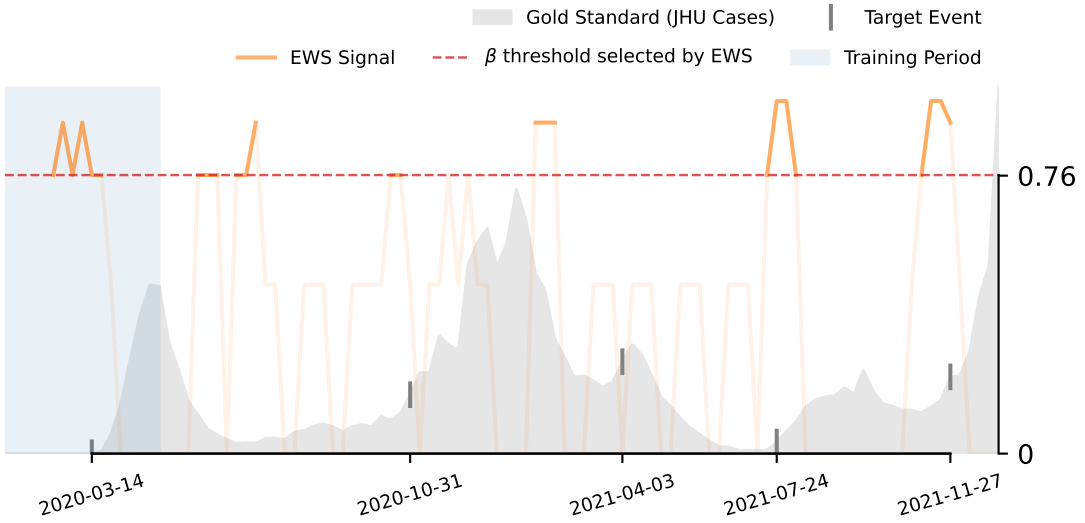
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	2	0	1	0	0	1
0.91	3	0	0	0	0	1
0.76	3	1	0	1	0	0
0.46	3	6	0	1	3	0
0.00	3	34	0	1	11	0

MA, Suffolk

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who

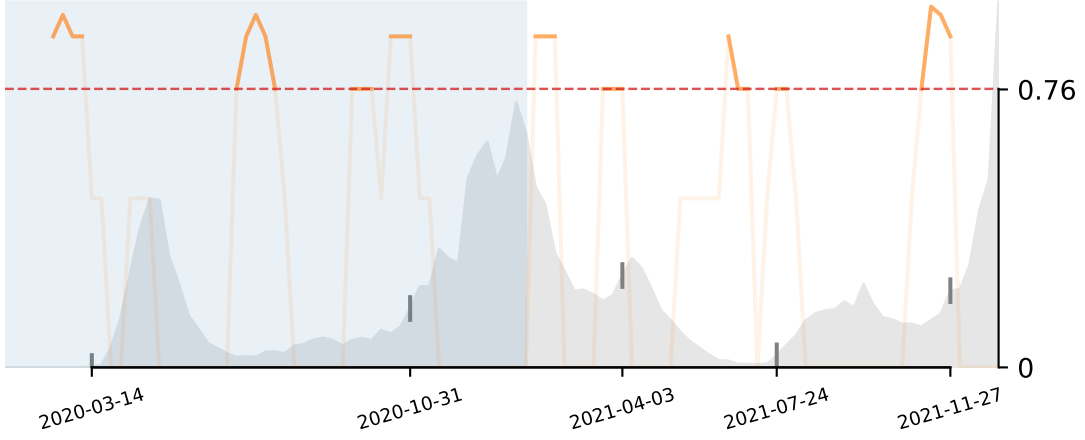


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	2	1	2
0.91	0	0	1	2	5	2
0.76	1	0	0	3	13	1
0.46	1	1	0	4	30	0
0.00	1	2	0	4	59	0

Model 2

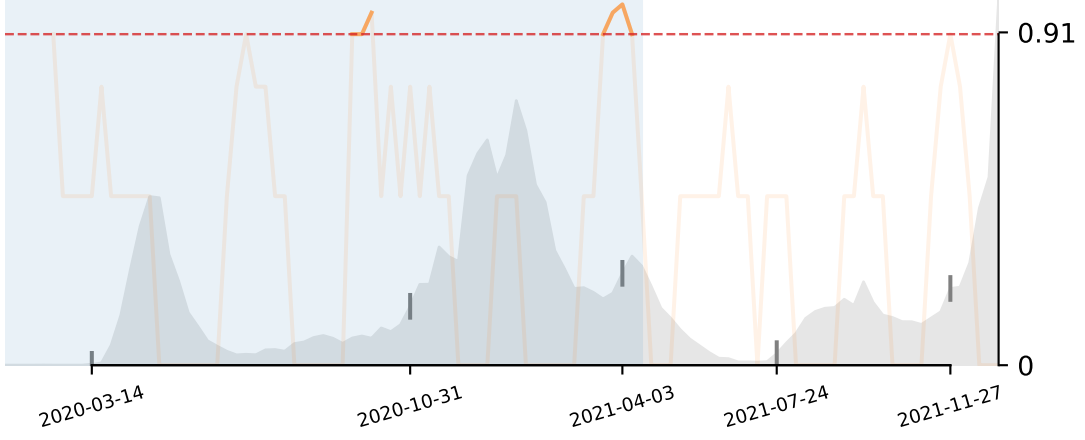
(GT) covid
(GT) covid-19
(GT) quarantine
(GT) Abdominal pain
(GT) Ageusia
(GT) Anosmia



β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	2	0	0	3
0.99	0	0	2	1	0	2
0.96	0	0	2	1	0	2
0.91	1	1	1	2	3	1
0.76	2	3	0	3	4	0
0.46	2	7	0	3	9	0
0.00	2	14	0	3	28	0

Model 3

(GT) Ageusia
(GT) Anosmia
(GT) Fever
(GT) Vertigo
(GT) loss smell
(GT) loss of smell



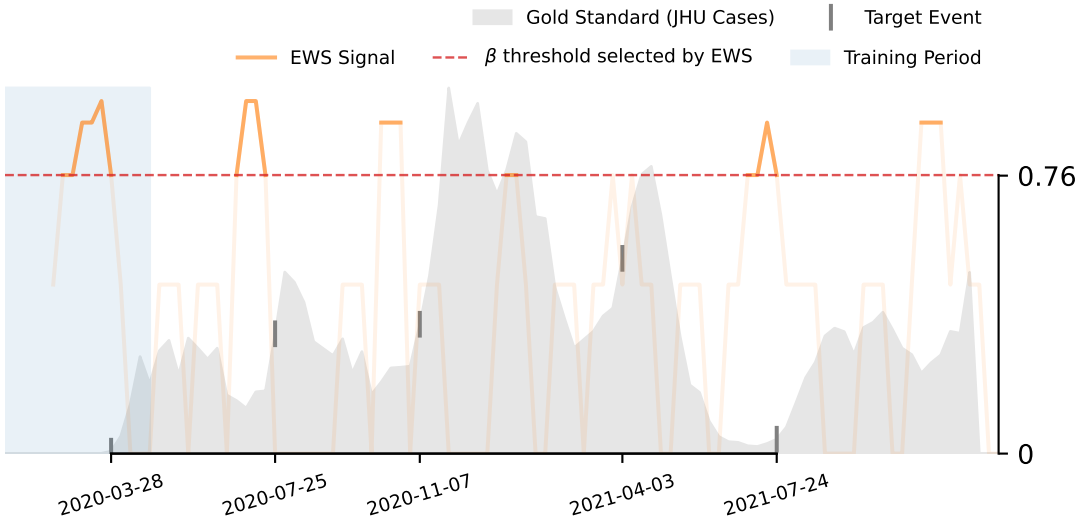
β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	0	2	0	0	2
0.91	2	0	1	1	0	1
0.76	3	4	0	2	2	0
0.46	3	9	0	2	12	0
0.00	3	24	0	2	23	0

MD, Baltimore

Proxies selected by the Multiple Sources method

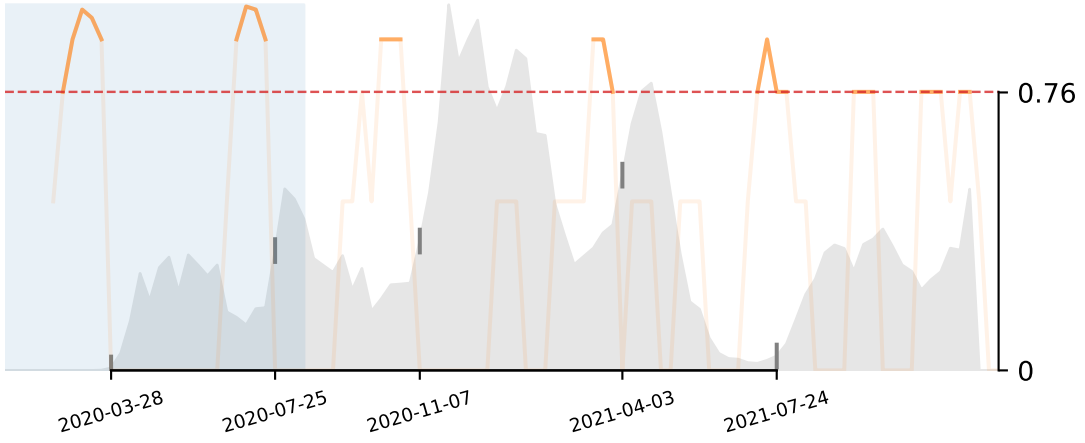
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who



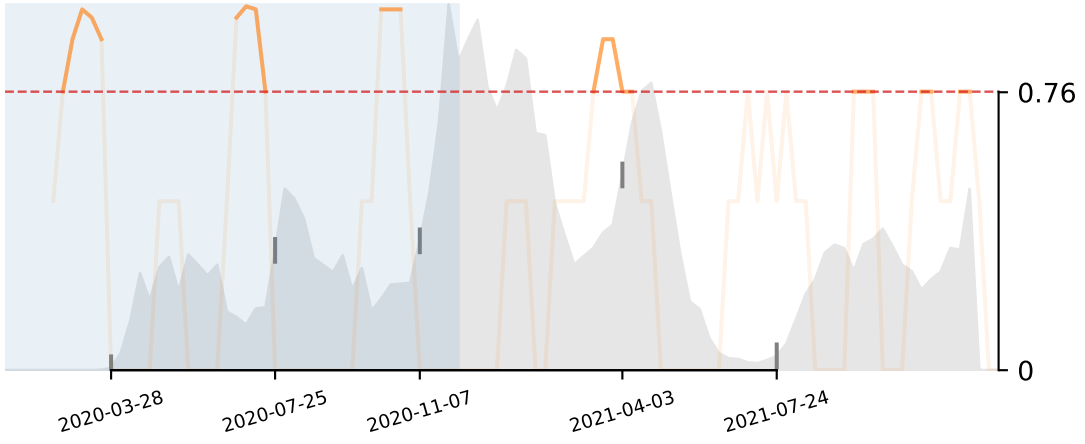
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) Acute bronchitis
(GT) Ageusia
(GT) Bronchitis



Model 3

(GT) covid
(GT) chest pain
(GT) Acute bronchitis
(GT) Ageusia
(GT) Phlegm
(GT) quarantine



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	0	3
0.91	1	0	0	3	3	1
0.76	1	0	0	4	7	0
0.46	1	1	0	4	35	0
0.00	1	3	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	0	1	0	0	3
0.96	2	0	0	0	0	3
0.91	2	0	0	3	0	0
0.76	2	0	0	3	9	0
0.46	2	1	0	3	25	0
0.00	2	3	0	3	51	0

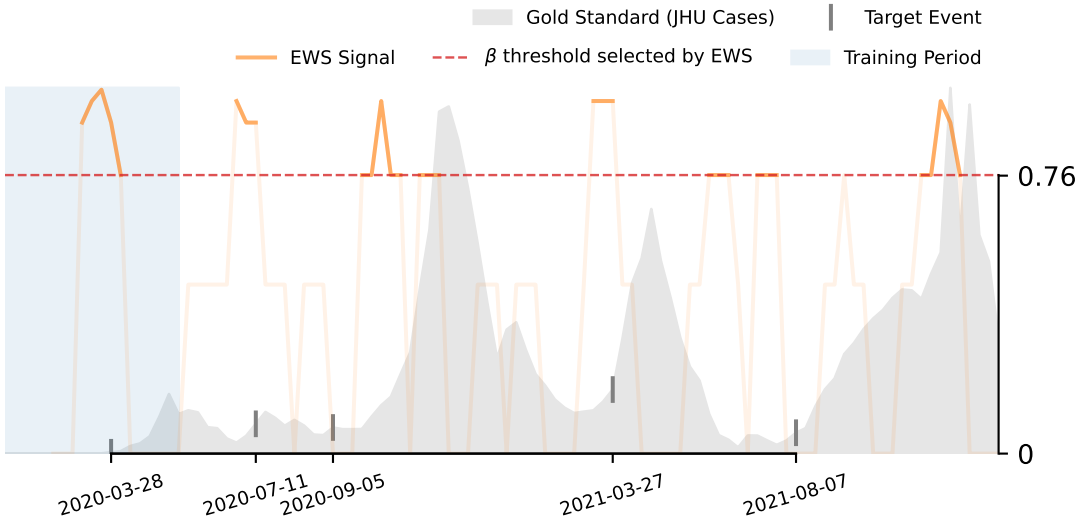
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	3	0	0	0	0	2
0.91	3	0	0	1	0	1
0.76	3	0	0	2	9	0
0.46	3	1	0	2	21	0
0.00	3	8	0	2	42	0

MI, Kent

Proxies selected by the Multiple Sources method

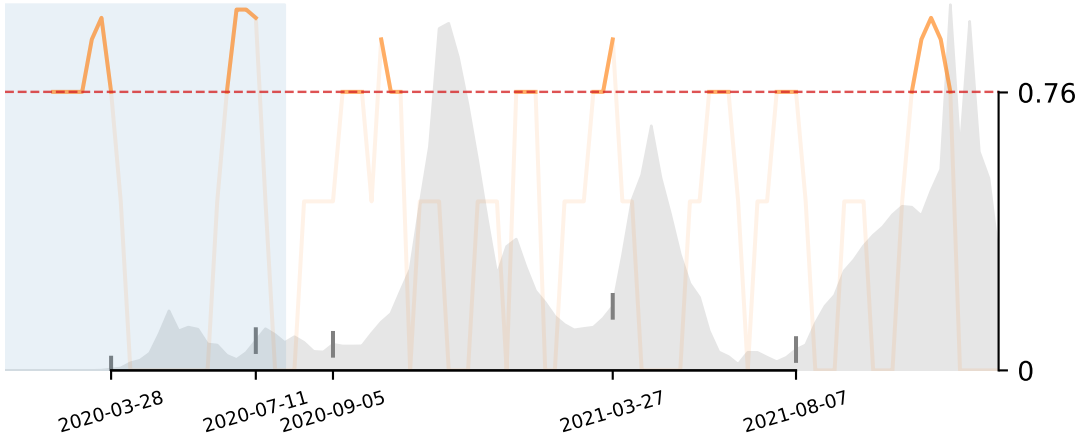
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine



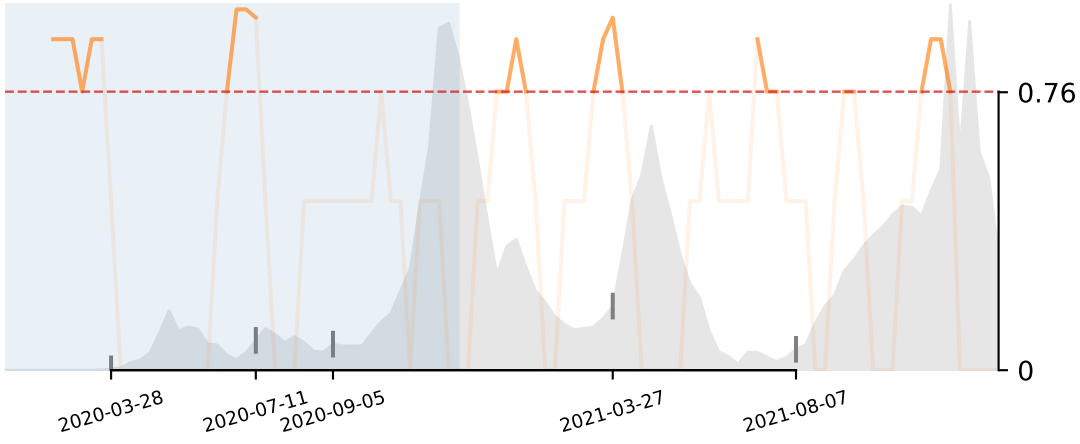
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Anosmia
(GT) Asthma



Model 3

(GT) Anosmia
(GT) chest pain
(GT) Nasal congestion
(GT) Wheeze
(GT) covid
(GT) covid-19



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	1	0	0	0	0	4
0.96	1	0	0	2	2	2
0.91	1	0	0	2	3	2
0.76	1	0	0	3	17	1
0.46	1	1	0	4	35	0
0.00	1	1	0	4	57	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	0	1	3
0.91	2	0	0	1	4	2
0.76	2	0	0	2	17	0
0.46	2	2	0	3	33	0
0.00	2	4	0	3	55	0

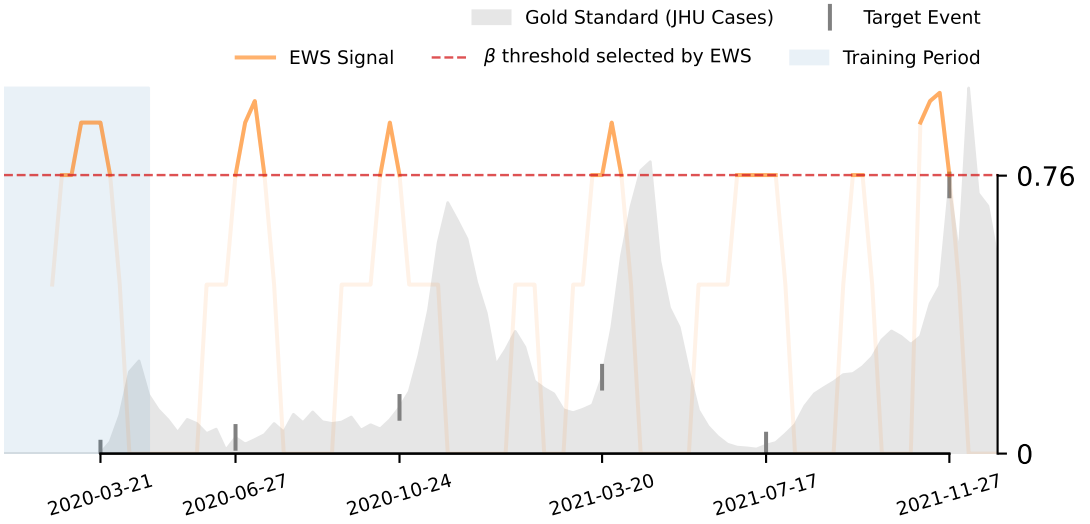
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	0	2	1	0	1
0.91	1	0	2	2	3	0
0.76	2	2	1	2	12	0
0.46	2	3	1	2	25	0
0.00	3	13	0	2	42	0

MI, Oakland

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who

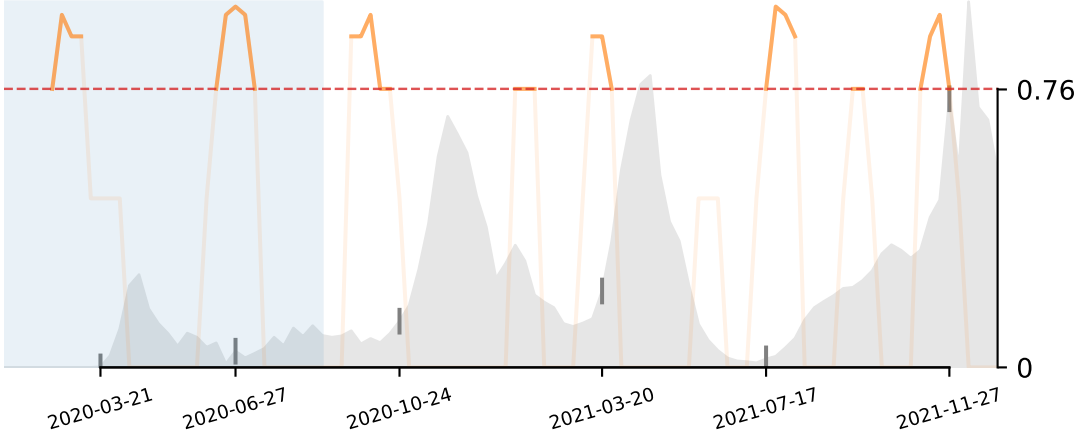


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	5
0.99	0	0	1	1	0	4
0.96	0	0	1	1	1	3
0.91	0	0	1	2	3	1
0.76	1	0	0	5	8	0
0.46	1	1	0	5	22	0
0.00	1	3	0	5	53	0

Model 2

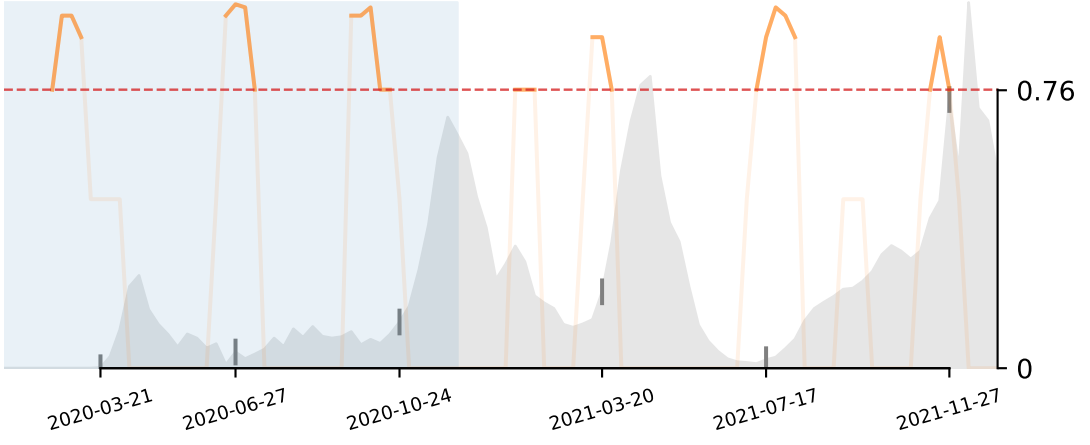
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) Ageusia
(GT) Anosmia
(GT) Asthma



β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	1	3
0.96	1	0	1	2	2	1
0.91	2	1	0	3	3	0
0.76	2	1	0	4	9	0
0.46	2	3	0	4	13	0
0.00	2	5	0	4	42	0

Model 3

(GT) covid
(GT) covid-19
(GT) Ageusia
(GT) Anosmia
(GT) Asthma
(GT) Chills



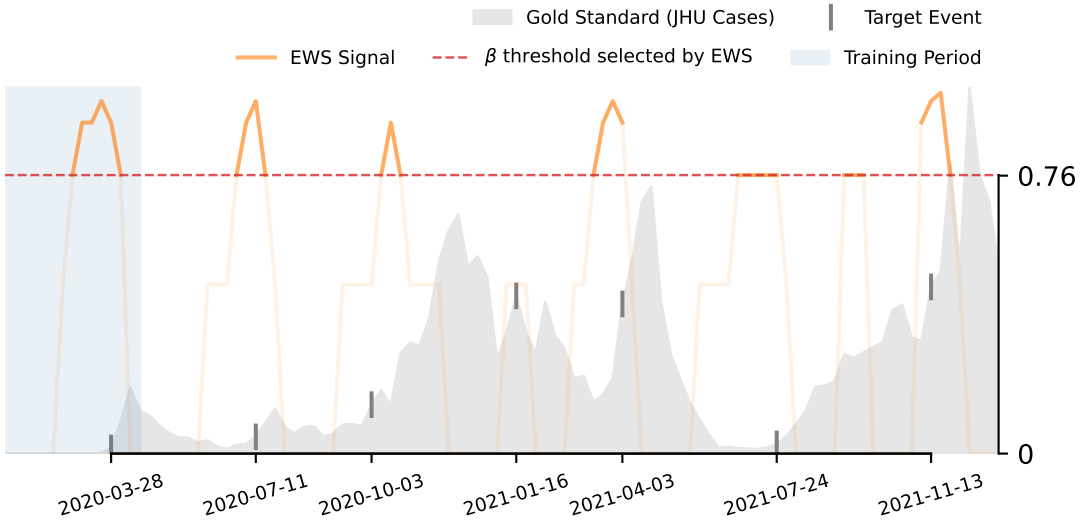
β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	3	0	0	3
0.99	1	0	2	0	1	2
0.96	2	1	1	0	2	2
0.91	3	2	0	3	3	0
0.76	3	2	0	3	7	0
0.46	3	4	0	3	11	0
0.00	3	6	0	3	35	0

MI, Washtenaw

Proxies selected by the Multiple Sources method

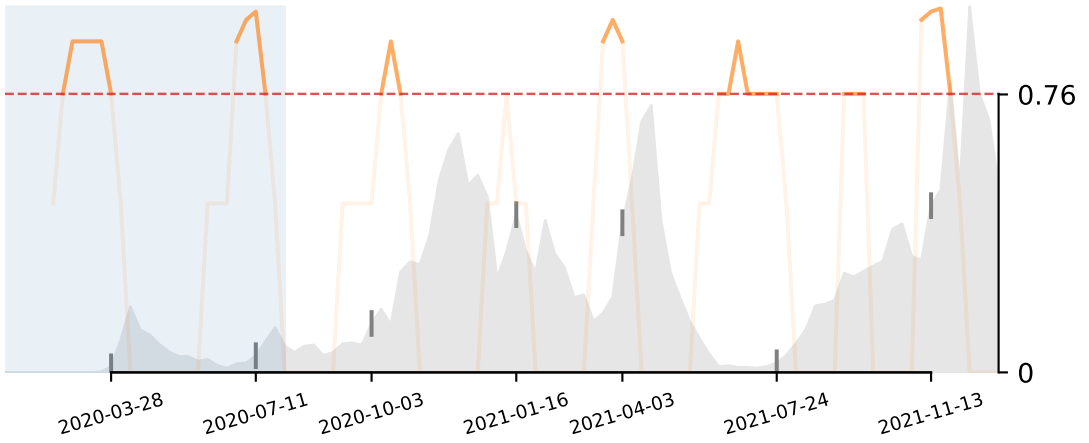
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who
(GT) Nasal congestion



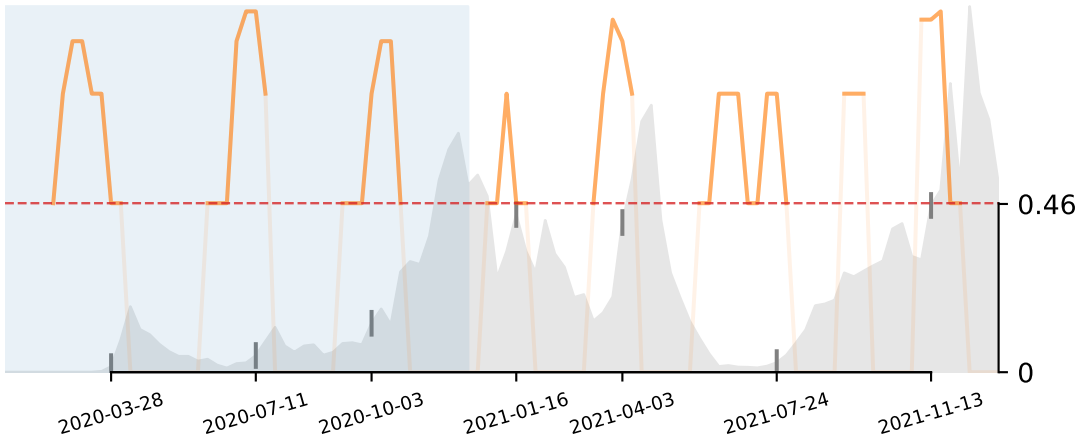
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Nasal congestion
(GT) Phlegm



Model 3

(GT) covid-19
(GT) covid symptoms
(GT) loss smell
(GT) Nasal congestion
(GT) Phlegm
(GT) covid



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	6
0.99	0	0	1	0	1	5
0.96	0	0	1	3	1	3
0.91	1	0	0	3	2	2
0.76	1	0	0	4	9	1
0.46	1	1	0	6	20	0
0.00	1	2	0	6	47	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	1	4
0.99	0	0	2	1	1	4
0.96	1	0	1	2	1	3
0.91	1	0	1	3	2	1
0.76	2	0	0	4	8	0
0.46	2	2	0	5	15	0
0.00	2	6	0	5	39	0

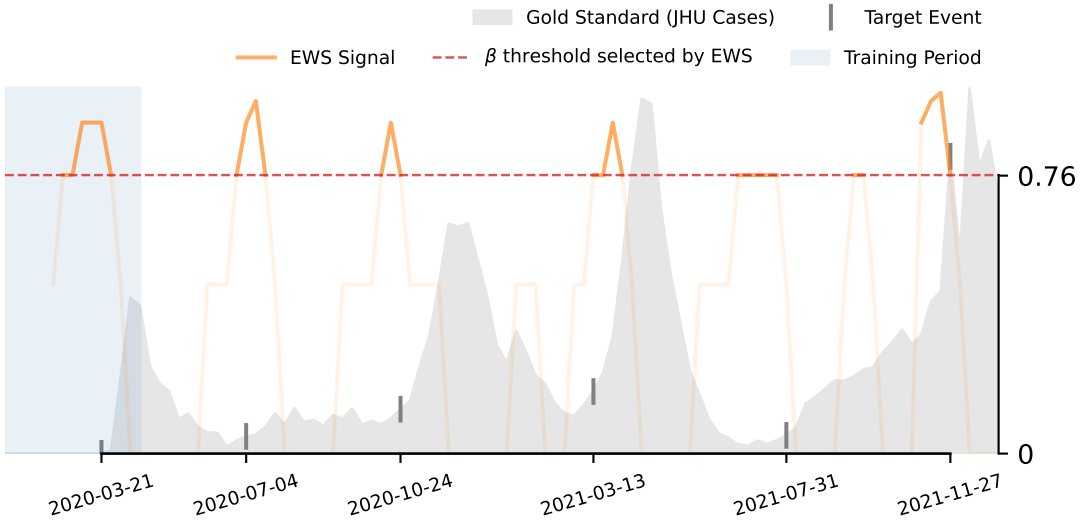
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	4
0.99	0	0	3	0	1	3
0.96	1	0	2	2	1	2
0.91	1	0	2	2	1	2
0.76	2	2	1	4	5	0
0.46	3	4	0	4	11	0
0.00	3	8	0	4	29	0

MI, Wayne

Proxies selected by the Multiple Sources method

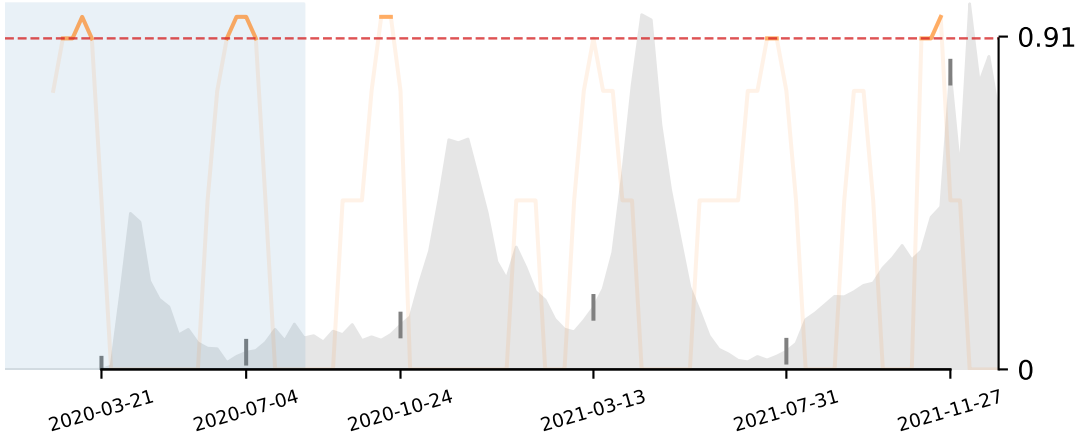
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who



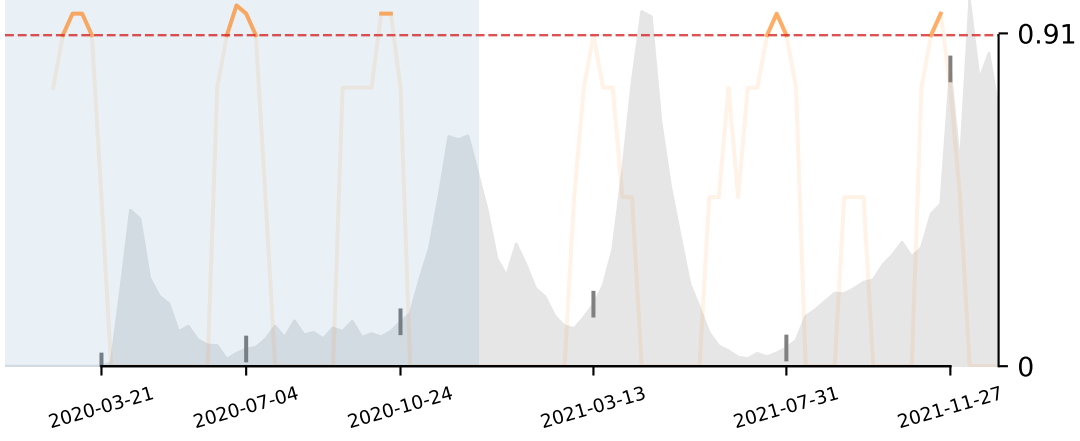
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia



Model 3

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia
(GT) Asthma



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	1	0	4
0.96	0	0	1	1	1	3
0.91	0	0	1	3	2	1
0.76	1	0	0	5	7	0
0.46	1	1	0	5	21	0
0.00	1	3	0	5	54	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	0	0	2	2	0	2
0.91	2	0	0	4	0	0
0.76	2	1	0	4	4	0
0.46	2	2	0	4	15	0
0.00	2	3	0	4	44	0

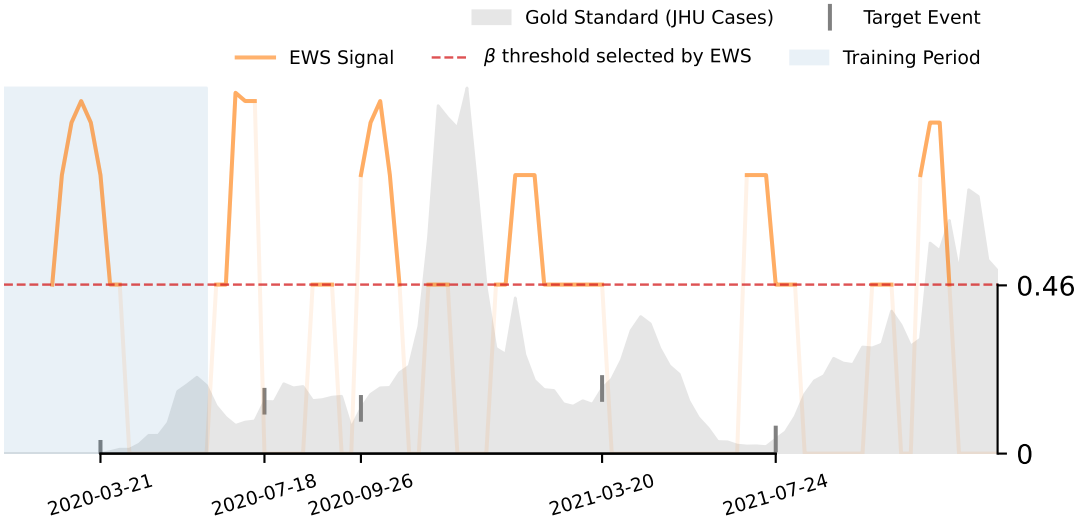
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	1	0	2	2	0	1
0.91	3	0	0	3	0	0
0.76	3	1	0	3	3	0
0.46	3	4	0	3	11	0
0.00	3	5	0	3	33	0

MN, Hennepin

Proxies selected by the Multiple Sources method

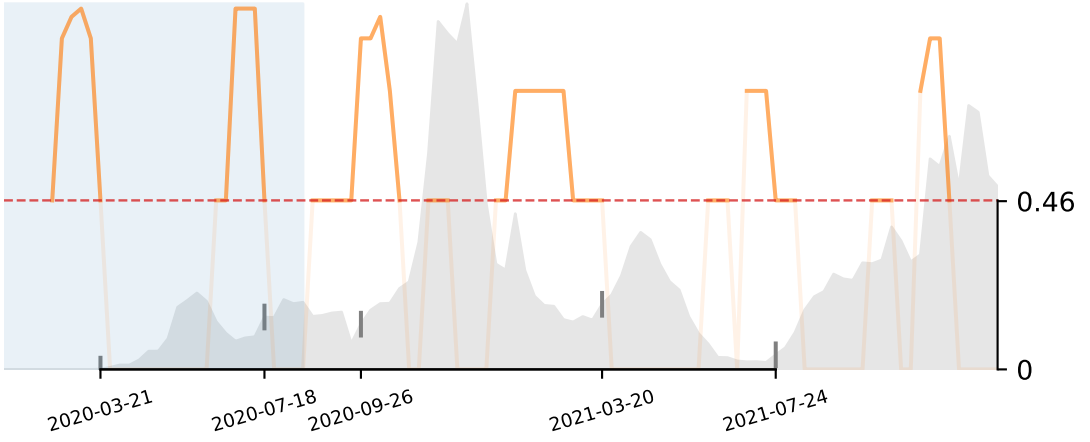
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) fever
(GT) Acute bronchitis



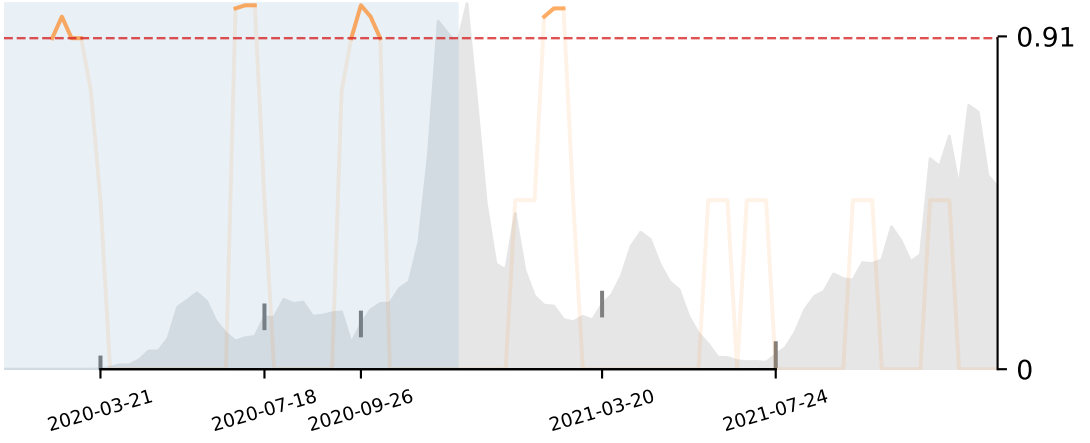
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Acute bronchitis
(GT) Anosmia



Model 3

(GT) covid symptoms
(GT) Acute bronchitis
(GT) Anosmia
(GT) Bronchitis
(GT) Cough
(GT) Phlegm



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	1	1	2
0.91	1	0	0	1	4	2
0.76	1	0	0	3	9	1
0.46	1	0	0	4	21	0
0.00	1	3	0	4	55	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	2	0	0	0	1	2
0.91	2	0	0	1	4	2
0.76	2	0	0	3	9	0
0.46	2	0	0	3	22	0
0.00	2	2	0	3	52	0

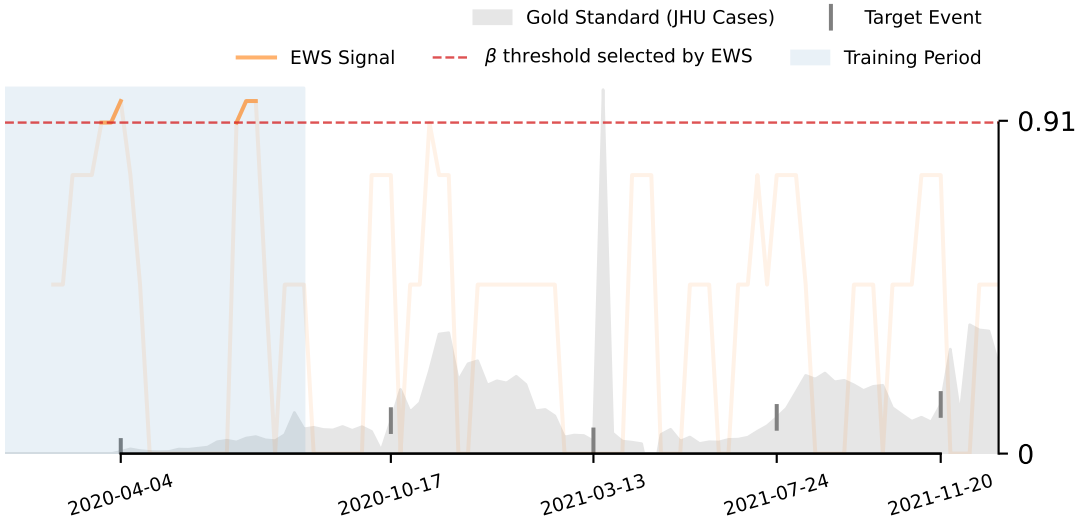
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	2	0	1	1	0	1
0.96	2	0	1	1	0	1
0.91	3	1	0	1	0	1
0.76	3	3	0	1	0	1
0.46	3	3	0	2	10	0
0.00	3	3	0	2	42	0

MO, Clay

Proxies selected by the Multiple Sources method

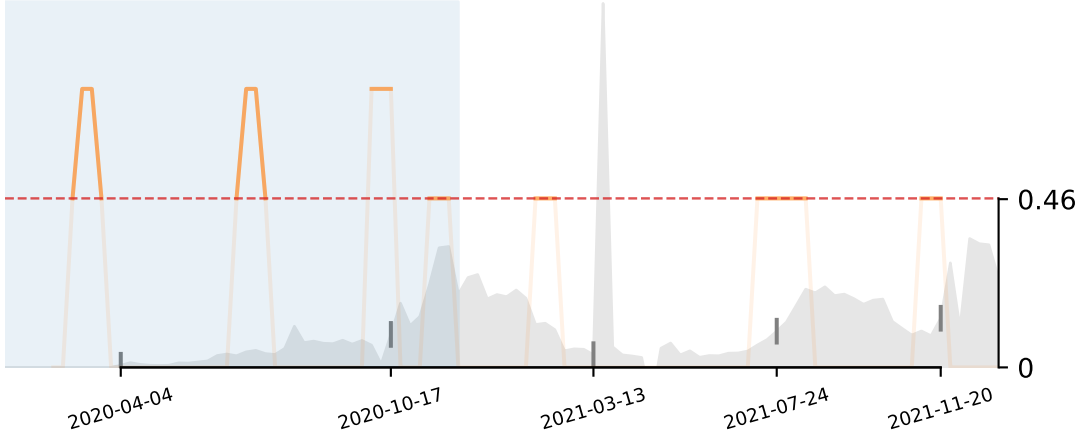
Model 1

(GT) covid-19 who
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Bronchitis
(GT) Cardiac arrest



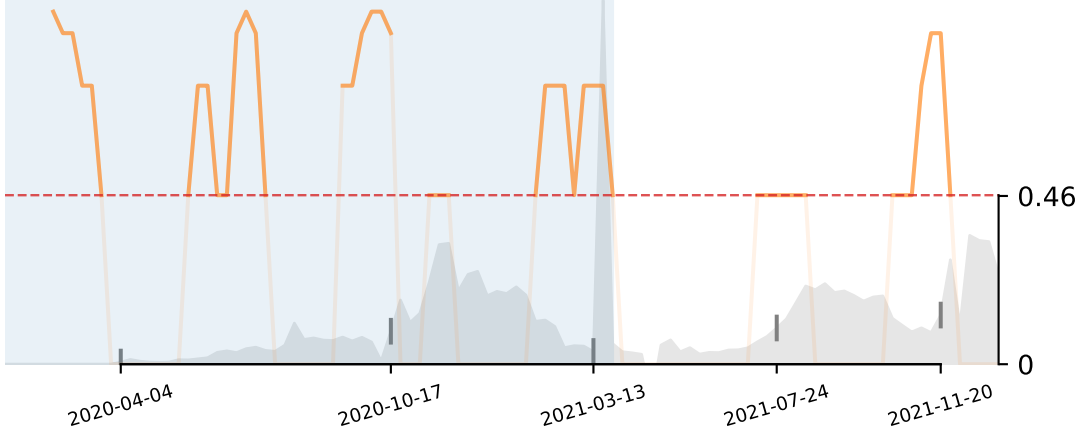
Model 2

(GT) covid-19
(GT) covid



Model 3

(GT) covid-19
(GT) covid
(GT) Cough
(GT) Fever
(GT) Otitis
(GT) Sore throat



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	0	4
0.91	1	2	0	0	1	4
0.76	1	3	0	3	8	1
0.46	1	5	0	4	26	0
0.00	1	12	0	4	44	0

β	tp	fp	fn	tp	fp	fn
0.76	0	0	2	0	0	3
0.46	2	2	0	3	3	0
0.00	2	8	0	3	35	0

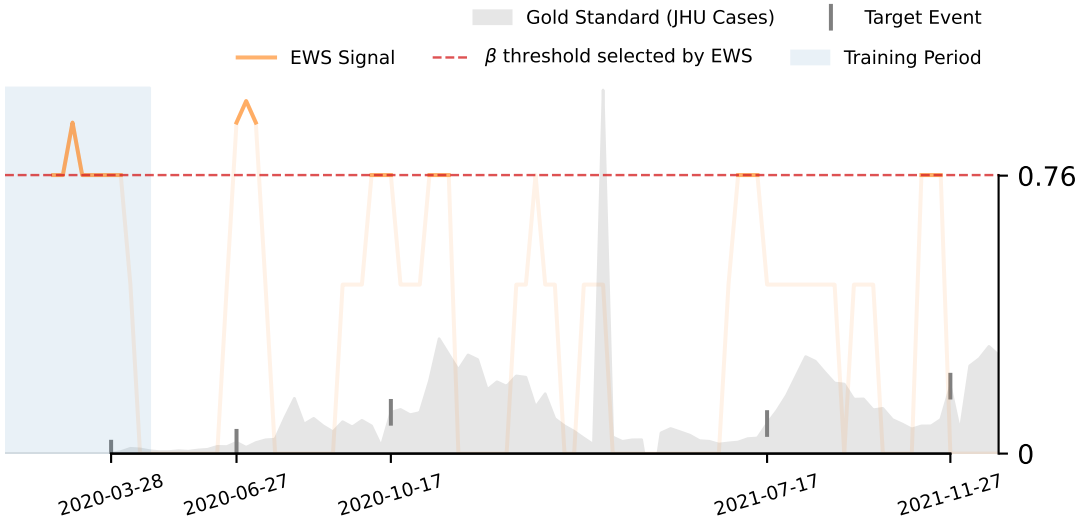
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	2	2	1	0	1
0.76	1	6	2	1	0	1
0.46	3	11	0	2	4	0
0.00	3	20	0	2	26	0

MO, Jackson

Proxies selected by the Multiple Sources method

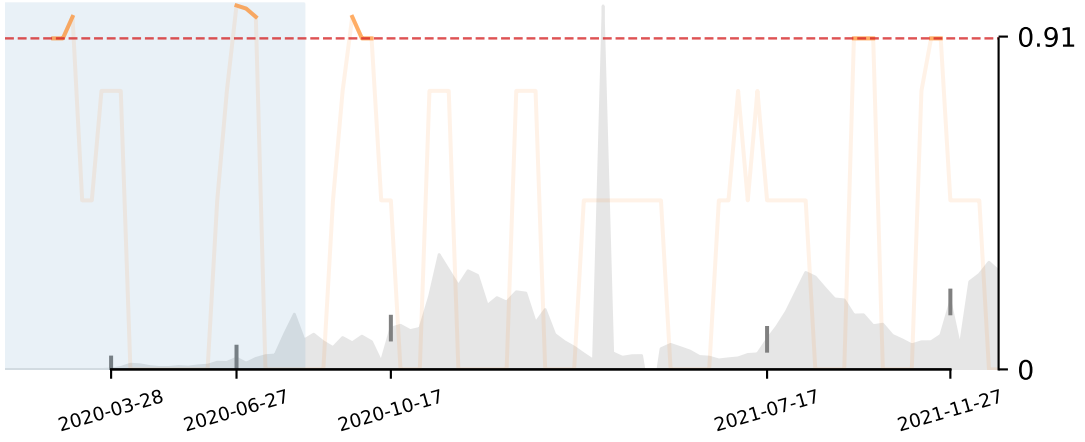
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) covid-19 who
(GT) Acute bronchitis



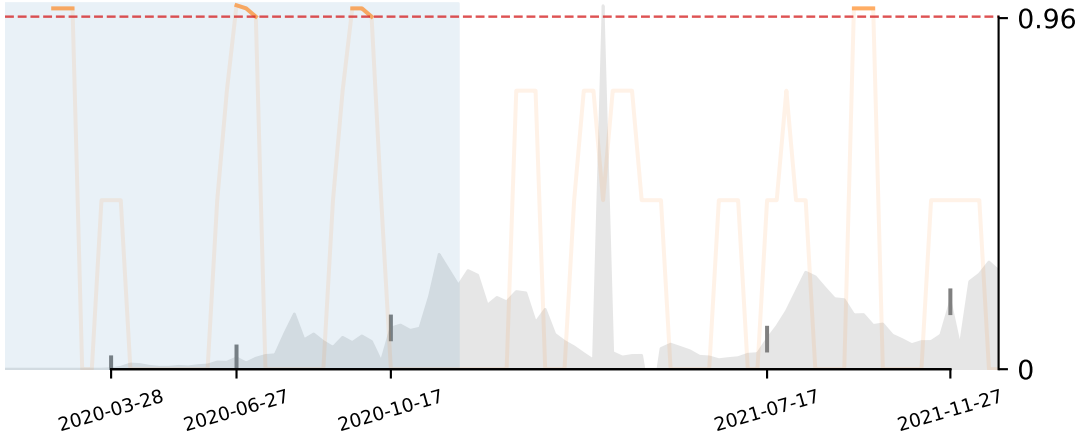
Model 2

(GT) covid
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Asthma
(GT) Bronchitis
(GT) Chest pain



Model 3

(GT) Acute bronchitis
(GT) Asthma
(GT) Bronchitis
(GT) Chest pain
(GT) Cough
(GT) Phlegm



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	1	3
0.91	0	0	1	1	2	3
0.76	1	0	0	4	6	0
0.46	1	3	0	4	27	0
0.00	1	4	0	4	60	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	0	1	0	0	3
0.96	1	1	1	1	0	2
0.91	2	2	0	2	3	1
0.76	2	4	0	3	9	0
0.46	2	5	0	3	25	0
0.00	2	5	0	3	51	0

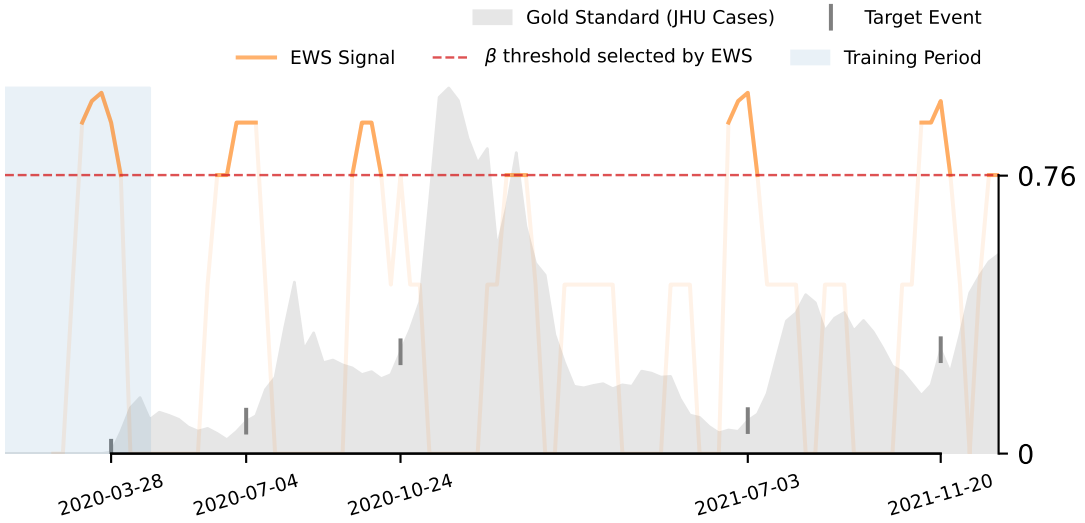
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	3	2
0.96	3	3	0	0	3	2
0.91	3	4	0	0	3	2
0.76	3	4	0	0	12	1
0.46	3	5	0	2	23	0
0.00	3	7	0	2	42	0

MO, St. Louis

Proxies selected by the Multiple Sources method

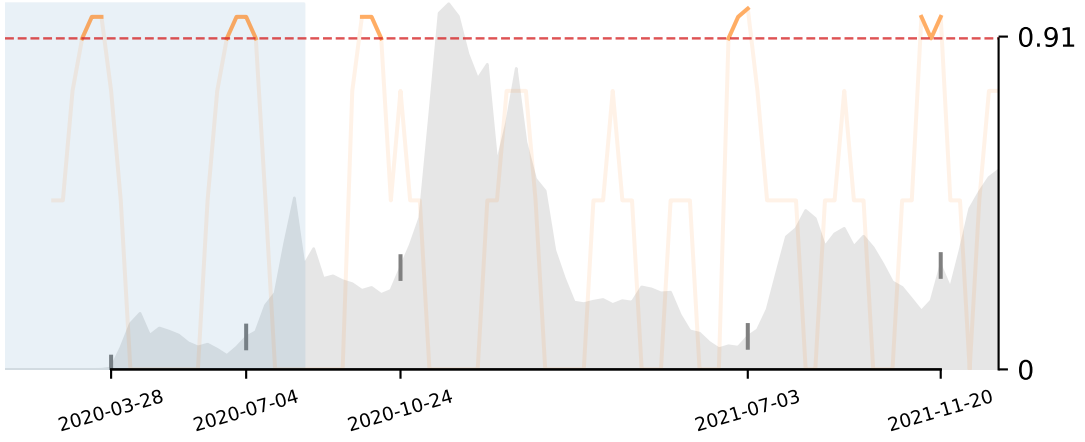
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Ageusia



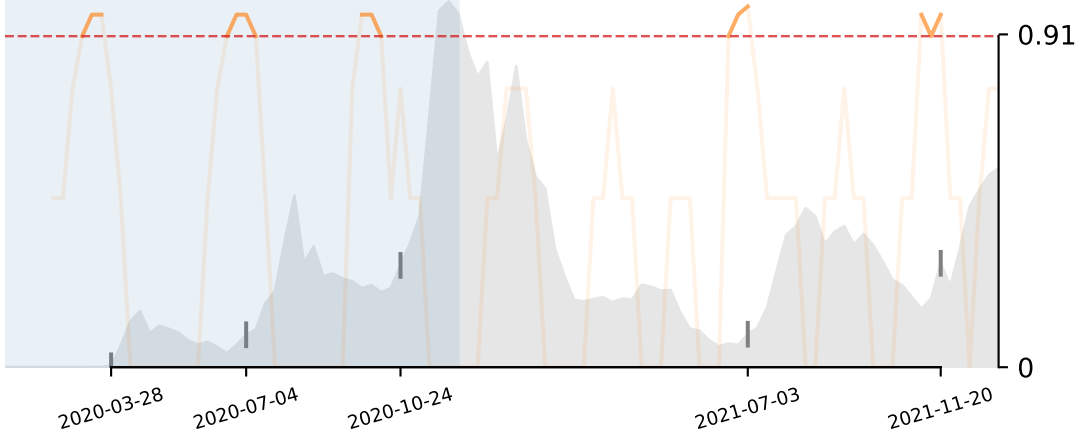
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Ageusia
(GT) Phlegm



Model 3

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Ageusia
(GT) Phlegm



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	1	0	0	2	0	2
0.91	1	0	0	4	1	0
0.76	1	0	0	4	8	0
0.46	1	1	0	4	31	0
0.00	1	1	0	4	60	0

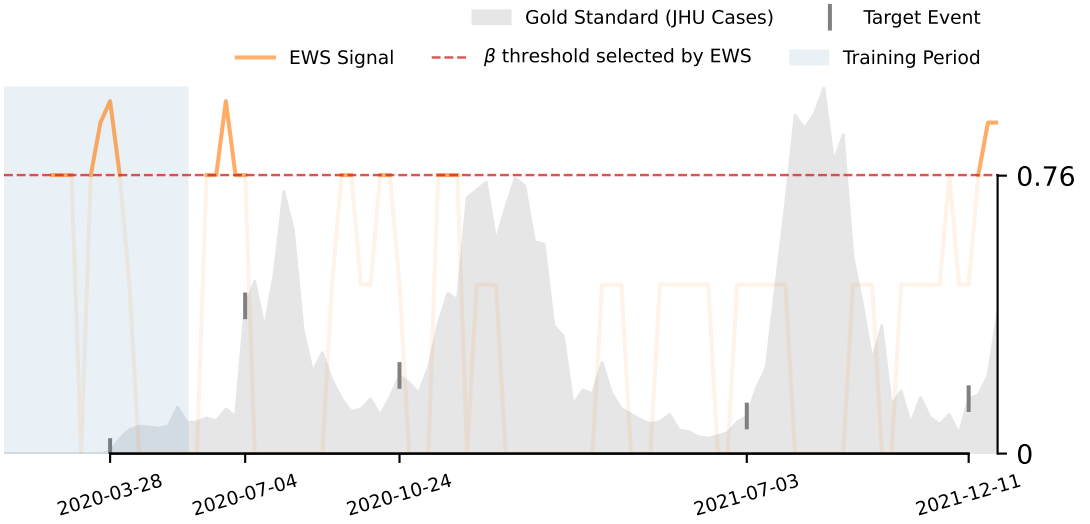
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	1	0	2
0.96	0	0	2	3	0	0
0.91	2	0	0	3	0	0
0.76	2	1	0	3	8	0
0.46	2	1	0	3	30	0
0.00	2	5	0	3	51	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	1	0	1
0.96	0	0	3	2	0	0
0.91	3	0	0	2	0	0
0.76	3	1	0	2	8	0
0.46	3	2	0	2	28	0
0.00	3	8	0	2	42	0

Proxies selected by the Multiple Sources method

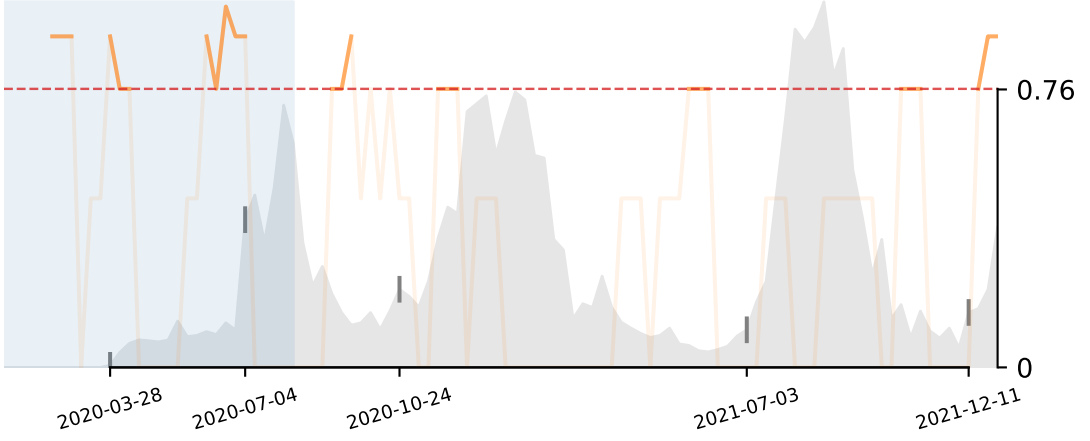
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Chest pain
(GT) Dizziness
(GT) Fatigue



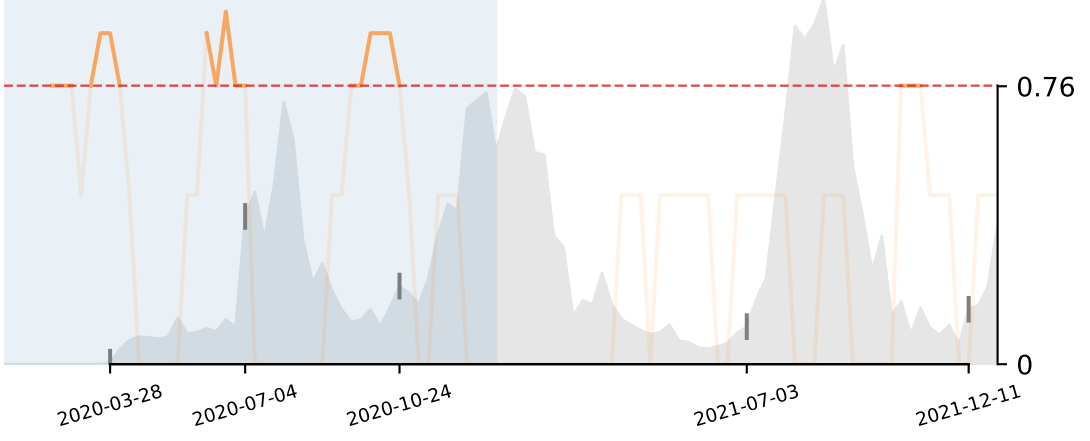
Model 2

(GT) covid-19
(GT) covid symptoms
(GT) Abdominal pain
(GT) Chest pain
(GT) Fatigue
(GT) Pneumonia



Model 3

(GT) Pneumonia
up2date
(GT) covid-19
(GT) Abdominal pain
(GT) covid
(GT) Chest pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	0	3
0.91	1	0	0	1	2	2
0.76	1	0	0	3	6	1
0.46	1	3	0	4	24	0
0.00	1	4	0	4	57	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	0	0	3
0.91	1	0	1	1	2	1
0.76	2	2	0	3	8	0
0.46	2	4	0	3	27	0
0.00	2	6	0	3	52	0

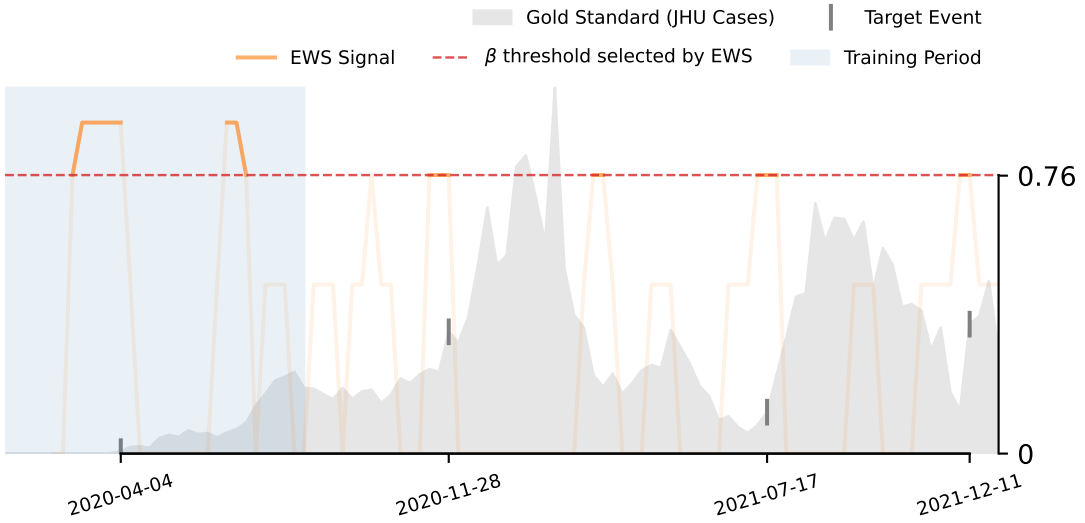
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	0	0	2
0.76	3	0	0	1	1	1
0.46	3	4	0	2	17	0
0.00	3	13	0	2	38	0

NC, Cumberland

Proxies selected by the Multiple Sources method

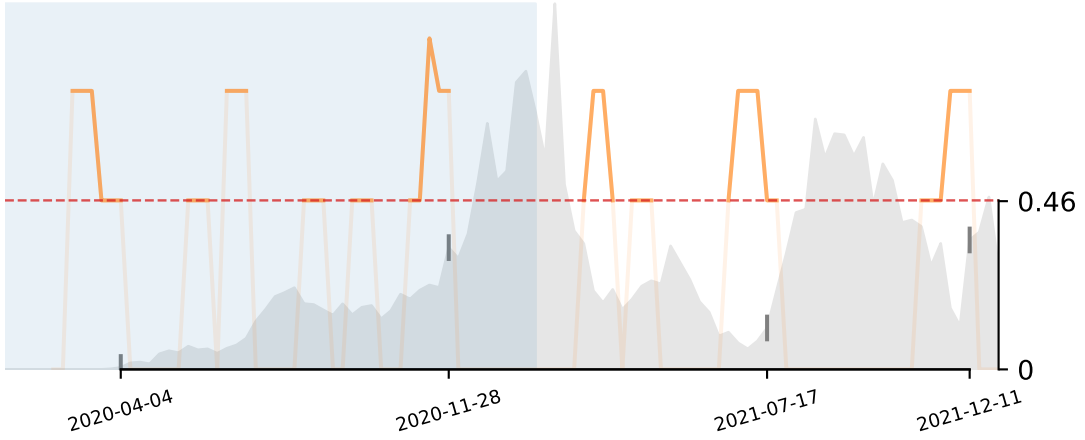
Model 1

(GT) chest tightness
(GT) covid-19 who
(GT) covid
(GT) loss smell
(GT) covid-19
(GT) covid symptoms



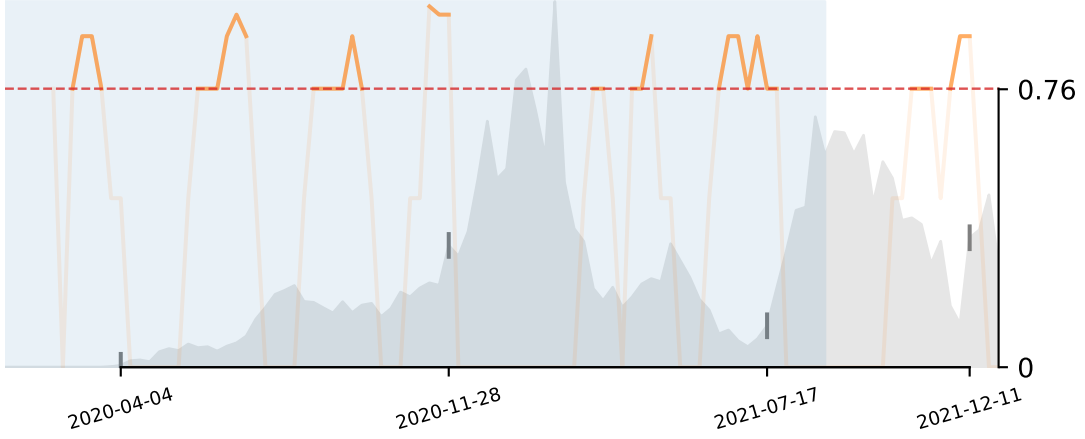
Model 2

(GT) covid
(GT) how long does covid last
(GT) covid-19



Model 3

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) Vomiting
(GT) Fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	0	3
0.91	0	0	1	0	0	3
0.76	1	2	0	3	4	0
0.46	1	4	0	3	21	0
0.00	1	9	0	3	51	0

β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	0	0	2
0.76	1	0	1	2	2	0
0.46	2	4	0	2	8	0
0.00	2	13	0	2	34	0

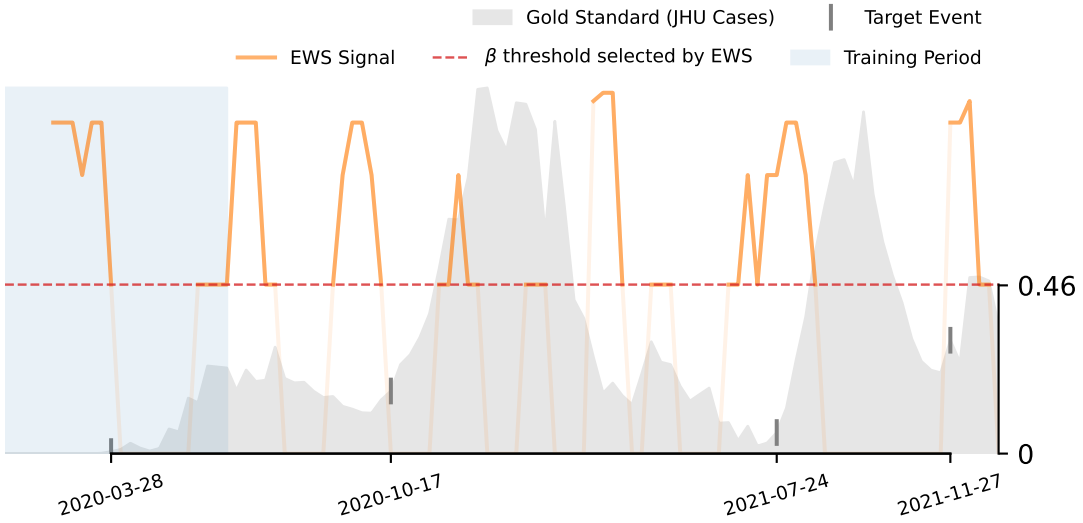
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	1	0	2	0	0	1
0.91	1	1	2	1	0	0
0.76	3	5	0	1	0	0
0.46	3	21	0	1	3	0
0.00	3	30	0	1	11	0

NC, Forsyth

Proxies selected by the Multiple Sources method

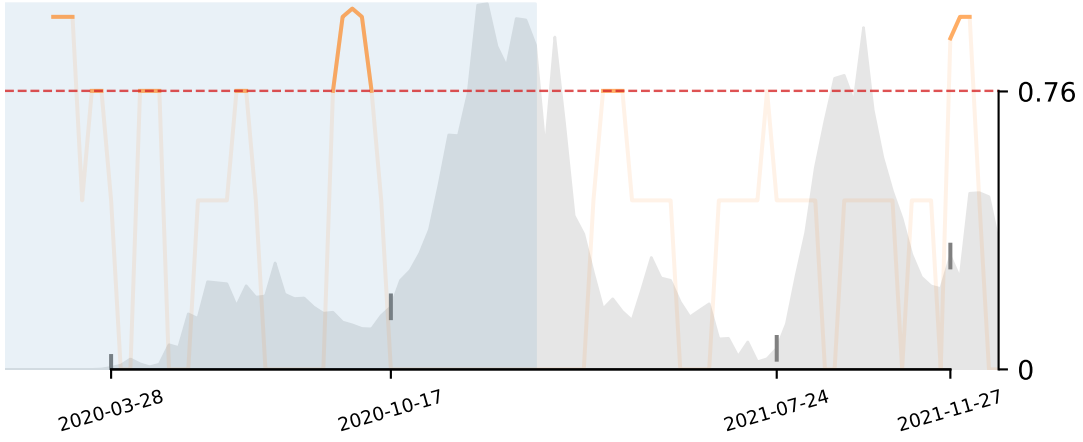
Model 1

(GT) covid
(GT) Bronchitis
(GT) Throat irritation
(GT) Wheeze
(GT) covid-19
(GT) covid symptoms



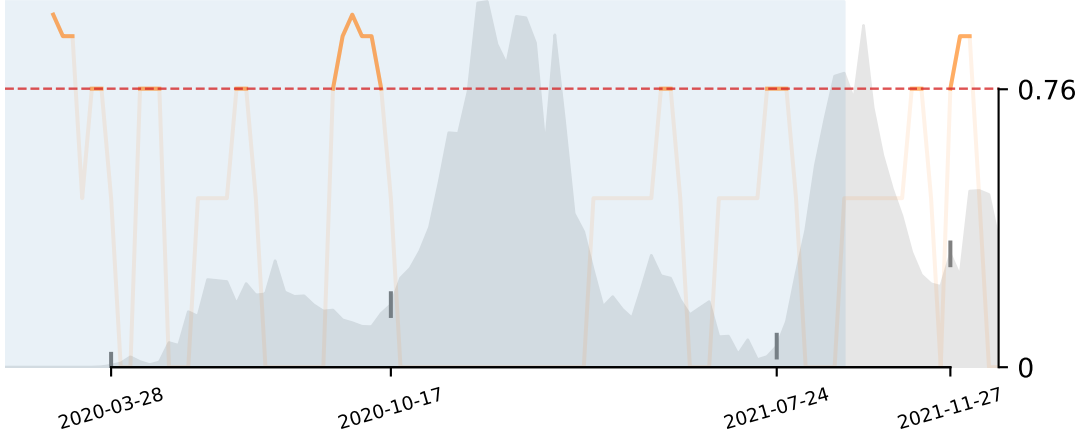
Model 2

(GT) Throat irritation
(GT) covid
(GT) covid symptoms
(GT) Abdominal pain
(GT) Asthma
(GT) Dizziness



Model 3

(GT) Asthma
(GT) covid
(GT) covid symptoms
(GT) quarantine
(GT) Abdominal pain
(GT) Dizziness



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	2	3
0.96	0	0	1	0	4	2
0.91	0	0	1	2	10	0
0.76	1	2	0	3	12	0
0.46	1	2	0	3	28	0
0.00	1	6	0	3	59	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	1	0	1	0	2	1
0.91	2	3	0	1	2	1
0.76	2	3	0	2	5	0
0.46	2	9	0	2	21	0
0.00	2	14	0	2	34	0

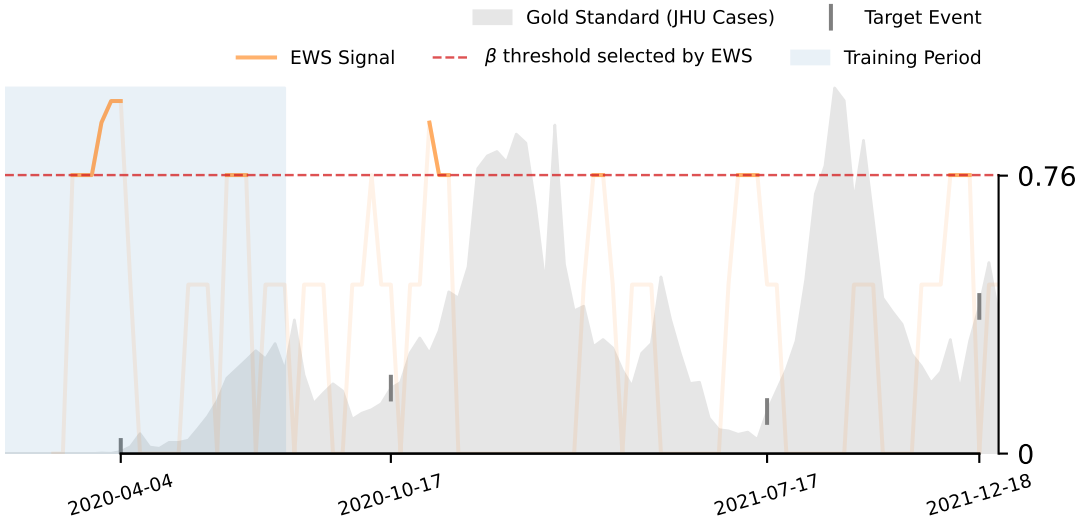
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	1	1	2	0	2	0
0.76	2	3	1	1	2	0
0.46	3	12	0	1	7	0
0.00	3	29	0	1	9	0

NC, Johnston

Proxies selected by the Multiple Sources method

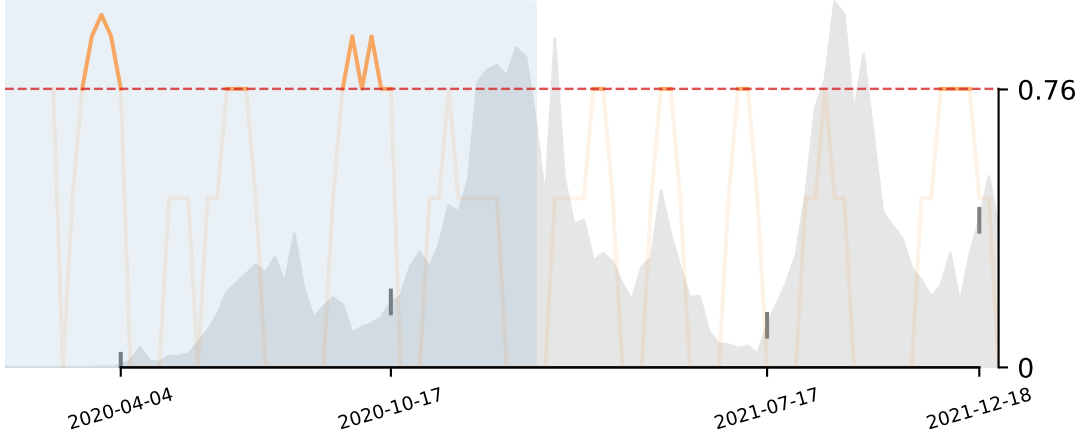
Model 1

(GT) chest tightness
(GT) covid-19 who
(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19



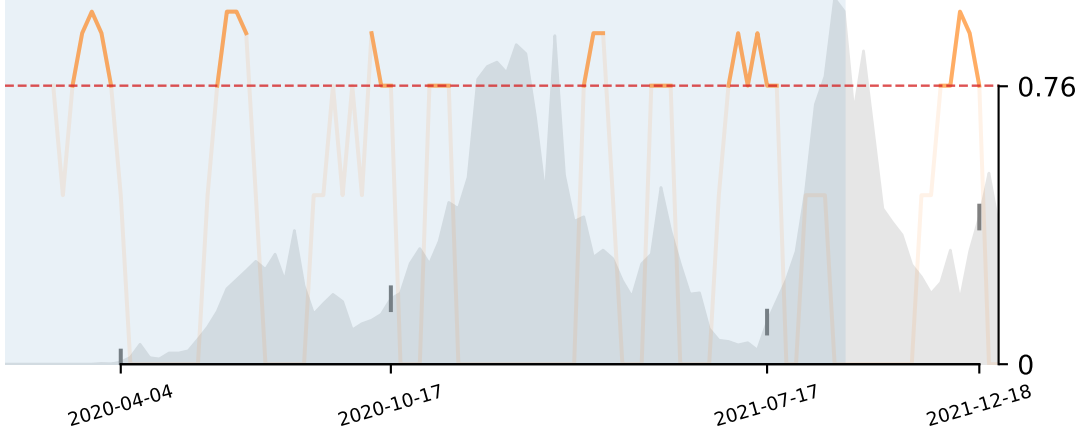
Model 2

(GT) covid-19 who
(GT) covid-19
(GT) fever
(GT) Diarrhea
(GT) Chest pain



Model 3

(GT) covid-19
(GT) fever
(GT) covid-19 who
(GT) Shortness of breath
(GT) covid
(GT) covid symptoms



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	0	3
0.91	1	0	0	0	1	3
0.76	1	0	0	3	5	0
0.46	1	4	0	3	21	0
0.00	1	11	0	3	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	2
0.96	0	0	2	0	0	2
0.91	1	0	1	0	0	2
0.76	2	0	0	2	5	0
0.46	2	6	0	2	17	0
0.00	2	21	0	2	34	0

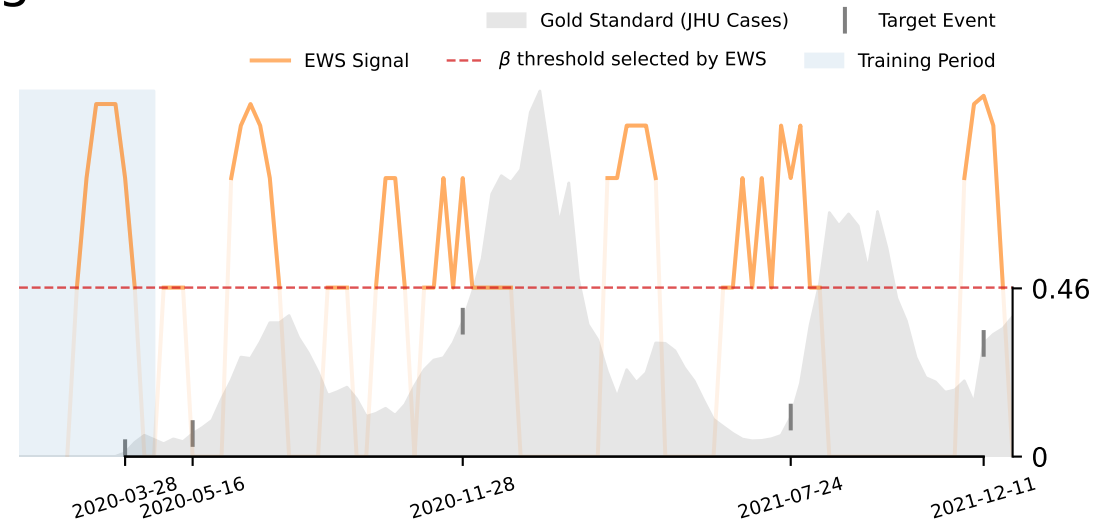
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	1	0	0
0.91	1	2	2	1	0	0
0.76	3	5	0	1	0	0
0.46	3	17	0	1	0	0
0.00	3	28	0	1	9	0

NC, Mecklenburg

Proxies selected by the Multiple Sources method

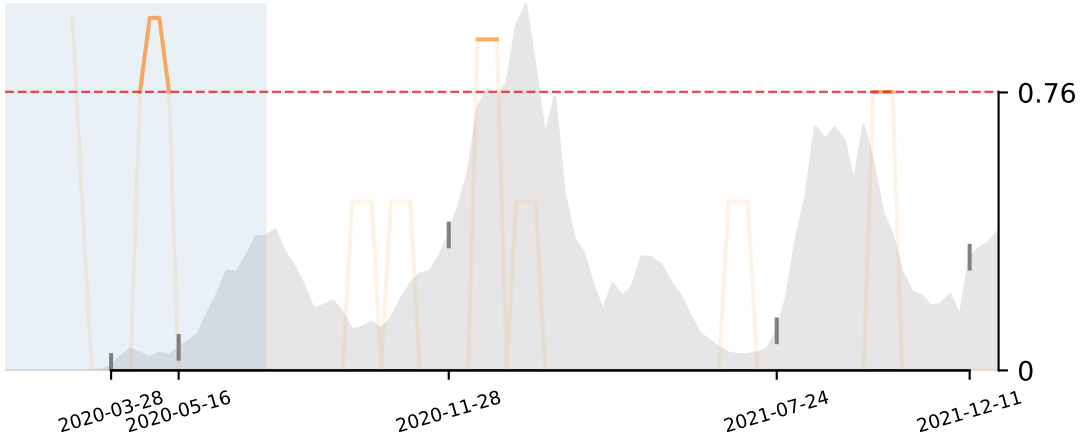
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Burning Chest Pain
(GT) Chronic pain



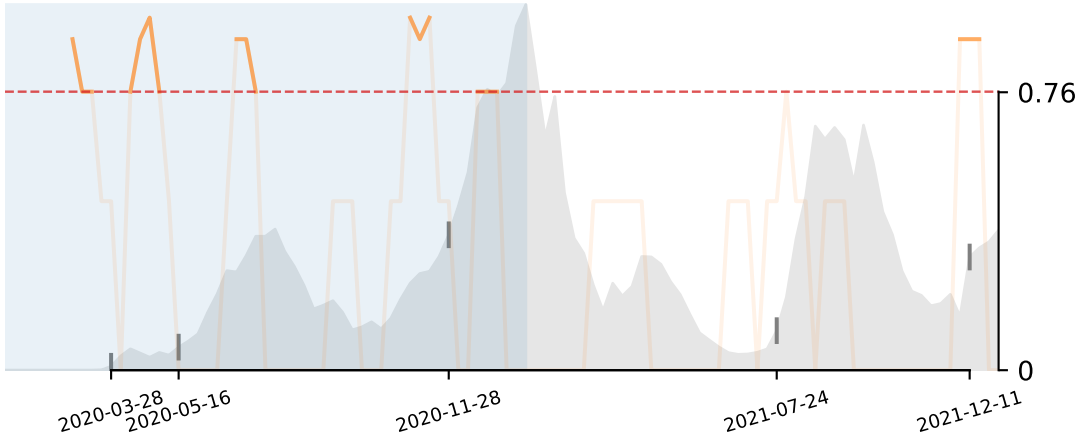
Model 2

(GT) Chronic pain
Apple Mobility (driving)
Apple Mobility (walking)
Apple Mobility (transit)



Model 3

Apple Mobility (walking)
(GT) covid
(GT) loss smell
(GT) quarantine
(GT) Abdominal pain
(GT) Chronic pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	1	1	3
0.91	1	0	0	2	8	2
0.76	1	0	0	3	15	1
0.46	1	0	0	4	29	0
0.00	1	2	0	4	64	0

β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	3
0.91	2	0	0	0	3	3
0.76	2	0	0	0	6	3
0.46	2	0	0	2	12	1
0.00	2	0	0	3	55	0

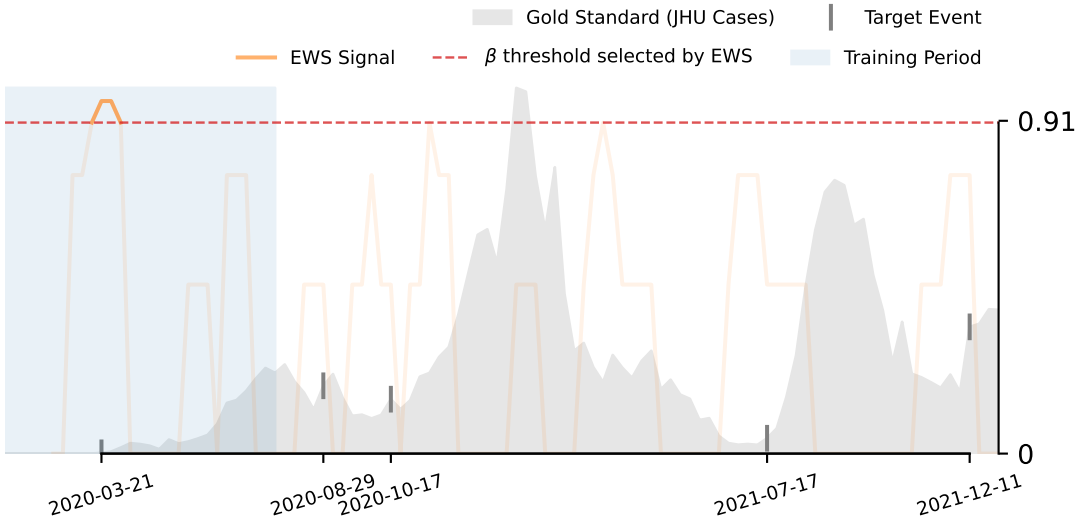
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	2	0	1	1	1	1
0.76	3	2	0	1	2	0
0.46	3	7	0	2	13	0
0.00	3	13	0	2	35	0

NC, Wake

Proxies selected by the Multiple Sources method

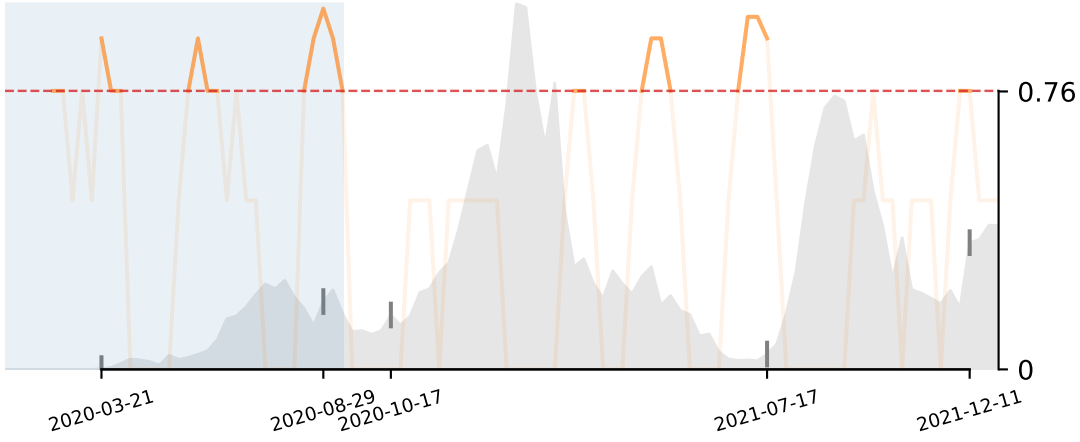
Model 1

(GT) chest tightness
(GT) covid-19 who
(GT) Hyperventilation
(GT) covid
(GT) how long does covid last
(GT) covid-19



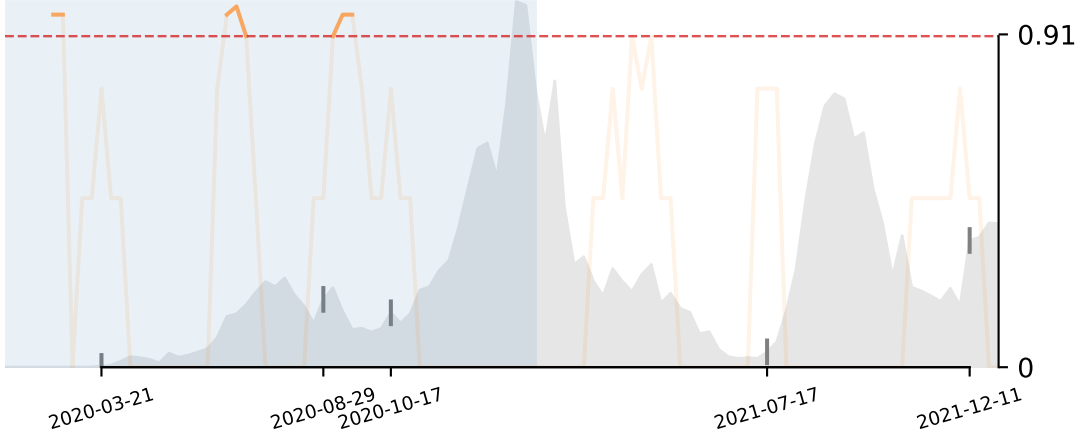
Model 2

(GT) how long does covid last
(GT) chest pain
(GT) covid symptoms
(GT) Burning Chest Pain
(GT) Chills



Model 3

(GT) covid-19 who
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Ageusia
(GT) Nasal congestion
(GT) Phlegm



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	0	4
0.91	1	1	0	0	2	4
0.76	1	2	0	3	6	1
0.46	1	5	0	4	20	0
0.00	1	8	0	4	49	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	3
0.96	1	0	1	1	0	2
0.91	1	0	1	1	2	2
0.76	2	2	0	2	7	1
0.46	2	10	0	2	28	0
0.00	2	14	0	3	49	0

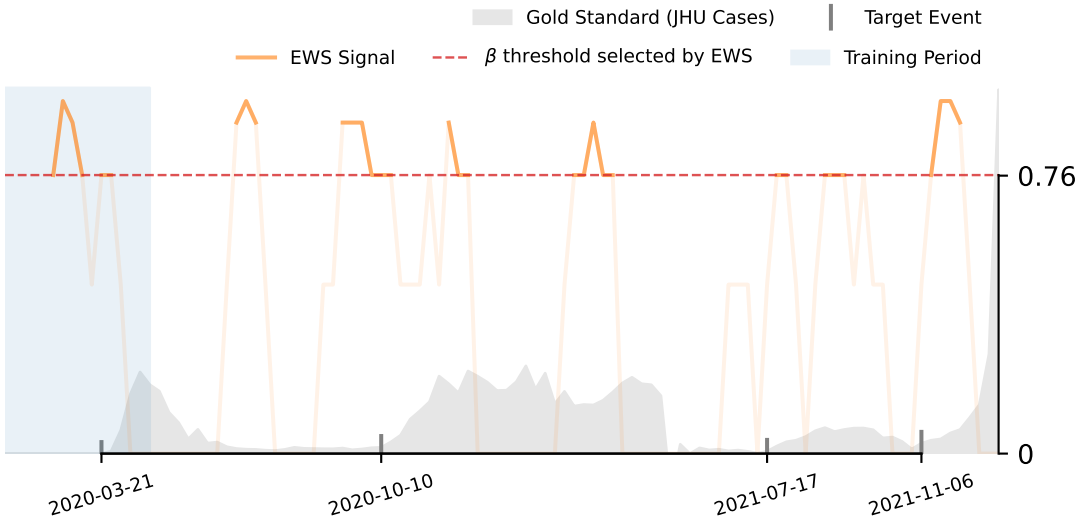
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	1	3	0	0	2
0.91	2	4	1	0	2	2
0.76	2	6	1	2	5	0
0.46	2	7	1	2	11	0
0.00	3	12	0	2	34	0

NJ, Essex

Proxies selected by the Multiple Sources method

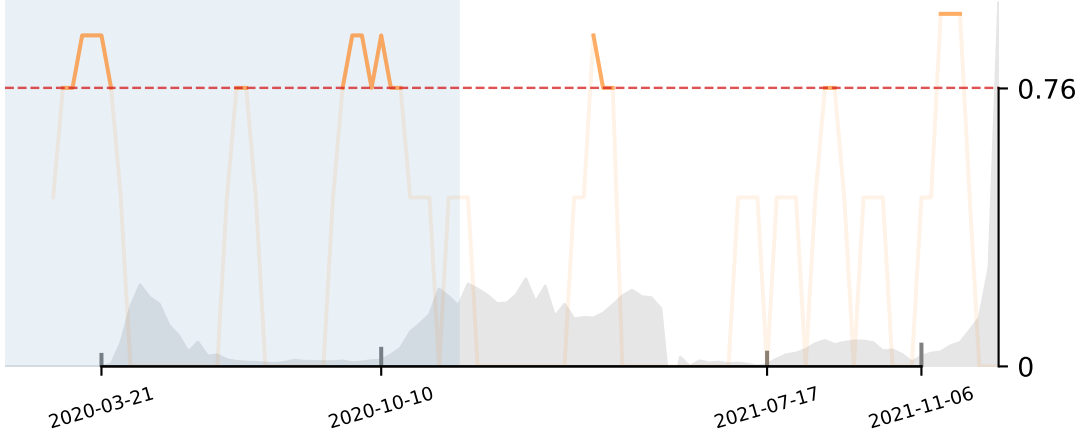
Model 1

(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain



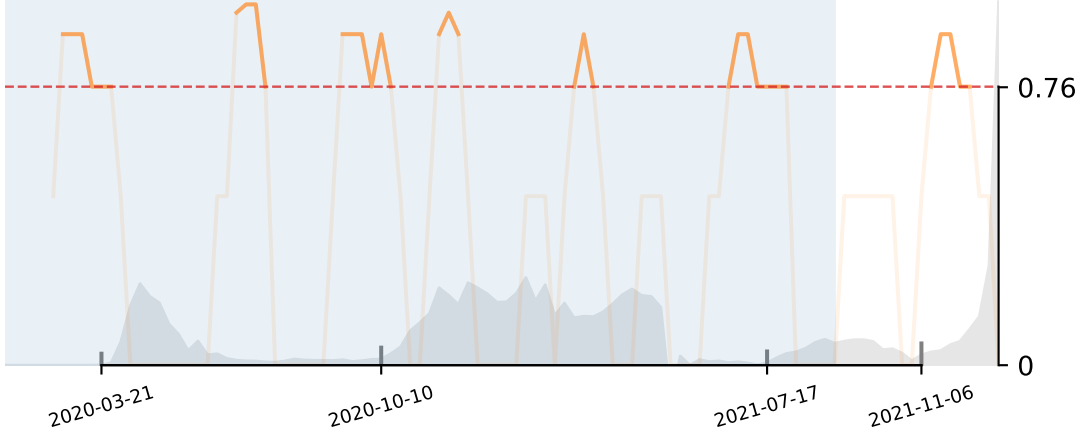
Model 2

(GT) how long does covid last
(GT) nose bleed
(GT) loss smell
(GT) covid-19
(GT) covid symptoms
(GT) sars-cov-2



Model 3

(GT) covid
(GT) covid symptoms
(GT) Ageusia
(GT) chest pain
(GT) Chest pain
(GT) Hyperventilation



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	3	2
0.91	1	0	0	1	8	1
0.76	1	0	0	2	22	0
0.46	1	2	0	3	33	0
0.00	1	3	0	3	67	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	0	0	2	0	3	1
0.91	0	0	2	0	4	1
0.76	2	0	0	0	8	1
0.46	2	5	0	2	18	0
0.00	2	15	0	2	42	0

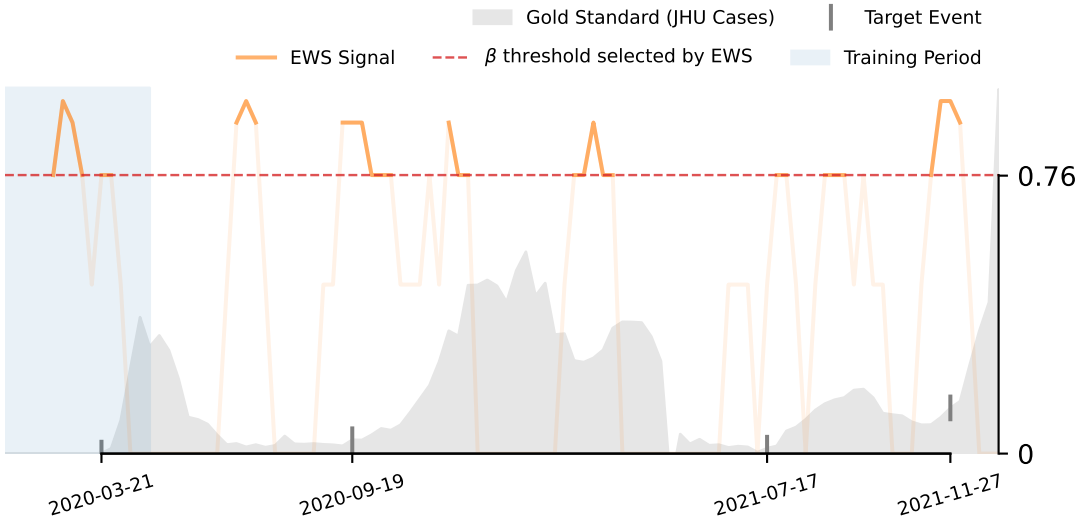
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	2	3	0	0	1
0.91	0	4	3	0	2	0
0.76	3	7	0	0	5	0
0.46	3	14	0	1	9	0
0.00	3	32	0	1	10	0

NJ, Middlesex

Proxies selected by the Multiple Sources method

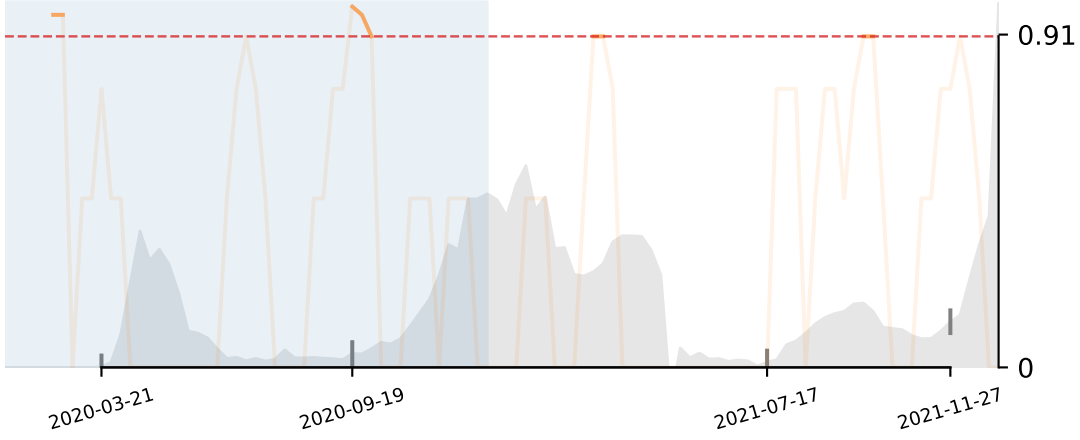
Model 1

(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain



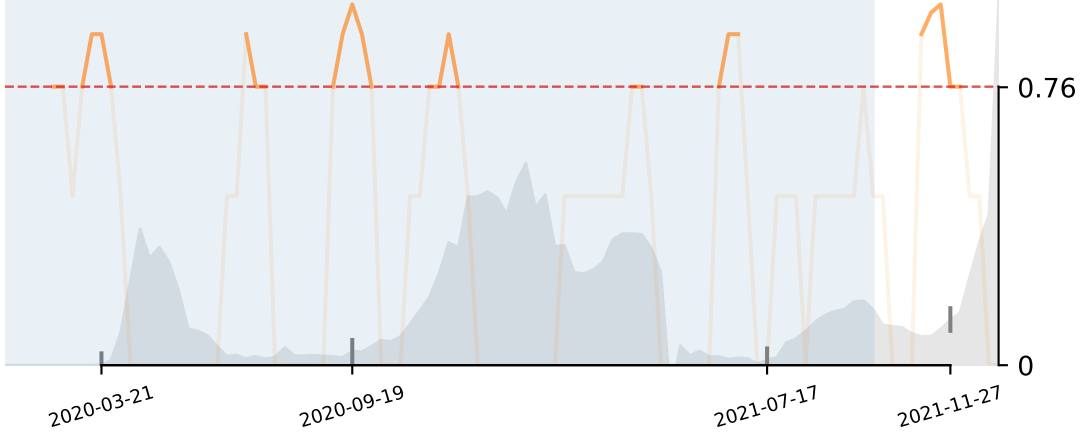
Model 2

(GT) how long does covid last
(GT) loss smell
(GT) sars-cov-2
(GT) Asthma
(GT) Cough
(GT) Wheeze



Model 3

(GT) Chest pain
(GT) chest pain
(GT) how long does covid last
(GT) covid-19 who
(GT) sars-cov-2
(GT) Asthma



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	1	2
0.91	1	0	0	2	7	1
0.76	1	0	0	2	23	0
0.46	1	2	0	3	36	0
0.00	1	3	0	3	67	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	1	0	1	0	0	2
0.91	2	2	0	0	5	1
0.76	2	4	0	1	13	0
0.46	2	6	0	1	21	0
0.00	2	16	0	2	39	0

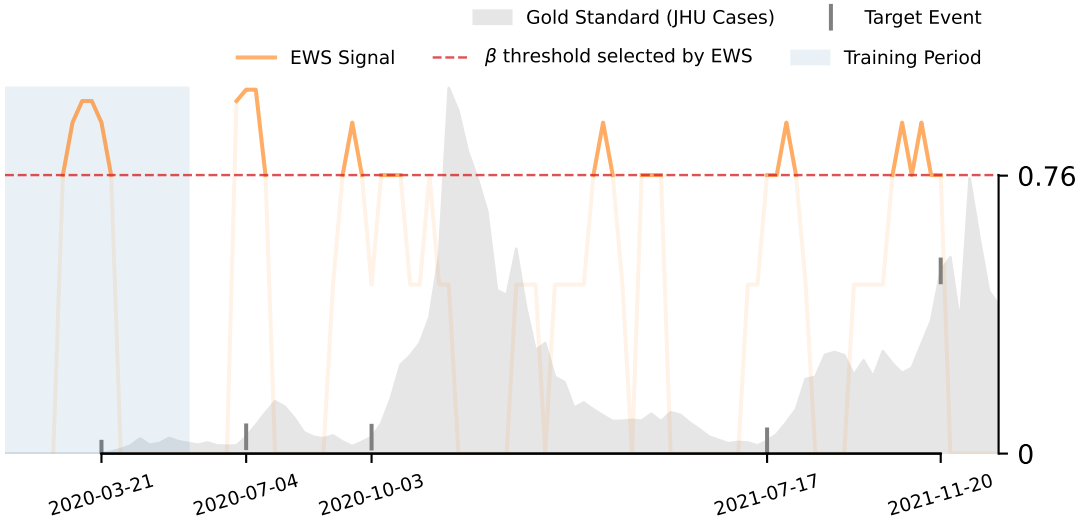
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	1	0	0
0.96	1	0	2	1	0	0
0.91	1	0	2	1	0	0
0.76	3	3	0	1	1	0
0.46	3	15	0	1	4	0
0.00	3	38	0	1	6	0

NM, Bernalillo

Proxies selected by the Multiple Sources method

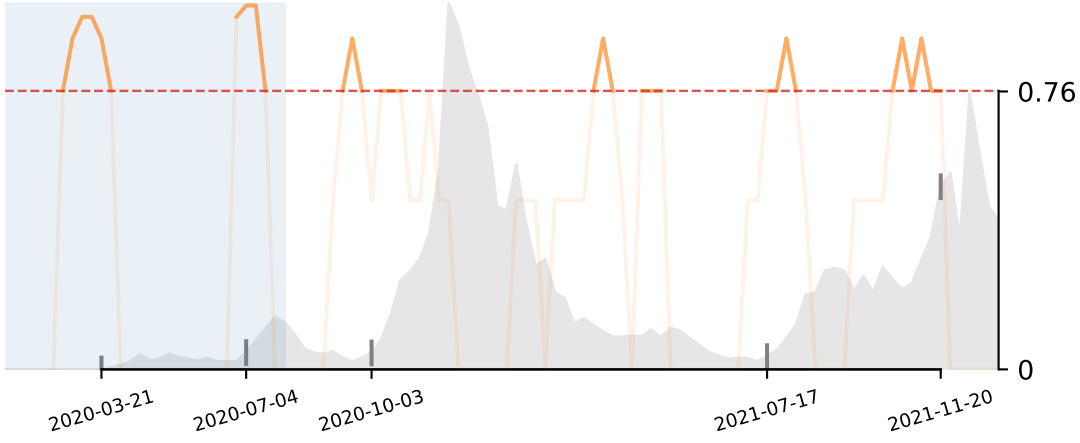
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis
(GT) Bronchitis



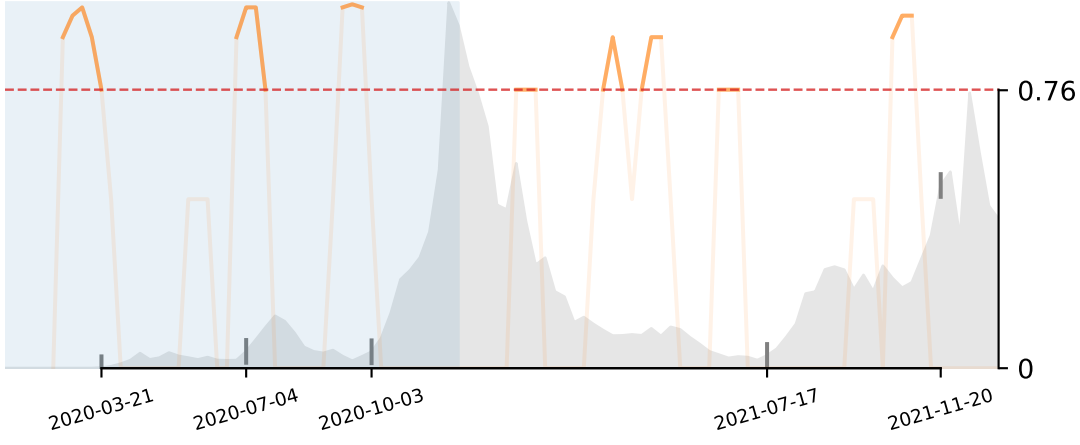
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis
(GT) Bronchitis



Model 3

(GT) Acute bronchitis
(GT) Bronchitis
(GT) Chills
(GT) Cough
(GT) Phlegm
(GT) Pneumonia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	1	1	3
0.99	0	0	1	1	1	3
0.96	0	0	1	1	1	3
0.91	1	0	0	3	3	0
0.76	1	0	0	4	15	0
0.46	1	1	0	4	31	0
0.00	1	1	0	4	57	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	1	1	0	0	3
0.96	1	1	1	0	0	3
0.91	2	1	0	2	2	0
0.76	2	1	0	3	13	0
0.46	2	3	0	3	29	0
0.00	2	3	0	3	53	0

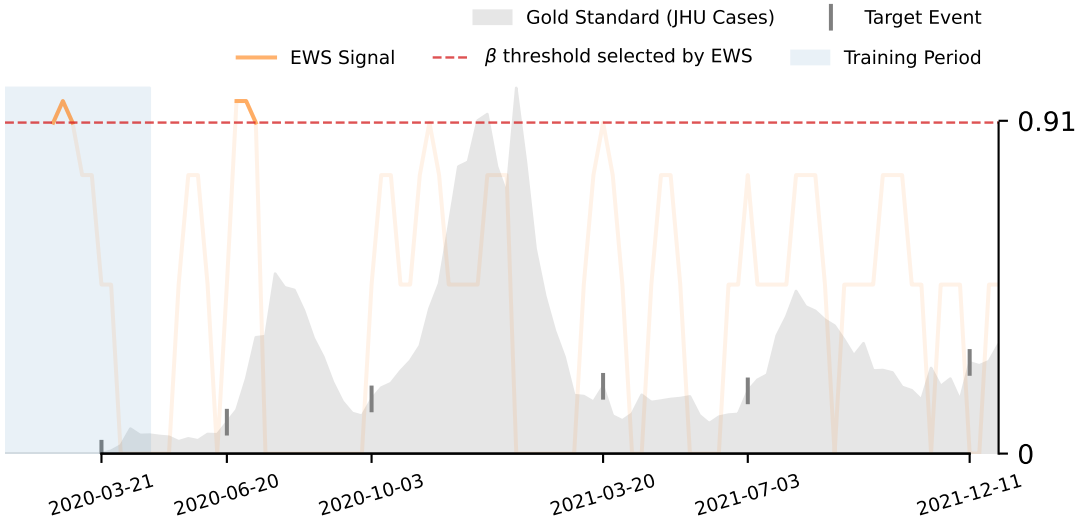
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	3	1	0	1	0	1
0.91	3	1	0	1	3	1
0.76	3	1	0	2	9	0
0.46	3	2	0	2	15	0
0.00	3	5	0	2	42	0

NV, Clark

Proxies selected by the Multiple Sources method

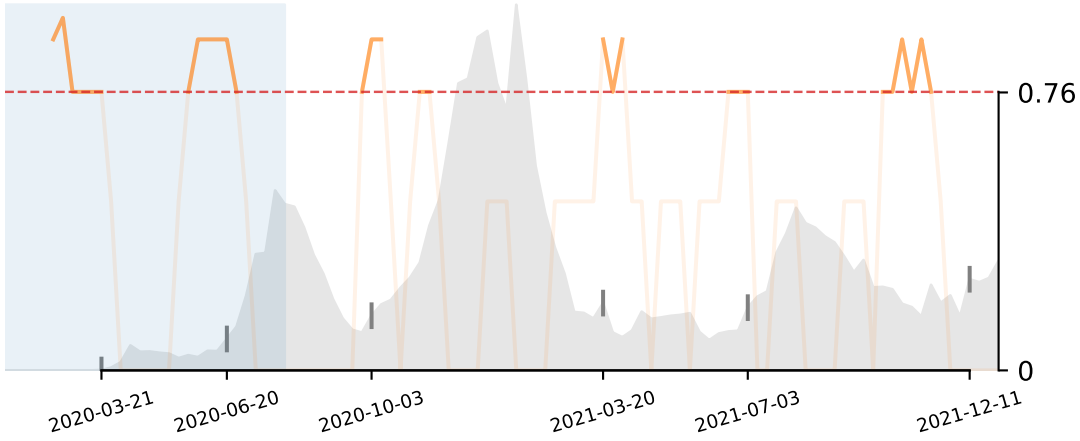
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



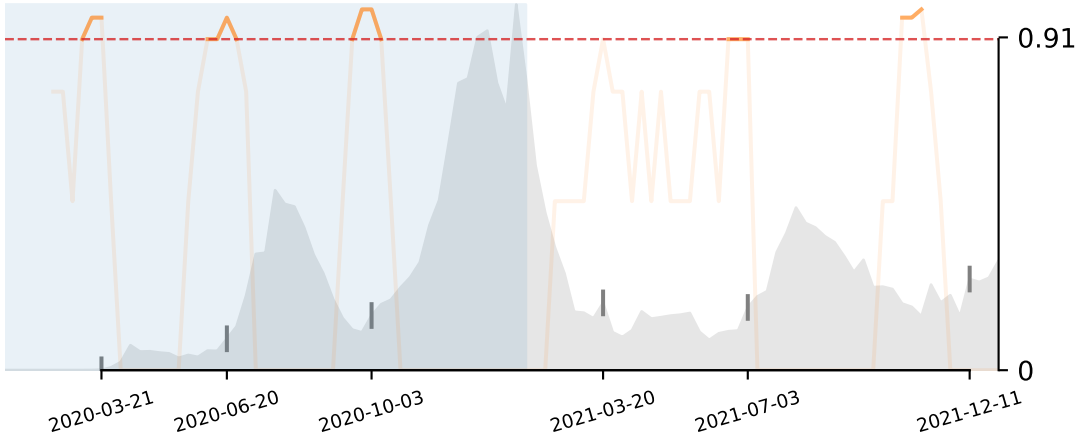
Model 2

(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Ageusia
(GT) Anosmia
(GT) Burning Chest Pain



Model 3

(GT) Ageusia
(GT) Anosmia
(GT) Burning Chest Pain
(GT) Chills
(GT) Fever
(GT) Phlegm



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	0	2	4
0.91	1	0	0	1	4	3
0.76	1	1	0	3	20	1
0.46	1	1	0	5	40	0
0.00	1	2	0	5	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	0	0	2	0	0	4
0.91	1	0	1	3	3	1
0.76	2	1	0	4	8	0
0.46	2	2	0	4	25	0
0.00	2	5	0	4	46	0

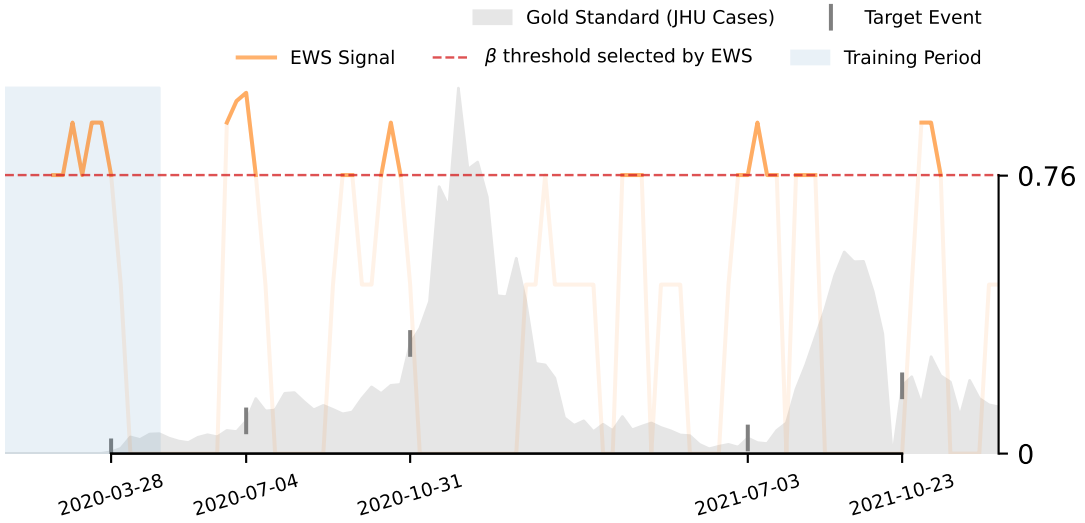
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	1	0	2
0.96	1	0	2	1	1	2
0.91	3	0	0	3	1	0
0.76	3	2	0	3	5	0
0.46	3	4	0	3	11	0
0.00	3	6	0	3	28	0

NV, Washoe

Proxies selected by the Multiple Sources method

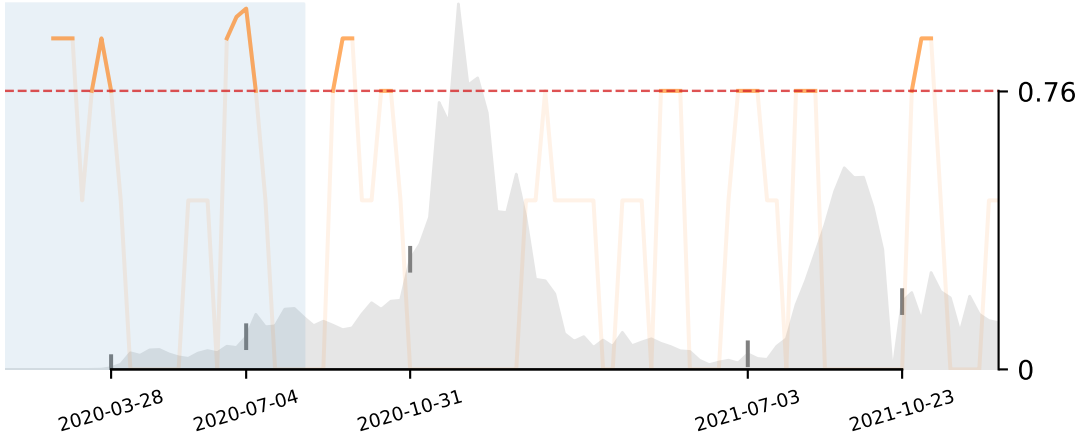
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Bronchitis



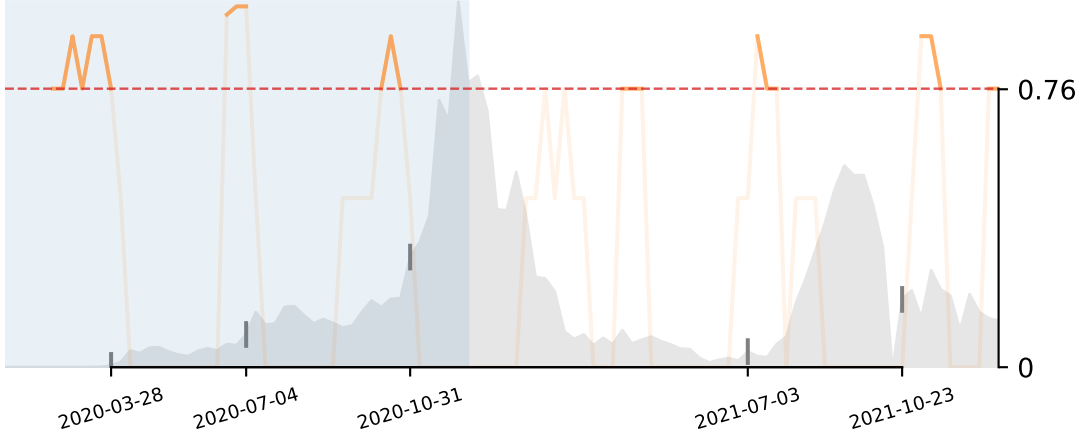
Model 2

(GT) covid
(GT) chest pain
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Bronchitis
(GT) Chills



Model 3

(GT) covid
(GT) chest pain
(GT) covid-19
(GT) Bronchitis
(GT) Sore throat
(GT) covid symptoms



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	1	0	3
0.91	0	0	1	2	3	0
0.76	1	0	0	3	15	0
0.46	1	2	0	3	30	0
0.00	1	3	0	4	59	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	0	0	3
0.91	1	0	1	1	3	1
0.76	2	2	0	2	13	0
0.46	2	3	0	2	28	0
0.00	2	7	0	3	51	0

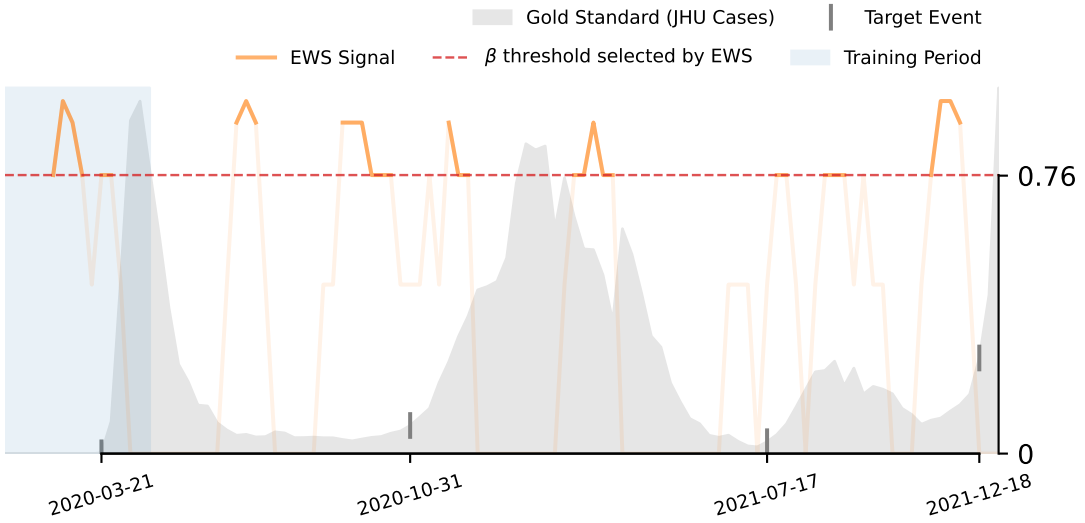
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	0	2	0	0	2
0.91	1	0	2	0	3	0
0.76	3	0	0	0	13	0
0.46	3	2	0	1	22	0
0.00	3	7	0	2	41	0

NY, Bronx

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain

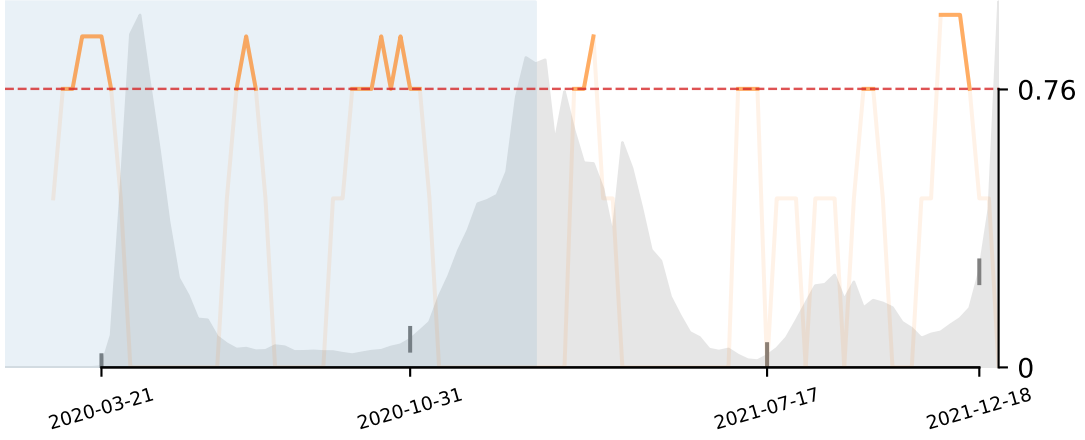


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	1	2
0.91	1	0	0	2	6	1
0.76	1	0	0	2	19	0
0.46	1	2	0	3	31	0
0.00	1	3	0	3	67	0

Model 2

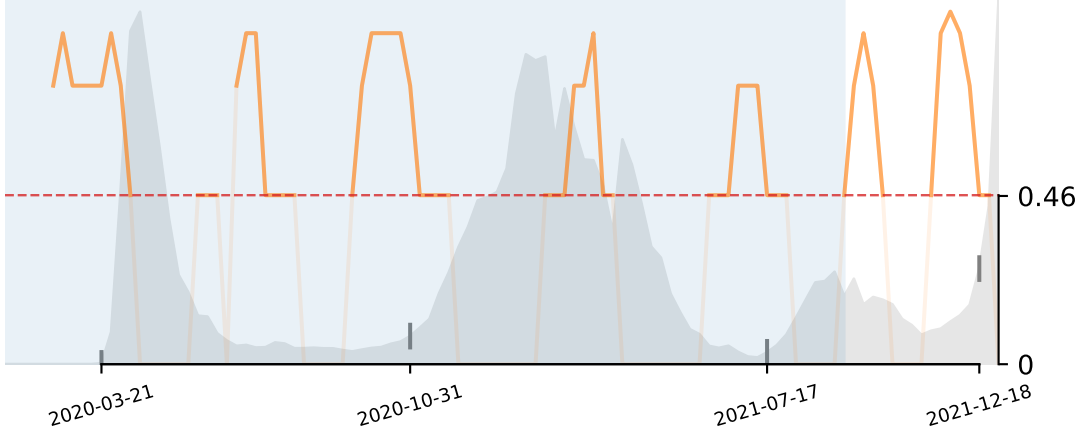
(GT) how long does covid last
(GT) nose bleed
(GT) covid-19
(GT) covid symptoms
(GT) sars-cov-2
(GT) Throat irritation



β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	0	0	2	1	0	1
0.91	0	0	2	1	1	1
0.76	2	1	0	2	5	0
0.46	2	7	0	2	16	0
0.00	2	14	0	2	34	0

Model 3

(GT) covid
(GT) covid symptoms
(GT) Throat irritation
(GT) Asphyxia
(GT) nose bleed
(GT) how long does covid last



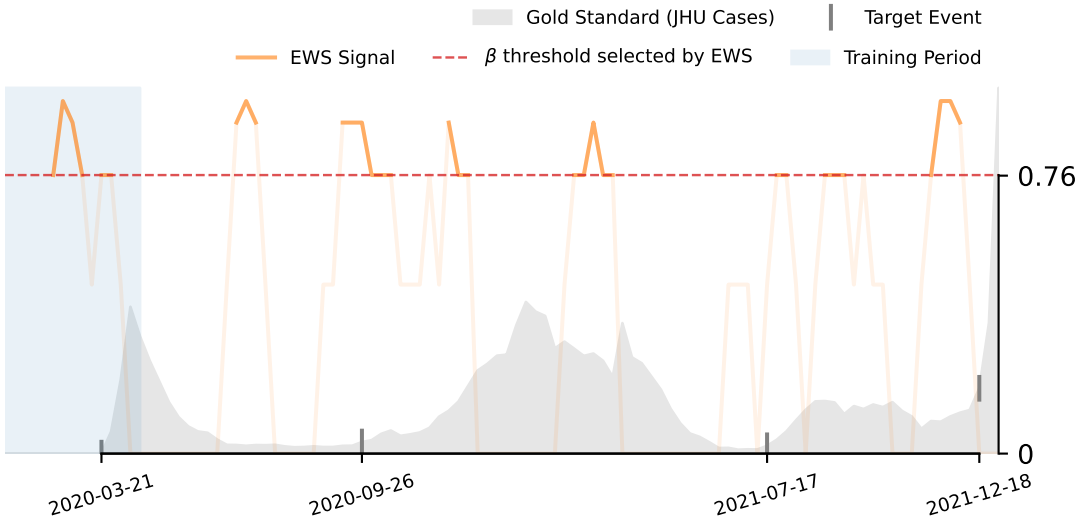
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	1	0	0
0.91	0	0	3	1	1	0
0.76	2	4	1	1	3	0
0.46	3	10	0	1	5	0
0.00	3	33	0	1	9	0

NY, Kings

Proxies selected by the Multiple Sources method

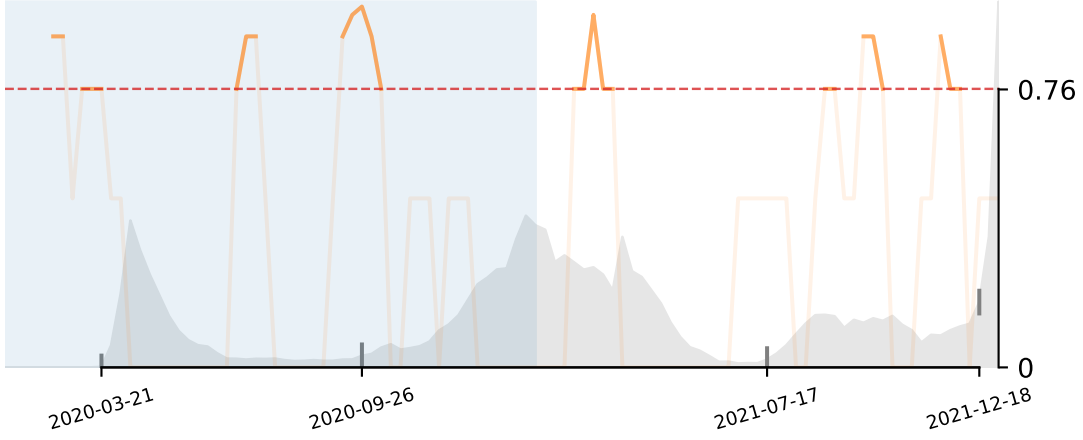
Model 1

(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain



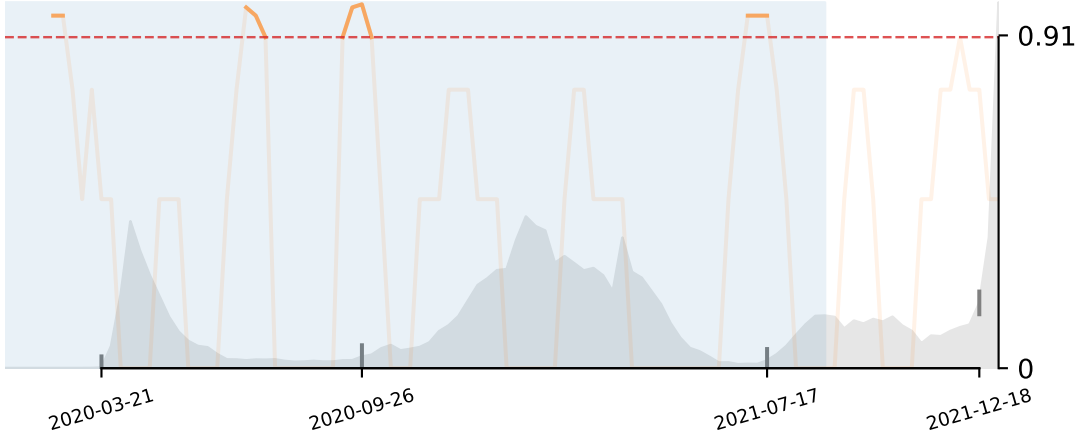
Model 2

(GT) how long does covid last
(GT) loss smell
(GT) covid symptoms
(GT) sars-cov-2
(GT) Asthma
(GT) Sore throat



Model 3

(GT) Asthma
(GT) covid symptoms
(GT) Chronic pain
(GT) Shortness of breath
(GT) chest pain
(GT) Ageusia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	1	2
0.91	1	0	0	2	5	1
0.76	1	0	0	2	21	0
0.46	1	2	0	3	33	0
0.00	1	3	0	3	68	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	1	0	1	0	1	2
0.91	1	0	1	1	3	1
0.76	2	4	0	1	10	1
0.46	2	6	0	2	17	0
0.00	2	15	0	2	34	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	1	0	2	0	0	1
0.96	1	1	2	0	0	1
0.91	3	3	0	1	0	0
0.76	3	5	0	1	2	0
0.46	3	12	0	1	6	0
0.00	3	30	0	1	11	0

NY, Monroe

Proxies selected by the Multiple Sources method

Model 1

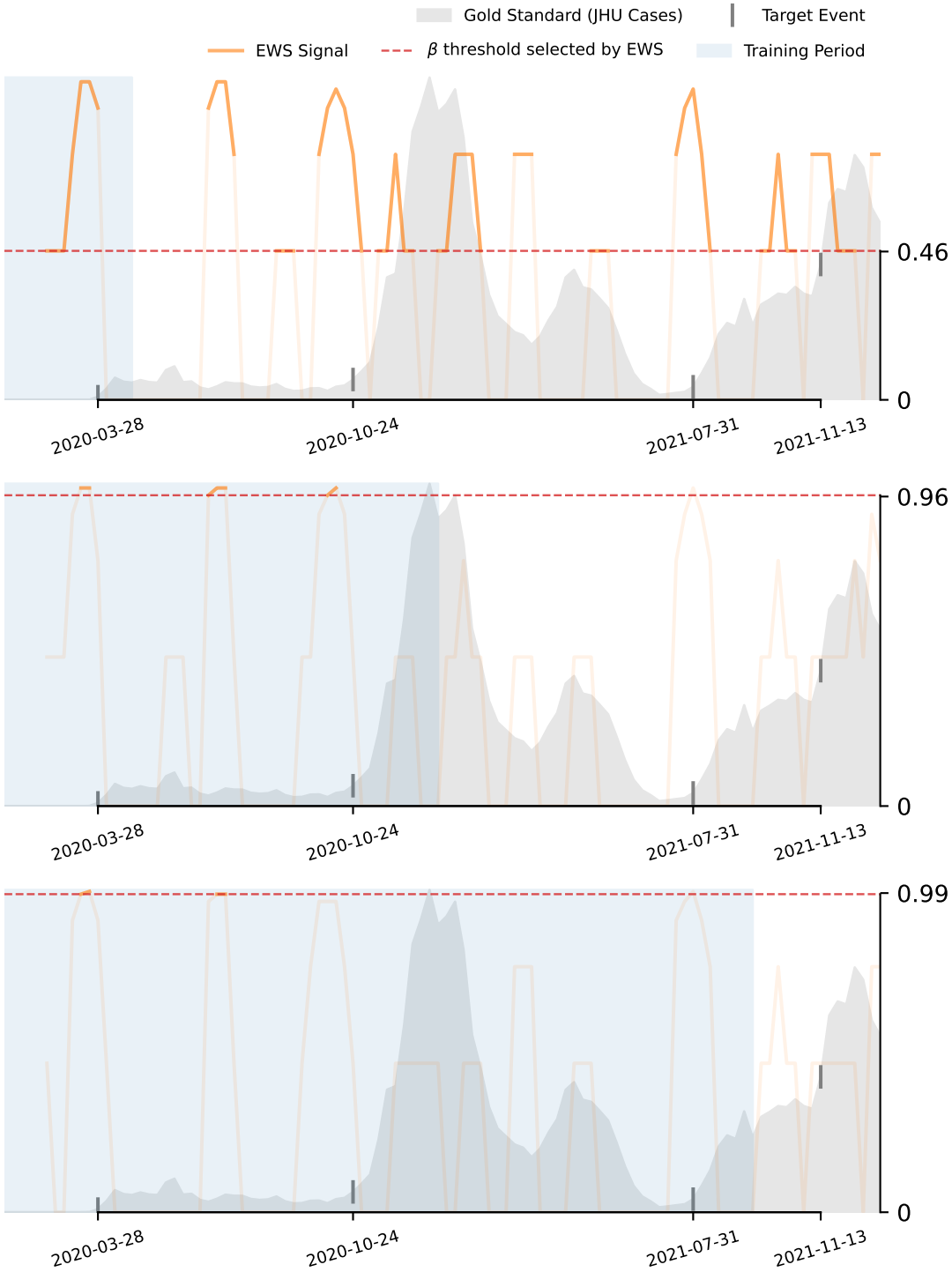
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever

Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Ageusia
(GT) Diarrhea
(GT) quarantine

Model 3

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Ageusia
(GT) Hyperventilation



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	2	3
0.96	1	0	0	2	2	1
0.91	1	0	0	2	3	1
0.76	1	0	0	3	15	0
0.46	1	0	0	3	34	0
0.00	1	2	0	3	67	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	1	0	1
0.96	2	2	0	1	0	1
0.91	2	3	0	1	2	1
0.76	2	3	0	2	6	0
0.46	2	3	0	2	21	0
0.00	2	14	0	2	38	0

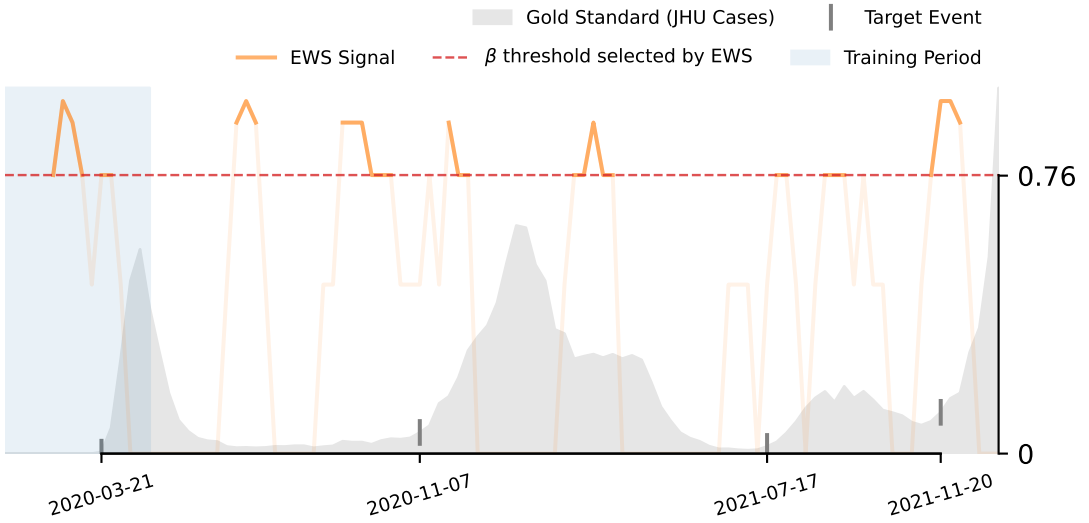
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	2	0	1	0	0	1
0.96	2	2	1	0	0	1
0.91	3	3	0	0	0	1
0.76	3	4	0	1	2	0
0.46	3	9	0	1	7	0
0.00	3	25	0	1	8	0

NY, Nassau

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain

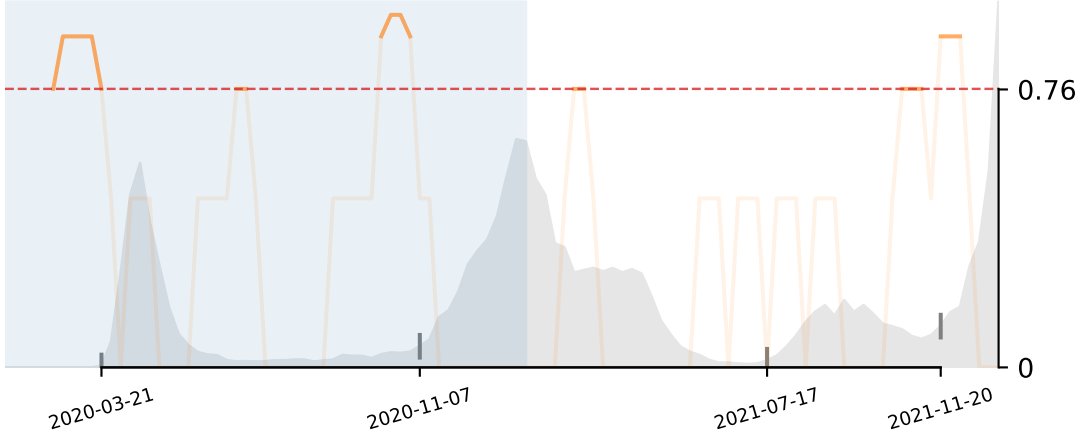


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	2	2
0.91	1	0	0	2	9	1
0.76	1	0	0	2	22	0
0.46	1	2	0	3	33	0
0.00	1	3	0	3	67	0

Model 2

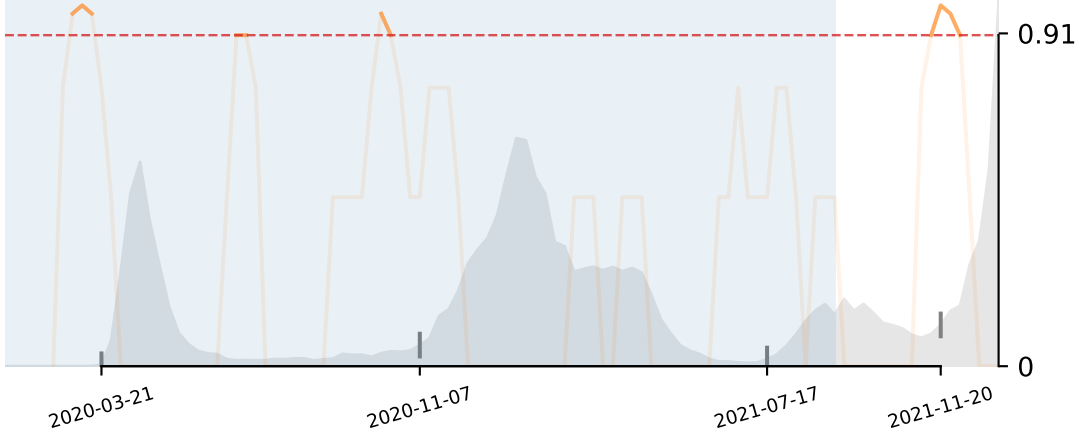
(GT) nose bleed
(GT) covid-19
(GT) covid symptoms
(GT) sars-cov-2
(GT) Abdominal pain
(GT) Otitis



β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	0	0	2	0	0	2
0.91	1	0	1	1	2	1
0.76	2	0	0	1	4	1
0.46	2	3	0	2	14	0
0.00	2	18	0	2	35	0

Model 3

(GT) covid
(GT) covid symptoms
(GT) nose bleed
(GT) covid-19
(GT) covid-19 who
(GT) sars-cov-2



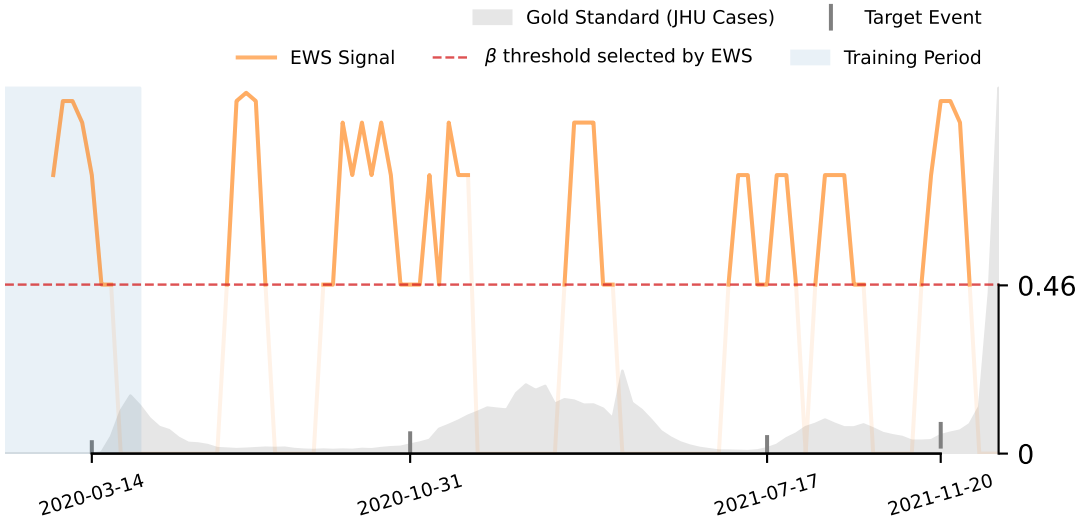
β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	3	0	0	1
0.99	0	0	3	1	0	0
0.96	1	0	2	1	1	0
0.91	2	0	1	1	2	0
0.76	2	2	1	1	2	0
0.46	3	9	0	1	3	0
0.00	3	27	0	1	10	0

NY, New York

Proxies selected by the Multiple Sources method

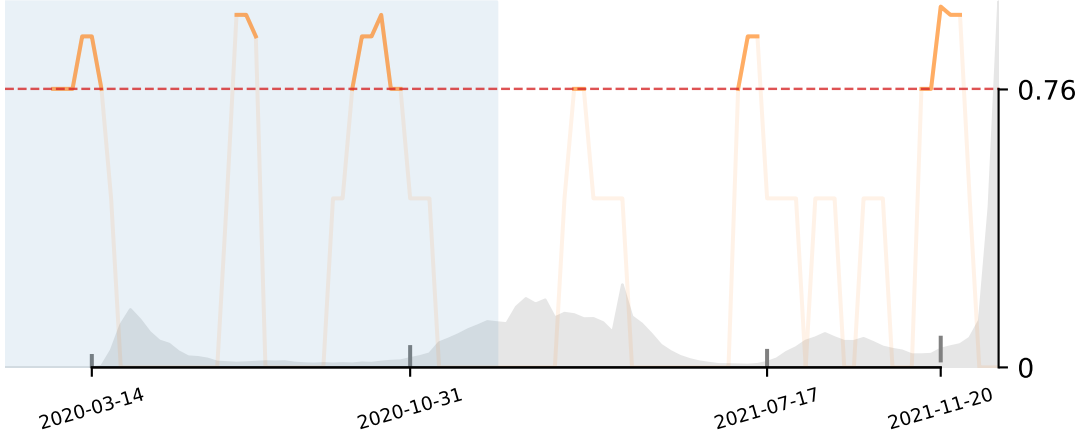
Model 1

(GT) covid
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain
(GT) covid symptoms



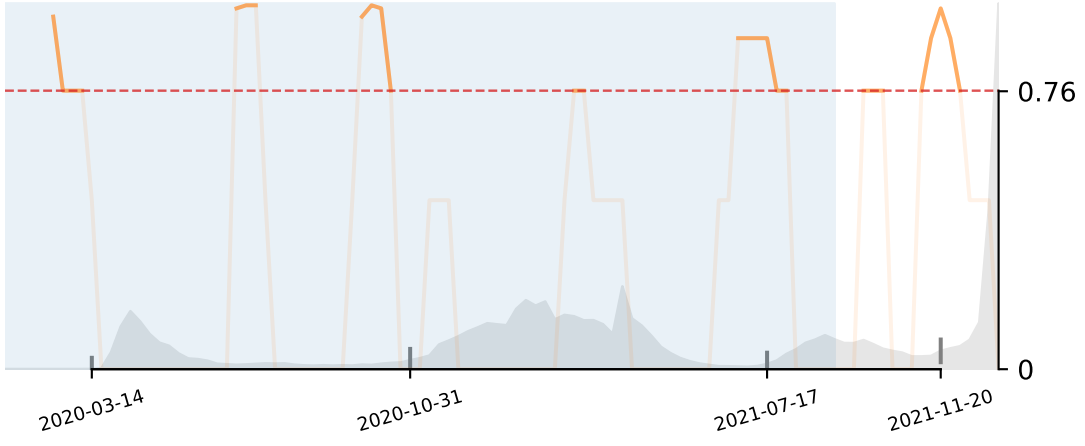
Model 2

(GT) nose bleed
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) sars-cov-2
(GT) Ageusia



Model 3

(GT) Shortness of breath
Twitter (state level signal)
(GT) covid
(GT) covid symptoms
(GT) quarantine
(GT) Ageusia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	1	3
0.96	0	0	1	1	4	2
0.91	1	0	0	2	10	1
0.76	1	0	0	3	18	0
0.46	1	0	0	3	32	0
0.00	1	2	0	3	68	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	1	0	1
0.96	0	0	2	1	2	1
0.91	1	2	1	2	2	0
0.76	2	4	0	2	4	0
0.46	2	6	0	2	18	0
0.00	2	12	0	2	38	0

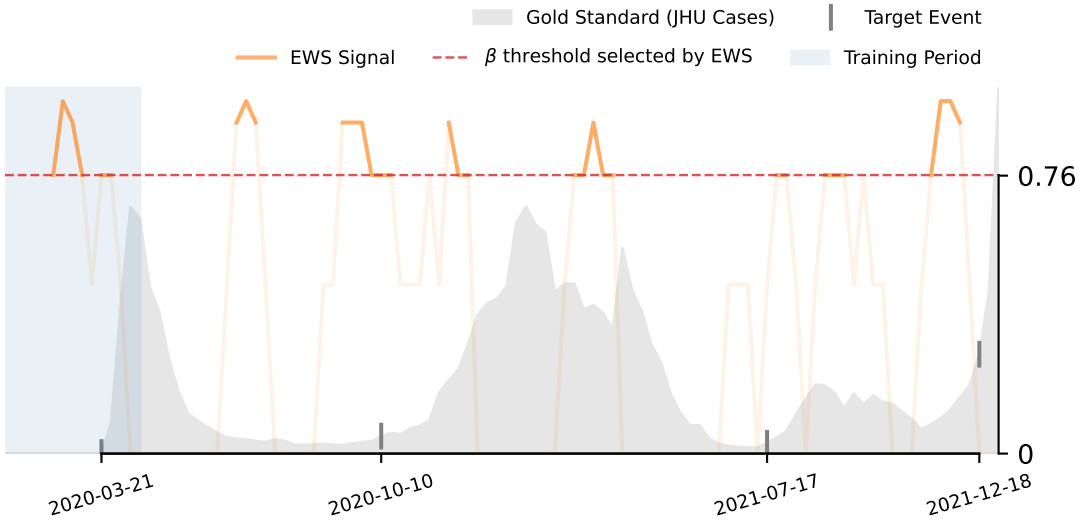
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	1	2	2	1	0	0
0.96	1	3	2	1	0	0
0.91	2	4	1	1	1	0
0.76	3	4	0	1	4	0
0.46	3	8	0	1	7	0
0.00	3	19	0	1	10	0

NY, Queens

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain

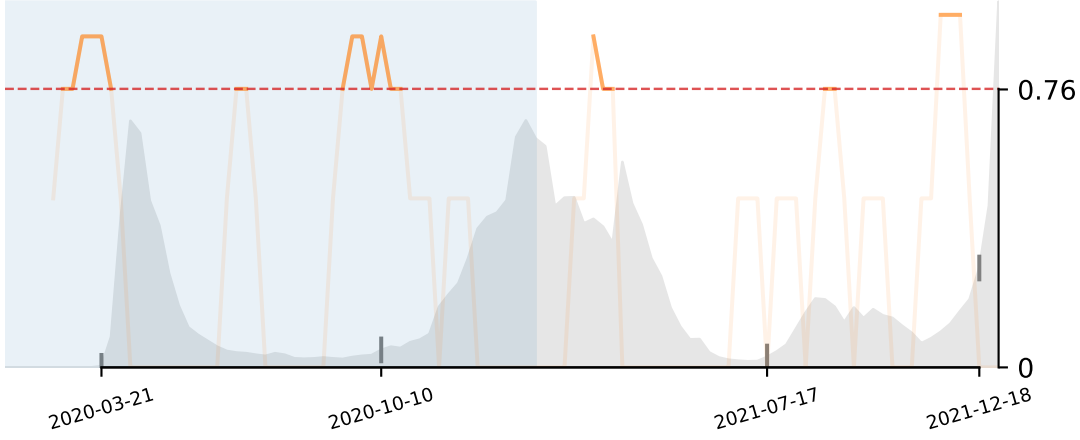


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	1	2
0.91	1	0	0	2	5	1
0.76	1	0	0	2	19	0
0.46	1	2	0	3	31	0
0.00	1	3	0	3	68	0

Model 2

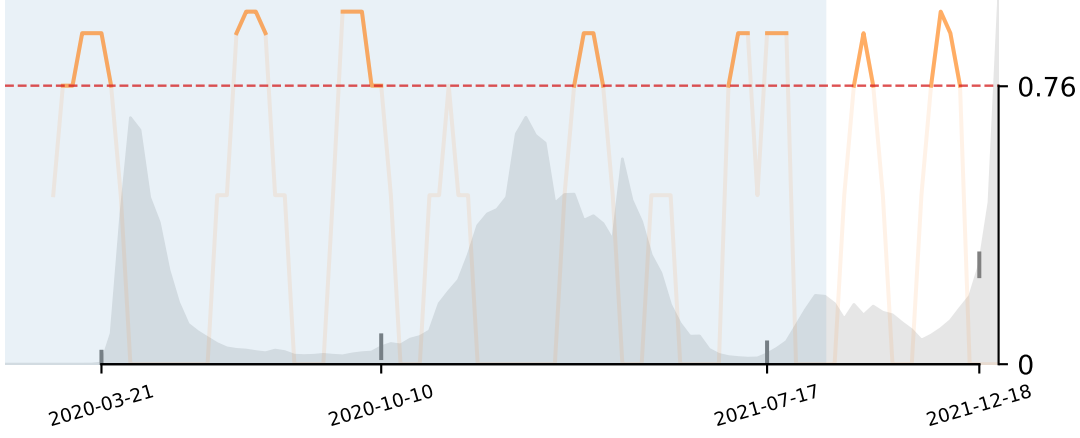
(GT) how long does covid last
(GT) nose bleed
(GT) loss smell
(GT) covid-19
(GT) covid symptoms
(GT) sars-cov-2



β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	0	0	2	1	0	1
0.91	0	0	2	1	1	1
0.76	2	0	0	1	5	1
0.46	2	5	0	2	15	0
0.00	2	16	0	2	34	0

Model 3

(GT) Asthma
(GT) covid
(GT) covid symptoms
(GT) Ageusia
(GT) chest pain
(GT) Bronchitis



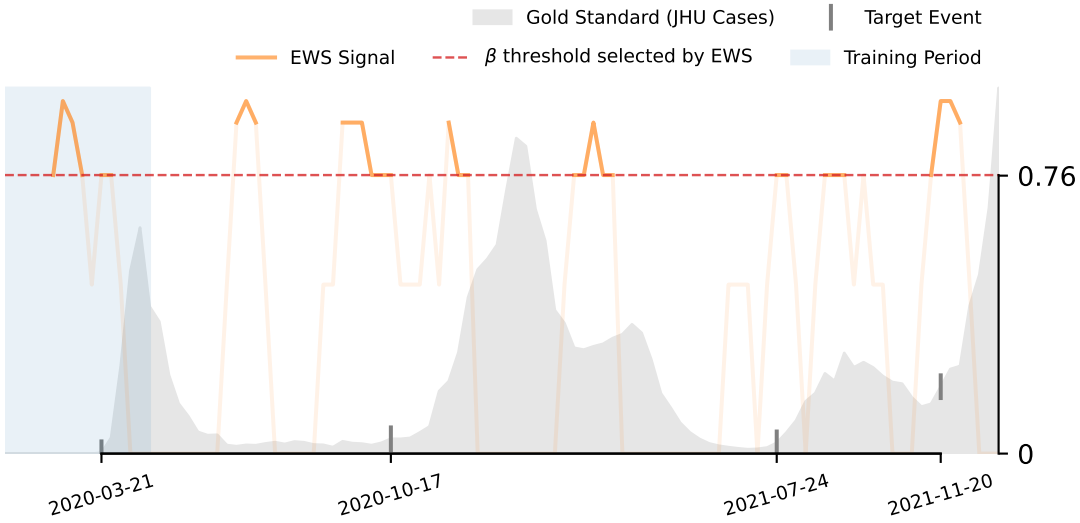
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	1	0	0
0.91	1	2	2	1	1	0
0.76	3	8	0	1	3	0
0.46	3	12	0	1	5	0
0.00	3	29	0	1	11	0

NY, Suffolk

Proxies selected by the Multiple Sources method

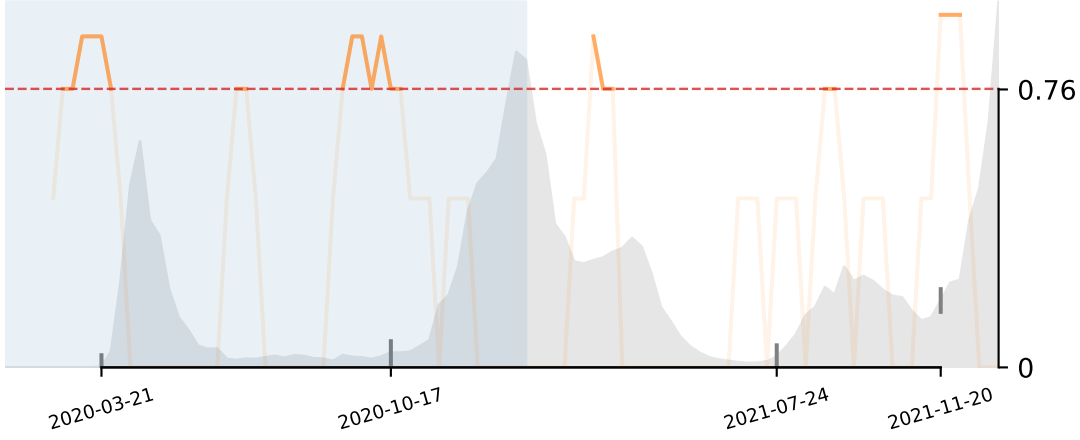
Model 1

(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain



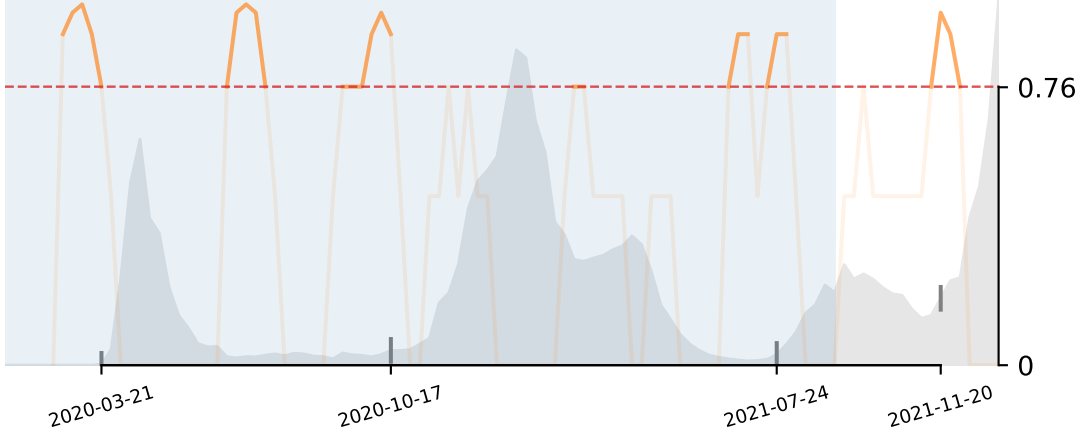
Model 2

(GT) how long does covid last
(GT) nose bleed
(GT) loss smell
(GT) covid-19
(GT) covid symptoms
(GT) sars-cov-2



Model 3

(GT) covid-19
(GT) covid
(GT) covid symptoms
(GT) Anosmia
(GT) chest pain
(GT) Viral pneumonia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	2	2
0.91	1	0	0	2	7	1
0.76	1	0	0	3	19	0
0.46	1	2	0	3	32	0
0.00	1	3	0	3	67	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	0	0	2	1	2	1
0.91	0	0	2	1	3	1
0.76	2	0	0	1	7	1
0.46	2	5	0	2	16	0
0.00	2	16	0	2	35	0

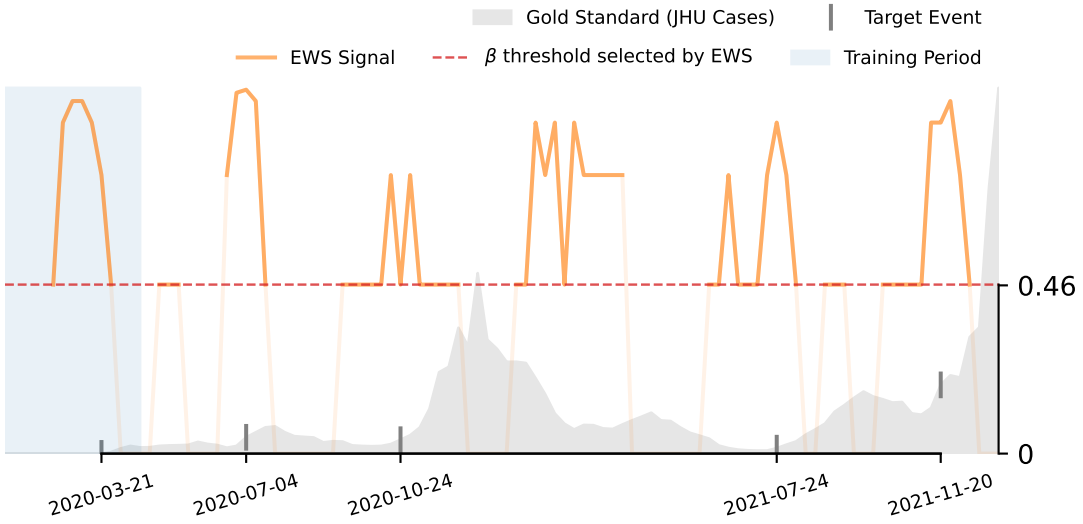
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	1	1	2	1	0	0
0.91	2	3	1	1	1	0
0.76	3	4	0	1	3	0
0.46	3	12	0	1	6	0
0.00	3	30	0	1	10	0

OH, Cuyahoga

Proxies selected by the Multiple Sources method

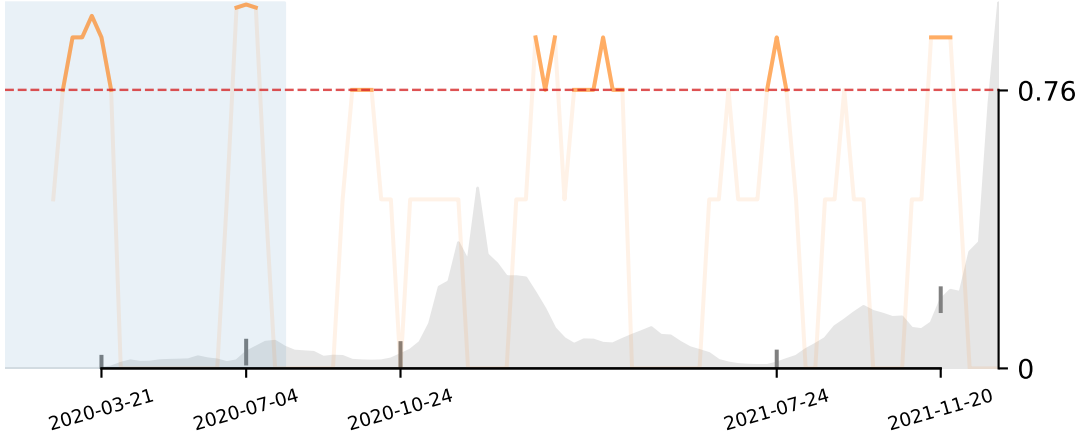
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine
(GT) Abdominal pain



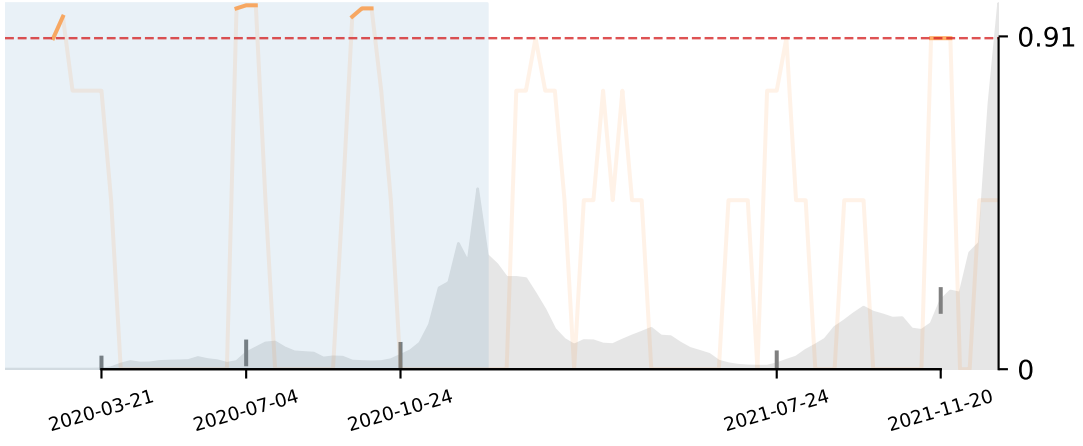
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine
(GT) Acute bronchitis



Model 3

(GT) covid
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Anosmia
(GT) Asthma
(GT) Bronchitis



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	1	0	3
0.99	0	0	1	1	0	3
0.96	0	0	1	1	2	2
0.91	1	0	0	3	5	1
0.76	1	0	0	4	14	0
0.46	1	0	0	4	32	0
0.00	1	2	0	4	61	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	0	1	0	0	3
0.96	1	1	1	0	0	3
0.91	2	1	0	2	4	1
0.76	2	1	0	3	12	0
0.46	2	2	0	3	28	0
0.00	2	4	0	3	53	0

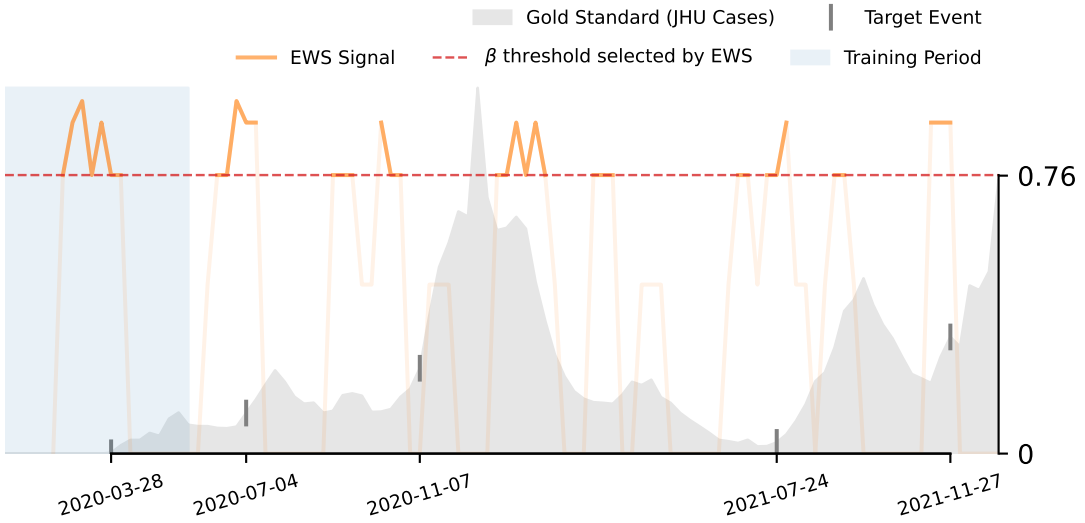
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	1	2	0	0	2
0.96	2	1	1	0	0	2
0.91	3	2	0	1	3	0
0.76	3	3	0	2	9	0
0.46	3	3	0	2	23	0
0.00	3	6	0	2	39	0

OH, Franklin

Proxies selected by the Multiple Sources method

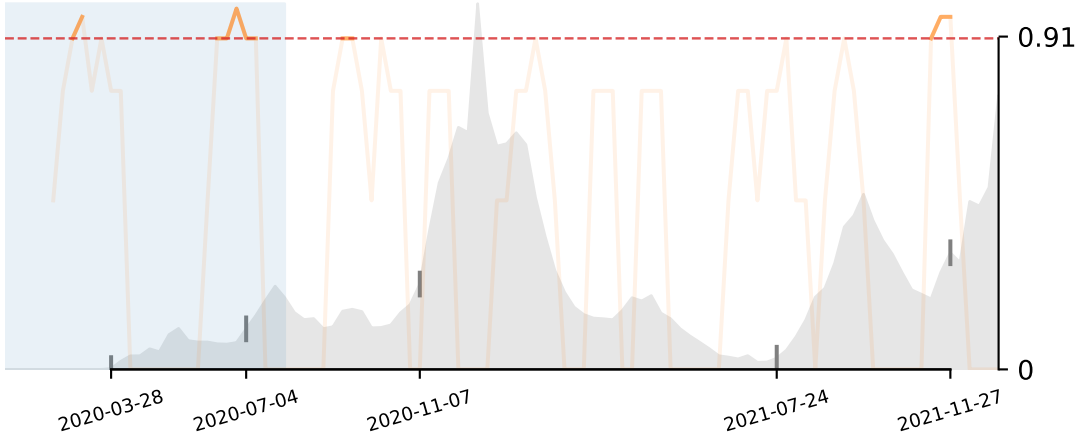
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) chest tightness
(GT) Burning Chest Pain
(GT) Hyperventilation



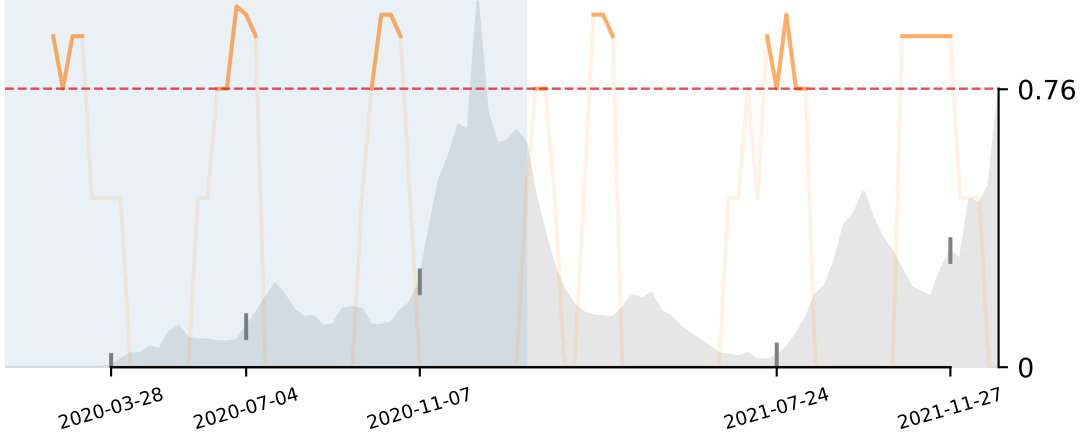
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) Burning Chest Pain
(GT) Hyperventilation
(GT) Chest pain



Model 3

(GT) covid-19
(GT) chest pain
(GT) covid
(GT) quarantine
(GT) Chills
(GT) Diarrhea



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	0	3
0.91	1	0	0	3	4	0
0.76	1	0	0	4	16	0
0.46	1	2	0	4	27	0
0.00	1	2	0	4	57	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	1	0	2
0.91	2	0	0	2	5	0
0.76	2	1	0	3	20	0
0.46	2	3	0	3	28	0
0.00	2	4	0	3	53	0

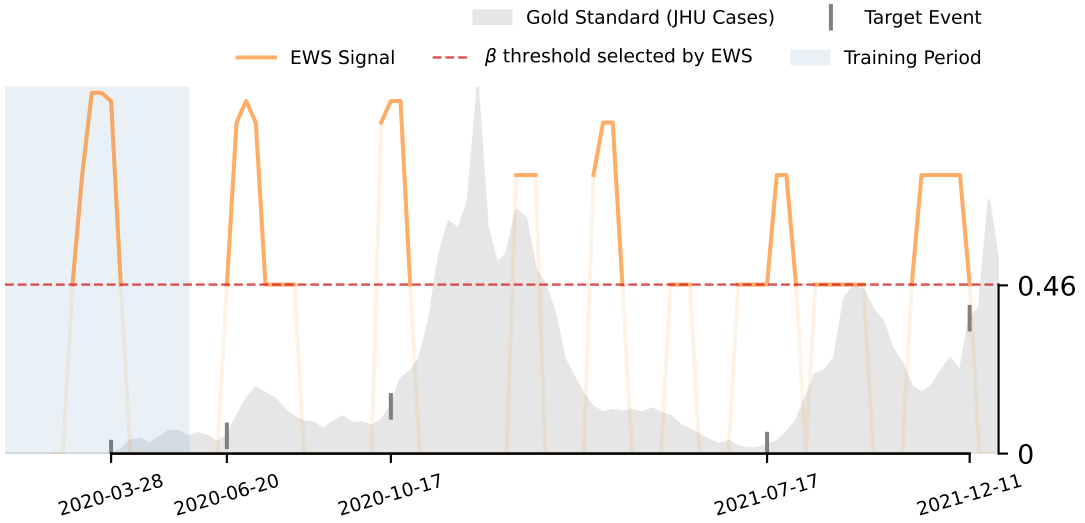
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	0	2	0	3	1
0.91	2	0	1	2	4	0
0.76	3	2	0	2	8	0
0.46	3	4	0	2	13	0
0.00	3	8	0	2	35	0

OH, Hamilton

Proxies selected by the Multiple Sources method

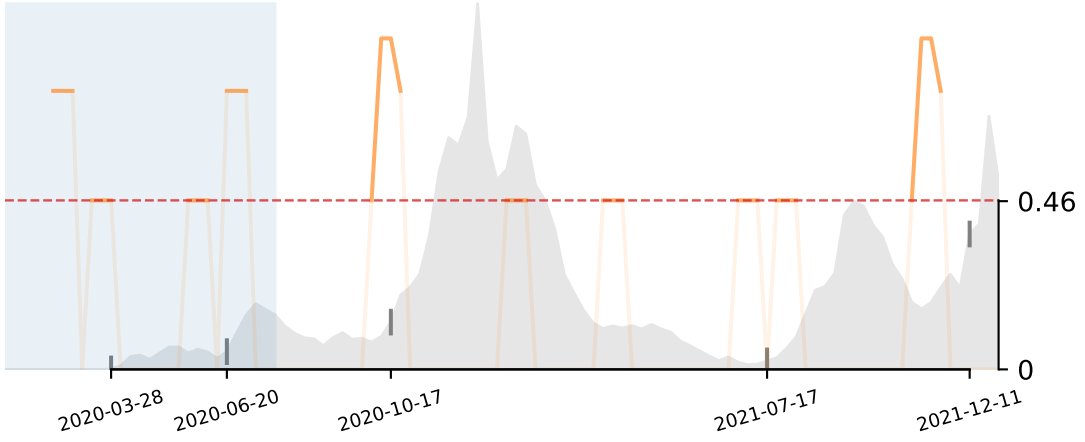
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine
(GT) sars-cov-2



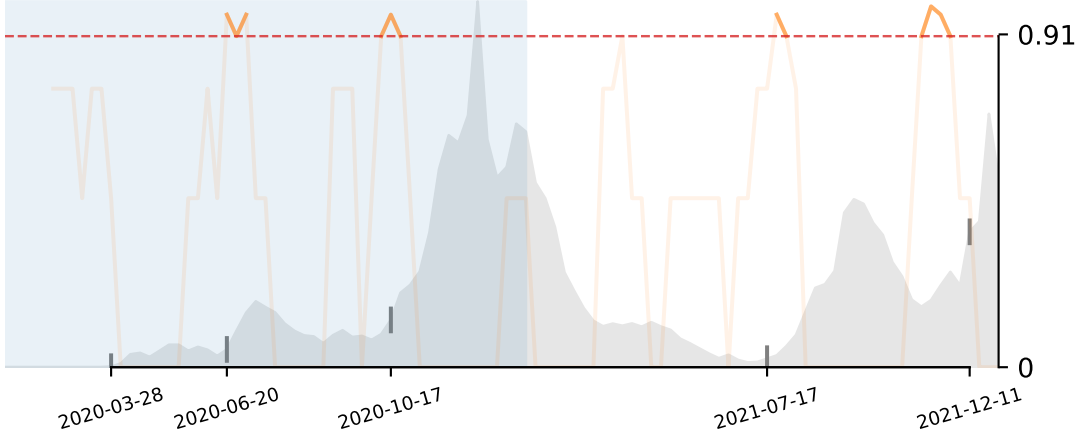
Model 2

(GT) covid symptoms
(GT) Otitis
(GT) Phlegm



Model 3

(GT) covid symptoms
(GT) Otitis
(GT) Phlegm
(GT) Ageusia
(GT) Anosmia
(GT) quarantine



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	1	0	0	1	2	2
0.91	1	0	0	1	6	2
0.76	1	0	0	2	12	0
0.46	1	0	0	4	28	0
0.00	1	1	0	4	59	0

β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	2	0	1
0.76	0	0	2	2	1	1
0.46	2	4	0	3	10	0
0.00	2	4	0	3	54	0

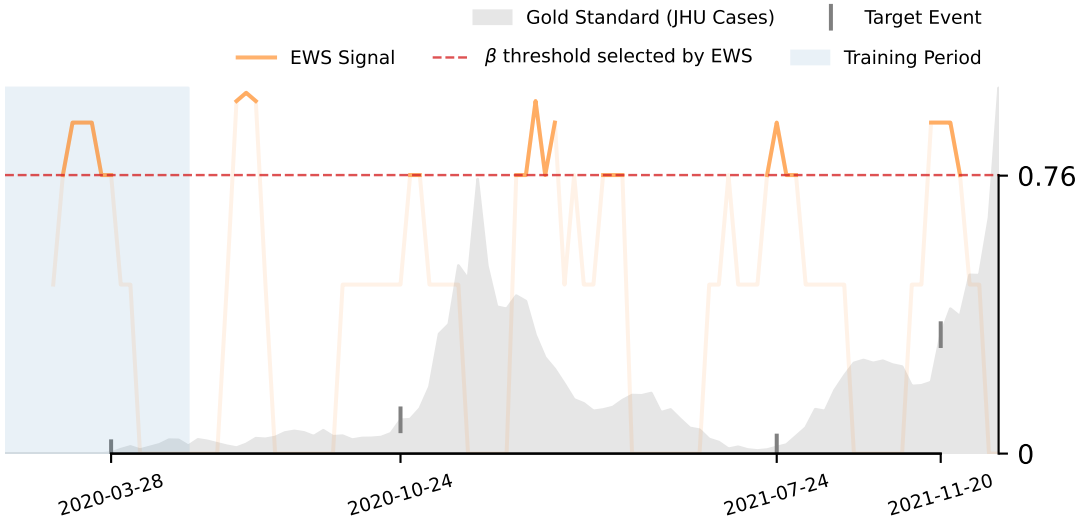
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	1	0	1
0.96	0	0	3	1	1	0
0.91	2	1	1	1	3	0
0.76	2	3	1	2	6	0
0.46	3	7	0	2	12	0
0.00	3	13	0	2	35	0

OH, Summit

Proxies selected by the Multiple Sources method

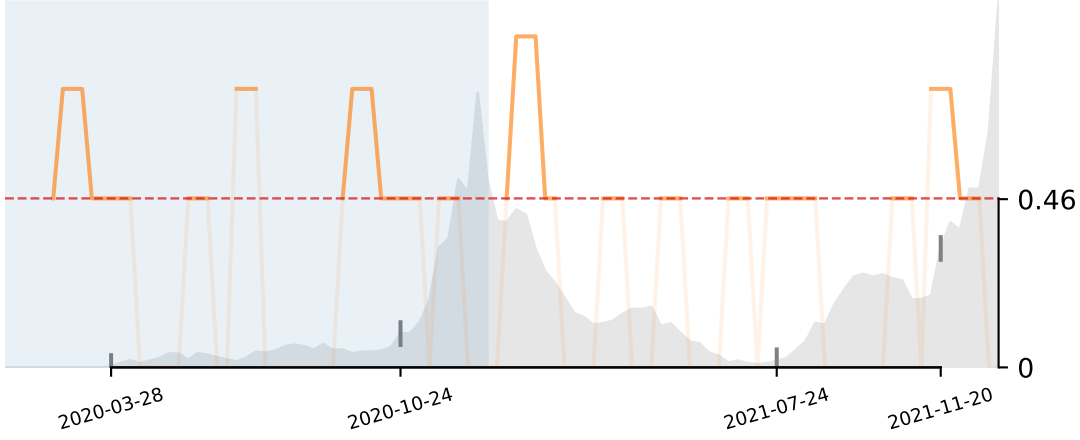
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine



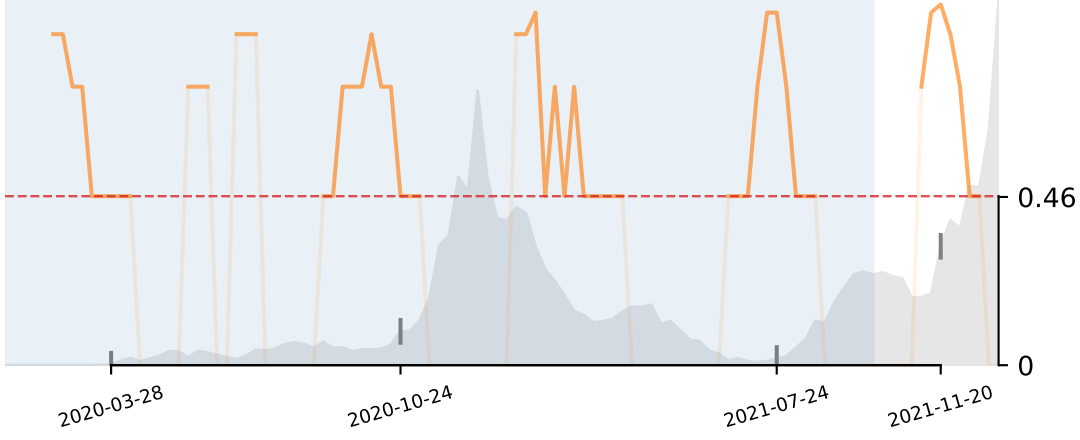
Model 2

(GT) how long does covid last
(GT) covid
(GT) covid symptoms
(GT) Otitis



Model 3

(GT) covid
(GT) covid symptoms
(GT) how long does covid last
(GT) Asthma
(GT) Nasal congestion
Twitter (state level signal)



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	1	3
0.96	0	0	1	0	4	3
0.91	0	0	1	2	6	1
0.76	1	0	0	2	18	0
0.46	1	1	0	3	35	0
0.00	1	4	0	3	63	0

β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	2
0.91	0	0	2	0	3	2
0.76	0	0	2	1	4	1
0.46	2	5	0	2	20	0
0.00	2	17	0	2	39	0

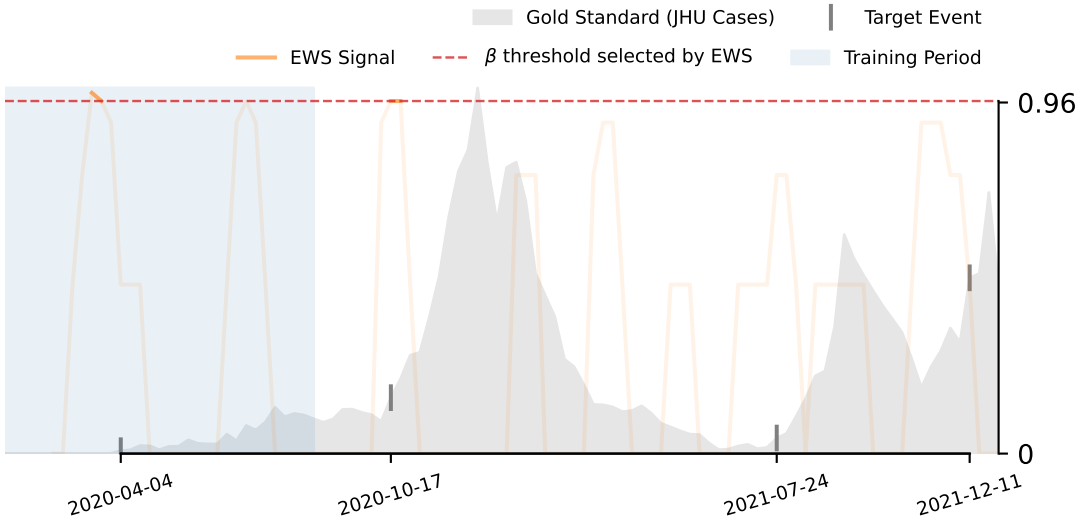
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	1	0	0
0.96	0	0	3	1	0	0
0.91	1	1	2	1	1	0
0.76	2	8	1	1	2	0
0.46	3	16	0	1	4	0
0.00	3	33	0	1	6	0

OH, Warren

Proxies selected by the Multiple Sources method

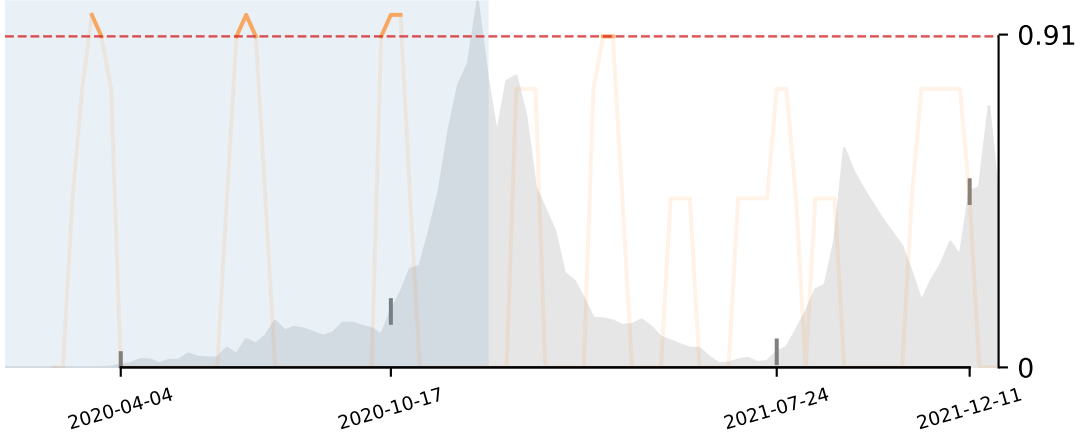
Model 1

(GT) chest tightness
(GT) covid-19 who
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine



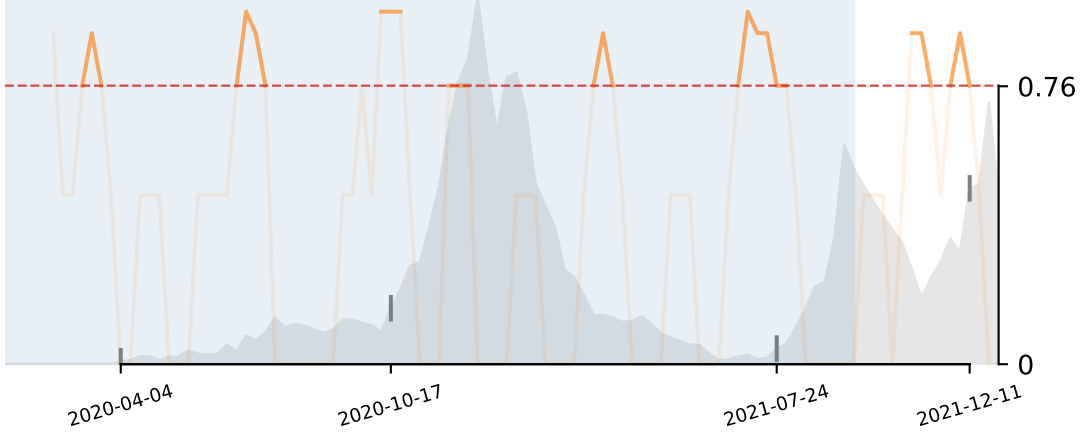
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine



Model 3

(GT) covid symptoms
(GT) quarantine
(GT) covid
(GT) fever
(GT) Fatigue
(GT) Sore throat



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	1	0	0	1	1	2
0.91	1	1	0	2	3	1
0.76	1	3	0	3	8	0
0.46	1	3	0	3	20	0
0.00	1	8	0	3	50	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	2
0.91	2	2	0	0	2	2
0.76	2	4	0	2	7	0
0.46	2	4	0	2	15	0
0.00	2	8	0	2	39	0

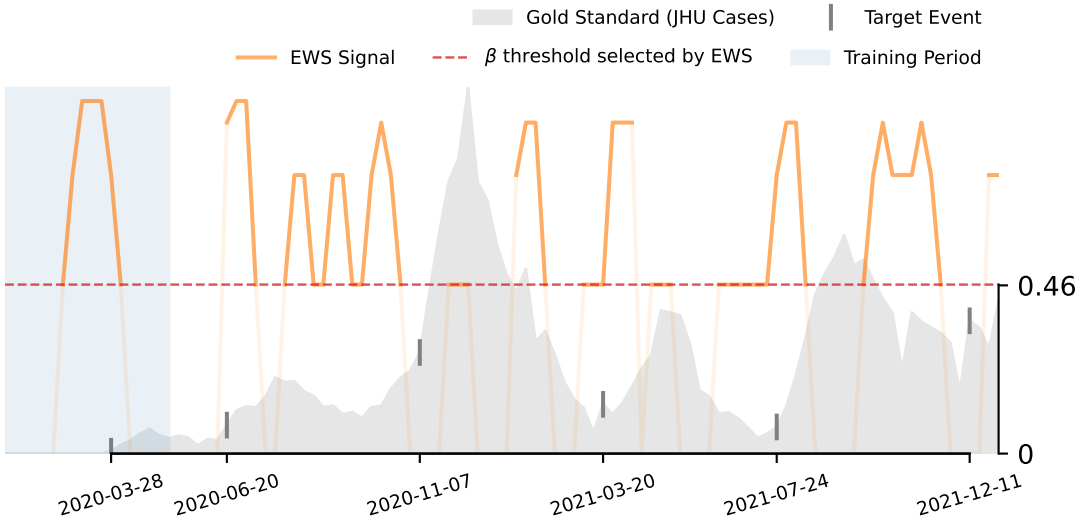
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	2	2	1	1	0	0
0.76	3	5	0	1	0	0
0.46	3	13	0	1	5	0
0.00	3	34	0	1	8	0

OR, Multnomah

Proxies selected by the Multiple Sources method

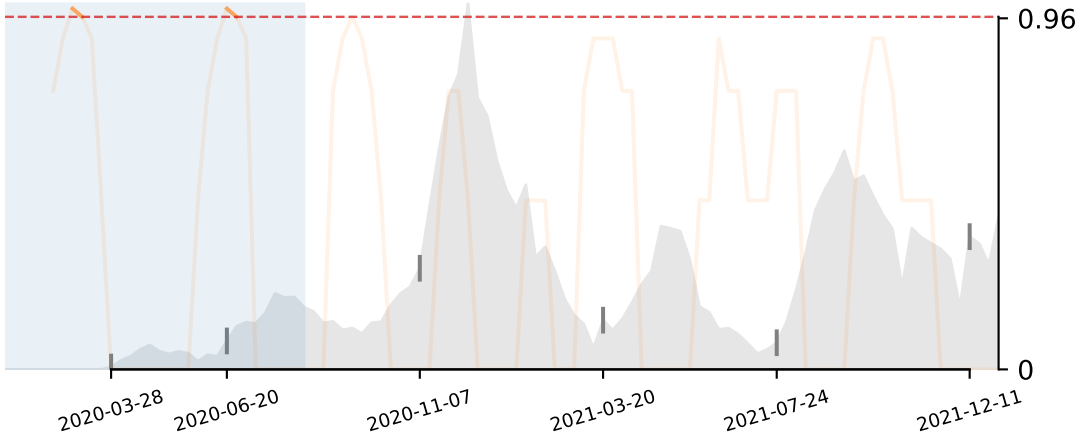
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis
(GT) Anosmia



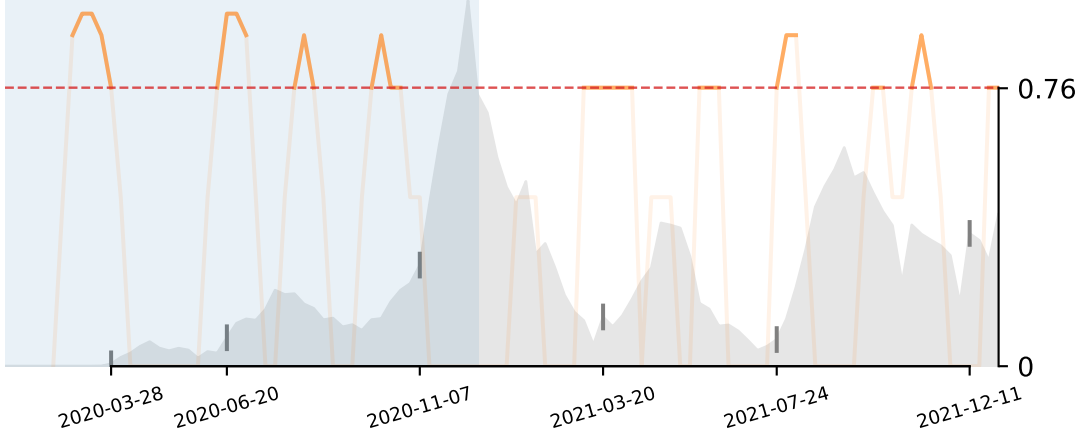
Model 2

(GT) covid symptoms
(GT) Anosmia
(GT) Asthma
(GT) Cough
(GT) Nasal congestion
(GT) Throat irritation



Model 3

(GT) Anosmia
(GT) Wheeze
(GT) Nasal congestion
(GT) covid
(GT) covid-19
(GT) quarantine



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	0	2	4
0.91	1	0	0	3	10	0
0.76	1	0	0	4	20	0
0.46	1	0	0	5	33	0
0.00	1	2	0	5	52	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	2	0	0	0	1	4
0.91	2	1	0	3	5	1
0.76	2	3	0	3	14	1
0.46	2	4	0	4	22	0
0.00	2	4	0	4	44	0

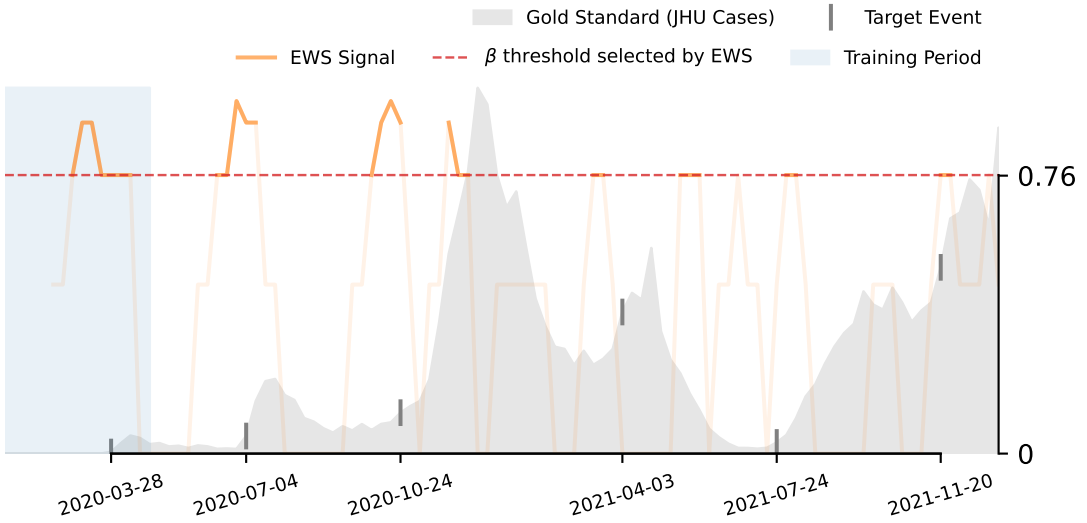
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	0	3	0	0	3
0.91	2	1	1	1	2	1
0.76	3	3	0	3	11	0
0.46	3	6	0	3	21	0
0.00	3	12	0	3	33	0

PA, Allegheny

Proxies selected by the Multiple Sources method

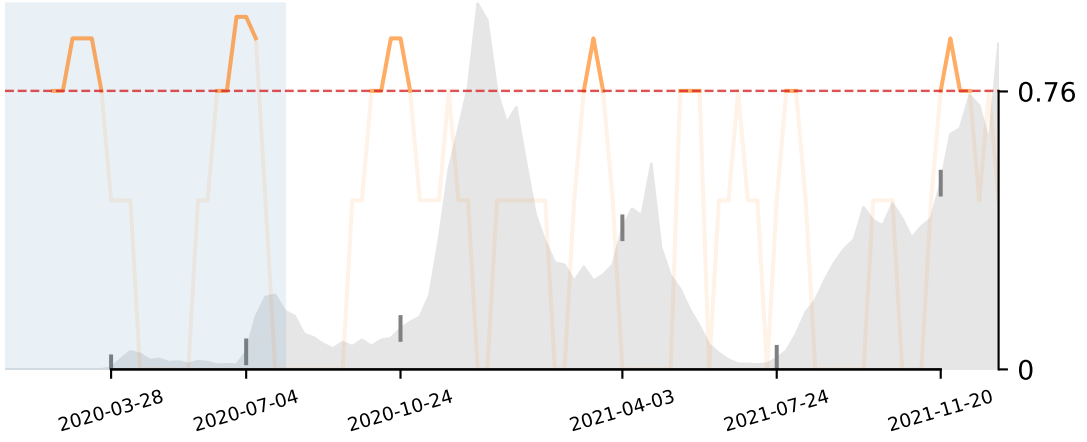
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



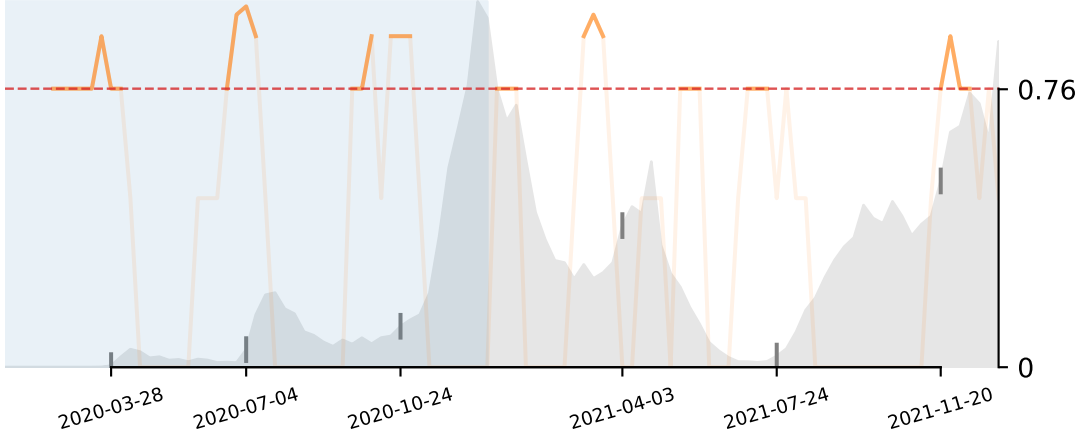
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine



Model 3

(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) quarantine
(GT) Anosmia
(GT) Burning Chest Pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	2	0	3
0.91	0	0	1	2	2	3
0.76	1	0	0	5	11	0
0.46	1	2	0	5	28	0
0.00	1	4	0	5	53	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	0	0	2	0	0	4
0.91	1	0	1	2	1	1
0.76	2	1	0	4	11	0
0.46	2	3	0	4	26	0
0.00	2	7	0	4	46	0

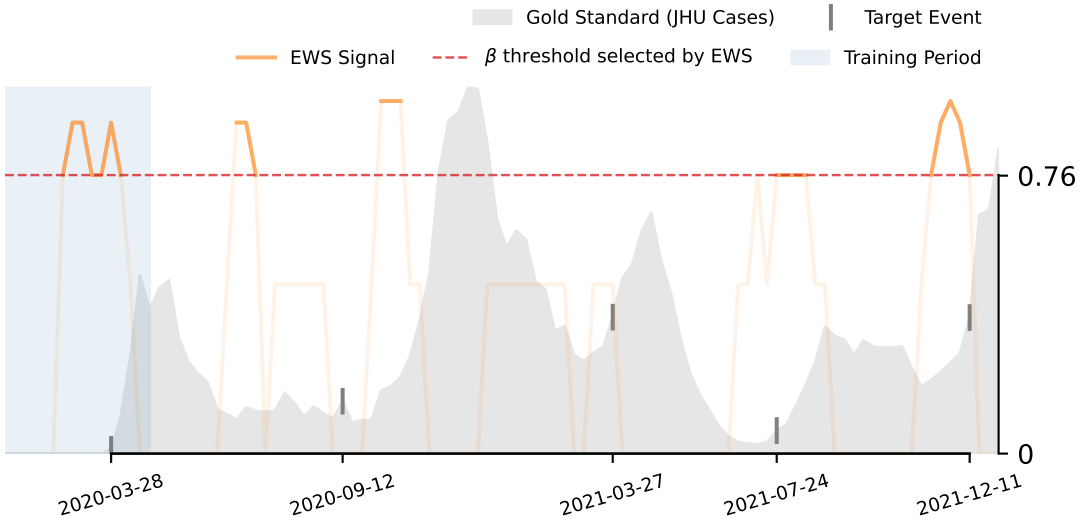
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	1	0	2	1	0	2
0.91	1	0	2	1	1	1
0.76	3	2	0	3	11	0
0.46	3	6	0	3	18	0
0.00	3	10	0	3	32	0

PA, Philadelphia

Proxies selected by the Multiple Sources method

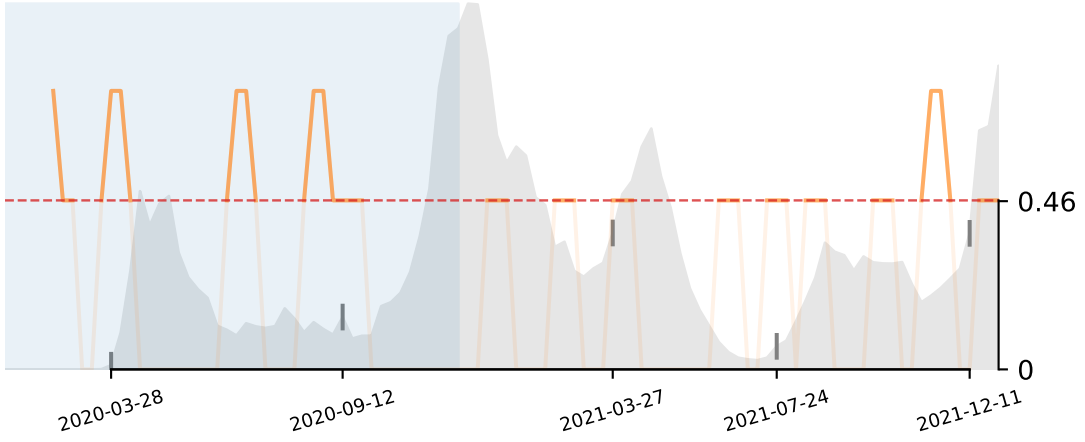
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) covid-19 who
(GT) sars-cov-2



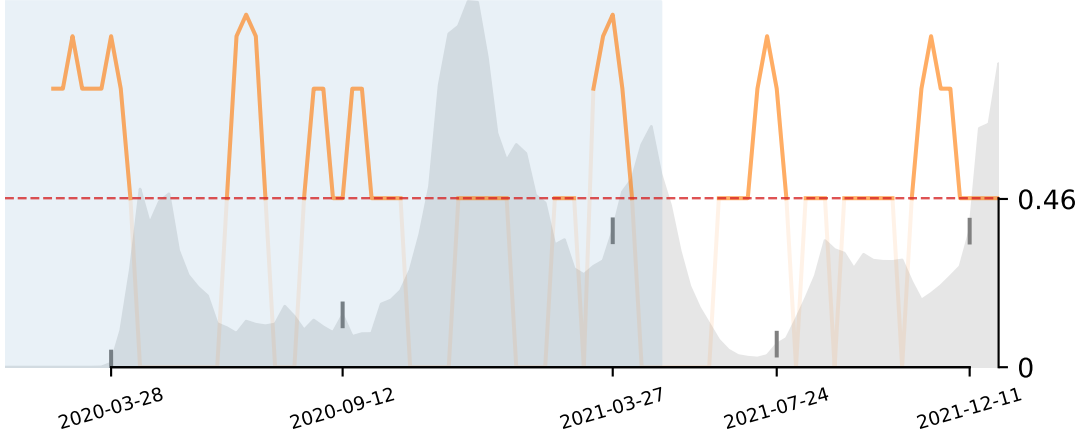
Model 2

(GT) sars-cov-2
(GT) Burning Chest Pain
(GT) Ageusia



Model 3

(GT) Burning Chest Pain
(GT) Ageusia
(GT) sars-cov-2
(GT) Nasal congestion
(GT) covid symptoms
(GT) nose bleed



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	3	3
0.91	0	0	1	1	5	3
0.76	1	0	0	2	9	2
0.46	1	2	0	4	23	0
0.00	1	3	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	0	0	3
0.76	0	0	2	1	0	2
0.46	2	4	0	3	15	0
0.00	2	10	0	3	35	0

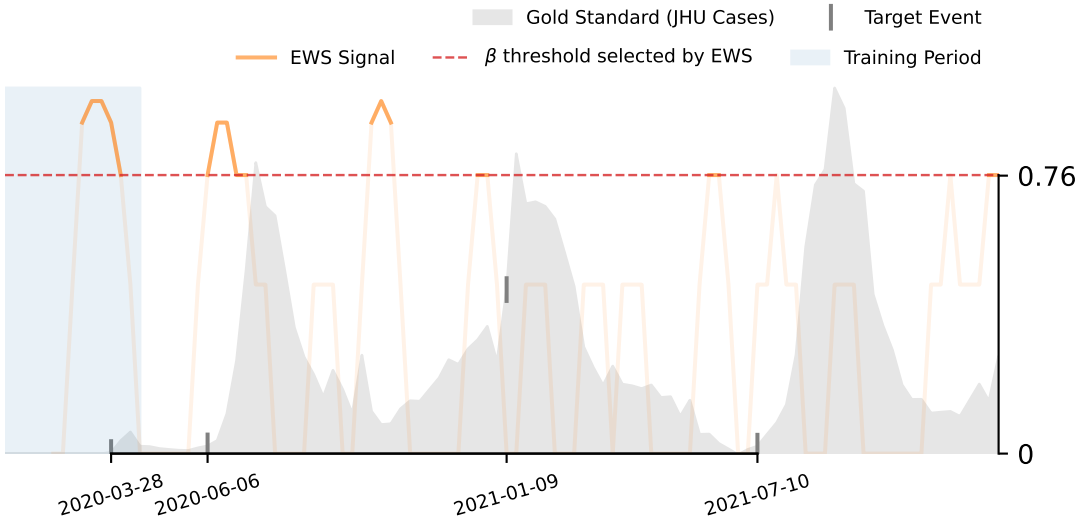
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	1	2	2	0	0
0.76	2	3	1	2	0	0
0.46	3	9	0	2	13	0
0.00	3	25	0	2	21	0

SC, Charleston

Proxies selected by the Multiple Sources method

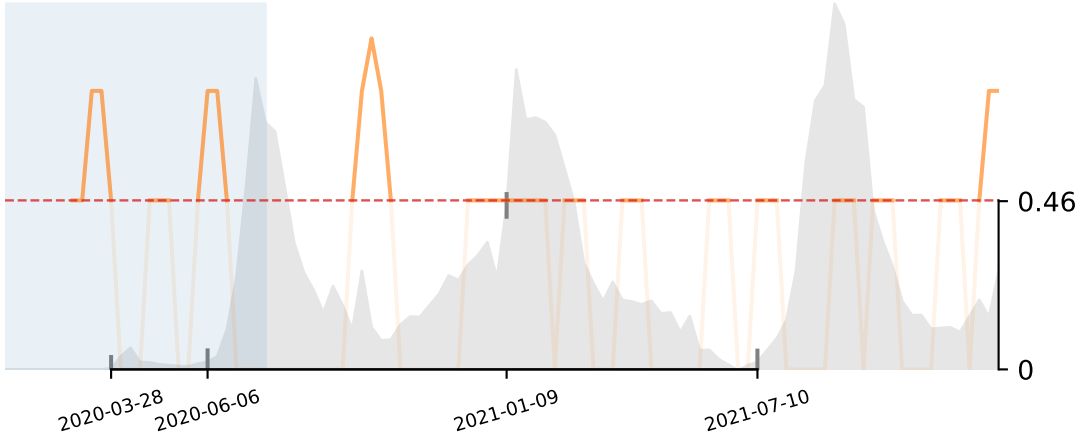
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who
(GT) fever



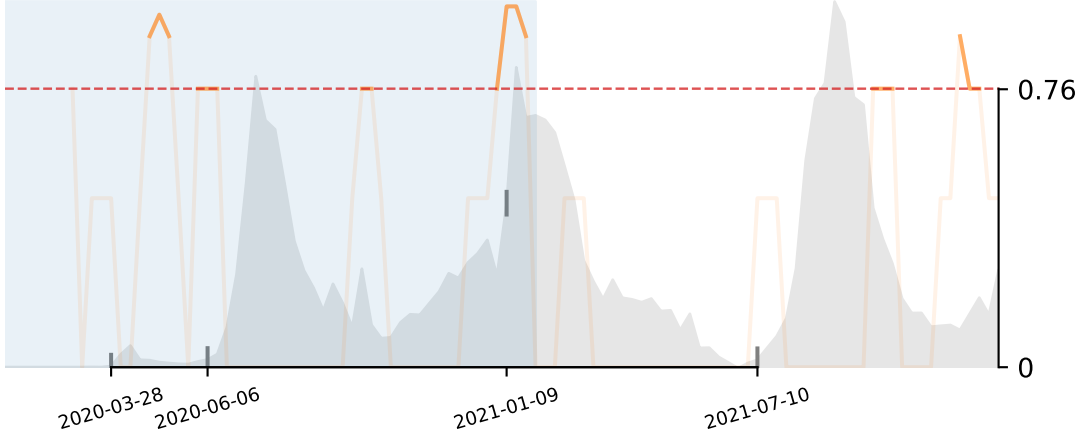
Model 2

(GT) covid symptoms
(GT) fever
Apple Mobility (transit)



Model 3

(GT) covid symptoms
Apple Mobility (transit)
(GT) Chronic pain
(GT) Diarrhea
(GT) Fatigue
Apple Mobility (driving)



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	1	3
0.91	1	0	0	0	5	2
0.76	1	0	0	3	11	0
0.46	1	1	0	3	38	0
0.00	1	2	0	3	68	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	0	1	2
0.76	0	0	2	0	5	2
0.46	2	1	0	2	29	0
0.00	2	4	0	2	62	0

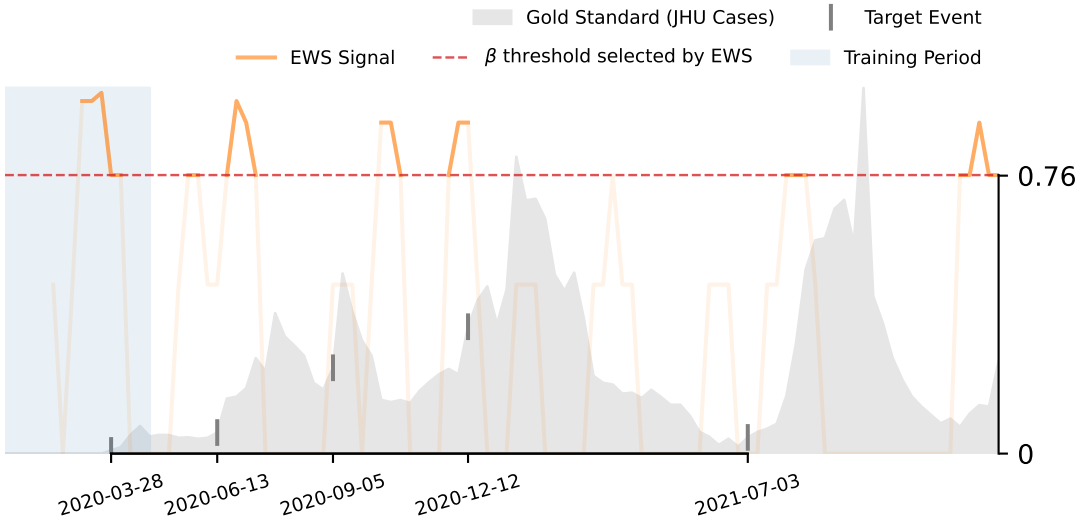
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	1	1	2	0	0	1
0.91	1	2	2	0	1	1
0.76	2	4	1	0	6	1
0.46	3	7	0	1	15	0
0.00	3	10	0	1	41	0

SC, Richland

Proxies selected by the Multiple Sources method

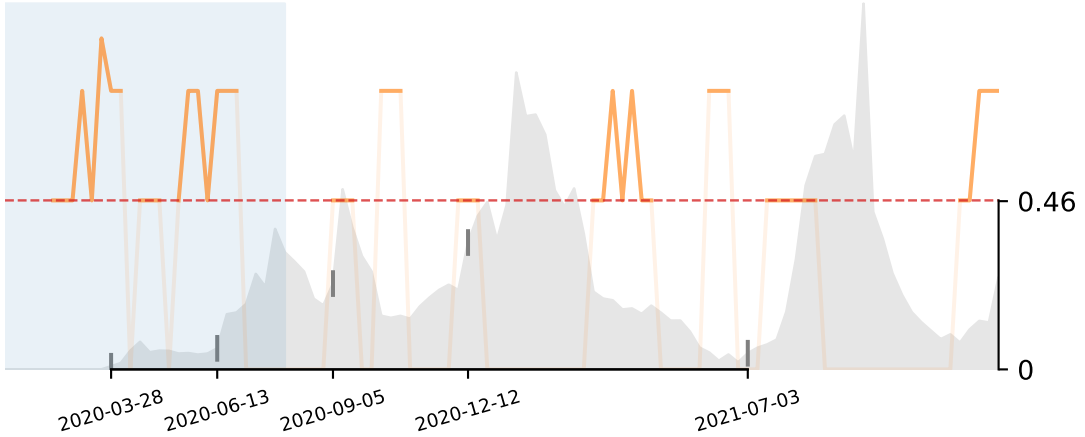
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
up2date
(GT) Chest pain



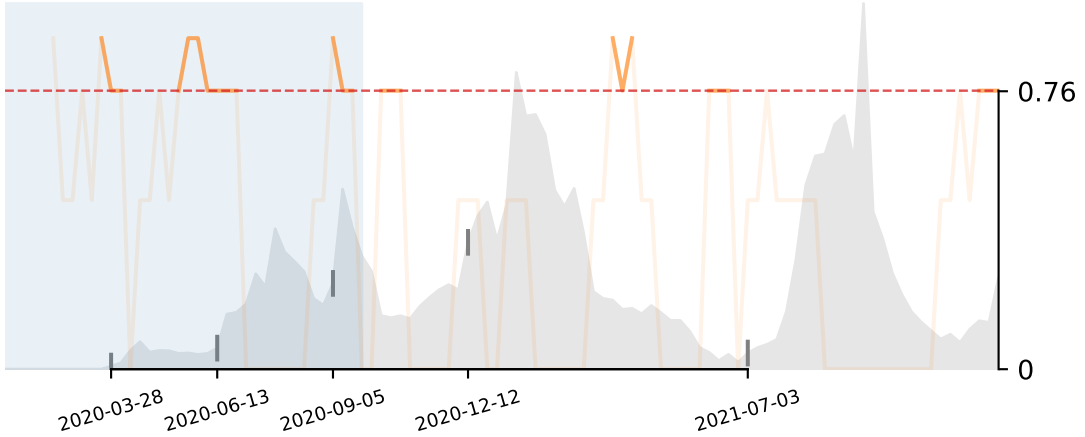
Model 2

(GT) covid
(GT) covid symptoms
(GT) Chest pain
(GT) Chronic pain



Model 3

(GT) Chest pain
(GT) covid
(GT) covid symptoms
(GT) Chills
(GT) Chronic pain
(GT) Fatigue



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	1	0	0	0	1	3
0.91	1	0	0	1	5	2
0.76	1	0	0	2	16	2
0.46	1	1	0	4	30	0
0.00	1	2	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	3
0.91	0	0	2	0	0	3
0.76	1	0	1	1	8	2
0.46	2	3	0	3	24	0
0.00	2	8	0	3	55	0

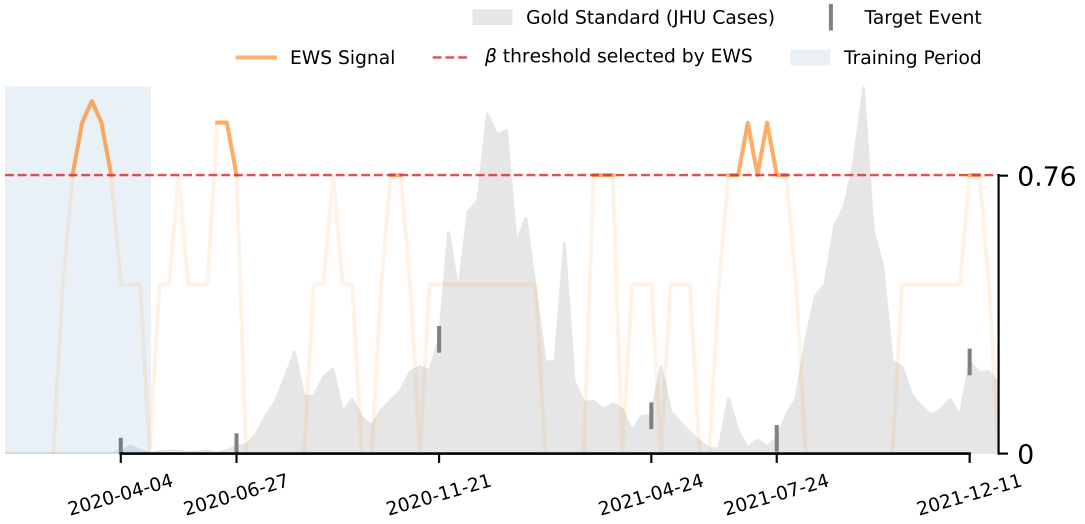
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	0	0	3	0	2	2
0.76	3	1	0	1	11	1
0.46	3	7	0	2	28	0
0.00	3	11	0	2	52	0

TN, Blount

Proxies selected by the Multiple Sources method

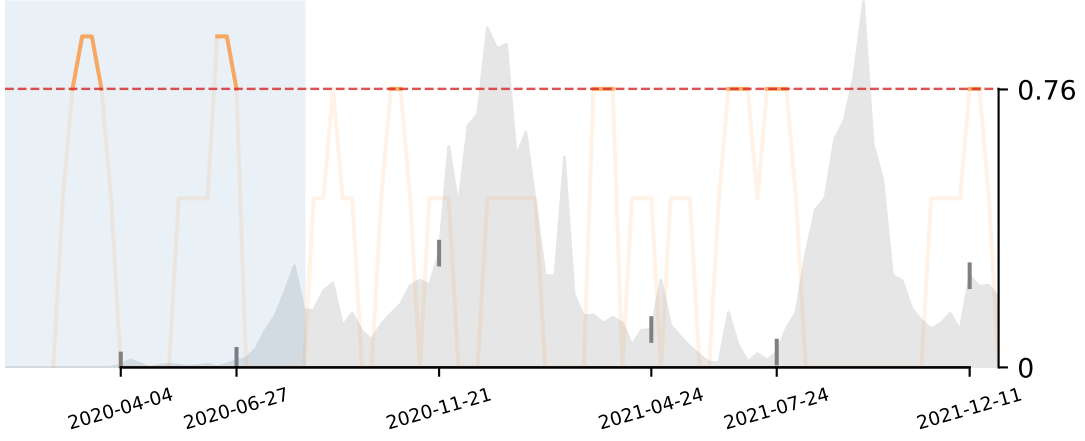
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) covid-19 who
(GT) fever
(GT) Diarrhea



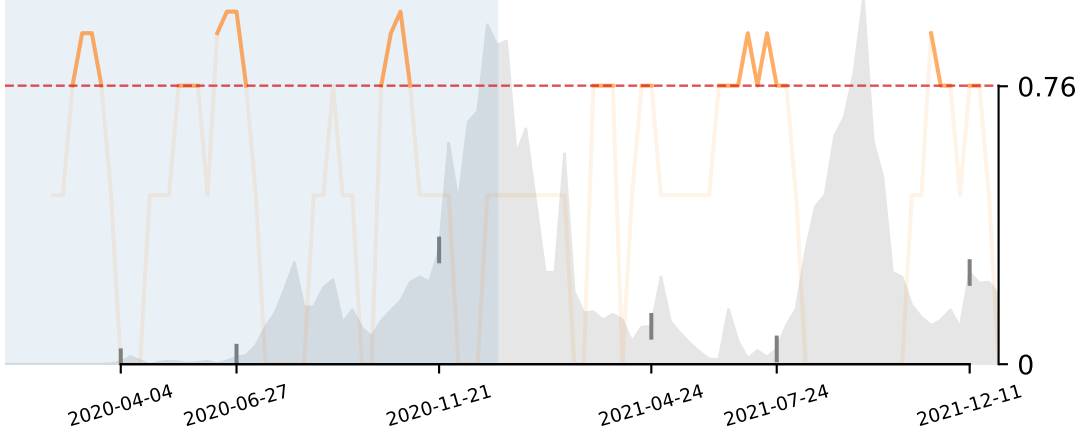
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) fever



Model 3

(GT) covid
(GT) covid symptoms
(GT) fever
(GT) covid-19
(GT) Abdominal pain
(GT) Fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	0	0	5
0.91	1	0	0	2	0	3
0.76	1	0	0	5	3	0
0.46	1	1	0	5	25	0
0.00	1	4	0	5	53	0

	tp	fp	fn	tp	fp	fn
β						
0.96	0	0	2	0	0	4
0.91	0	0	2	0	0	4
0.76	2	0	0	4	3	0
0.46	2	1	0	4	19	0
0.00	2	4	0	4	44	0

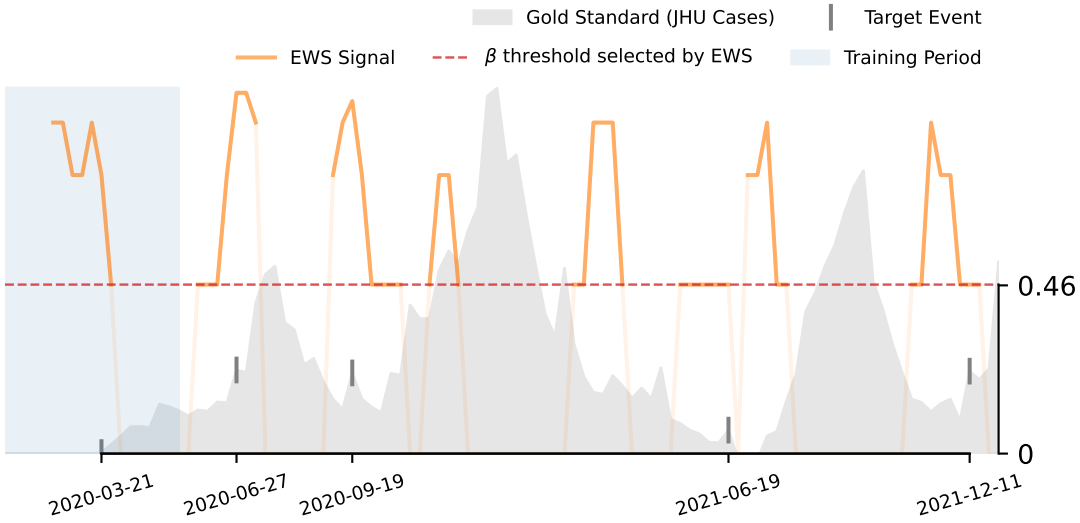
	tp	fp	fn	tp	fp	fn
β						
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	0	3	0	0	3
0.91	2	0	1	2	0	1
0.76	3	1	0	3	2	0
0.46	3	7	0	3	17	0
0.00	3	20	0	3	31	0

TN, Davidson

Proxies selected by the Multiple Sources method

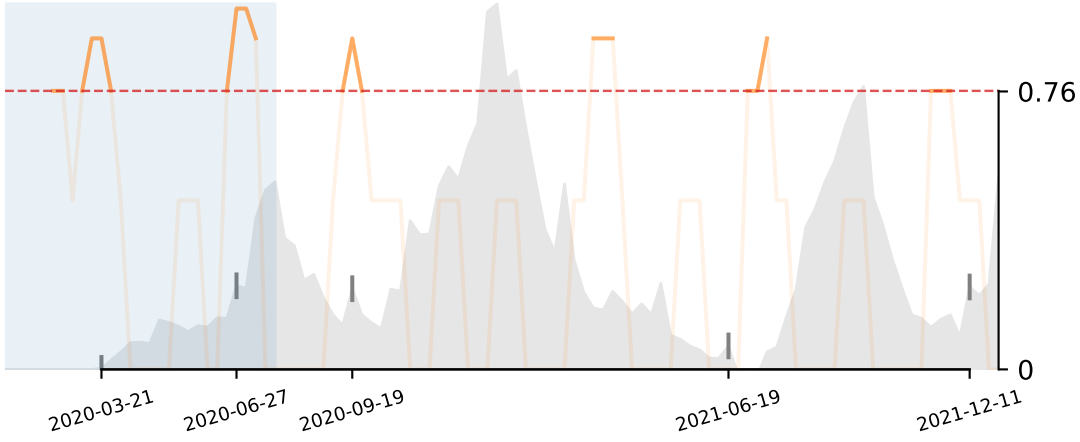
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Bronchitis
(GT) Chest pain



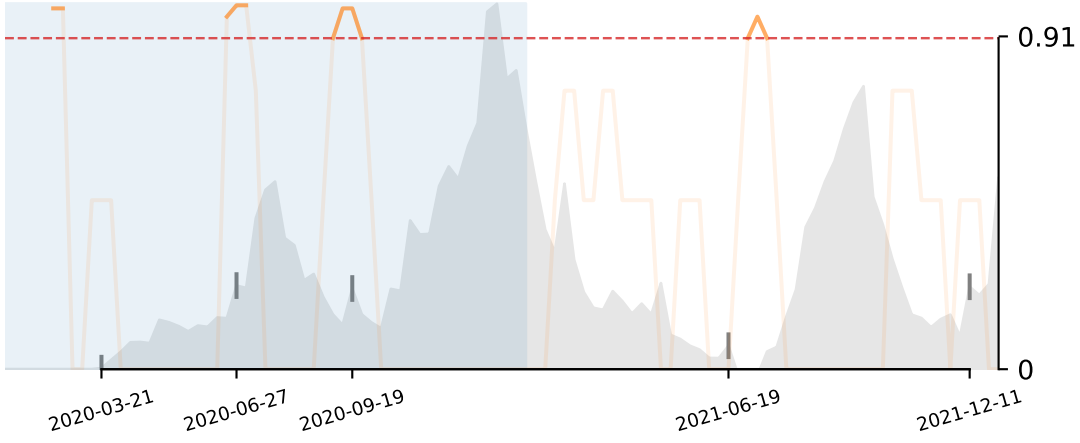
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) Acute bronchitis
(GT) Bronchitis



Model 3

(GT) covid symptoms
(GT) Acute bronchitis
(GT) Bronchitis
(GT) Cough
(GT) Nasal congestion
(GT) Pneumonia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	1	3
0.96	0	0	1	2	1	2
0.91	0	0	1	3	6	1
0.76	1	1	0	3	11	0
0.46	1	1	0	4	23	0
0.00	1	2	0	4	58	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	1	1	0	0	3
0.91	1	1	1	1	4	2
0.76	2	2	0	2	7	0
0.46	2	4	0	3	26	0
0.00	2	7	0	3	54	0

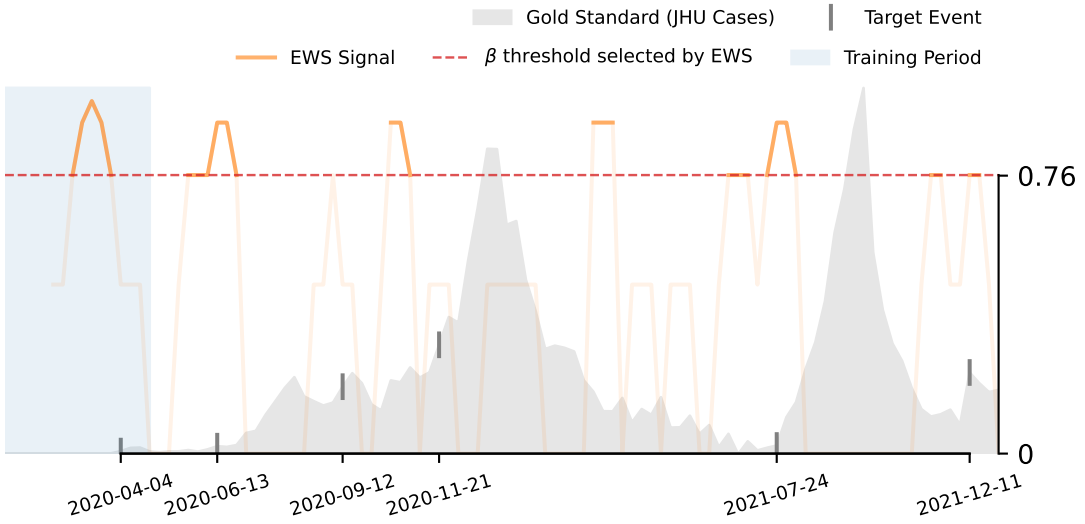
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	1	2	0	0	2
0.96	3	2	0	0	1	2
0.91	3	2	0	0	3	1
0.76	3	3	0	1	9	0
0.46	3	4	0	2	19	0
0.00	3	6	0	2	35	0

TN, Knox

Proxies selected by the Multiple Sources method

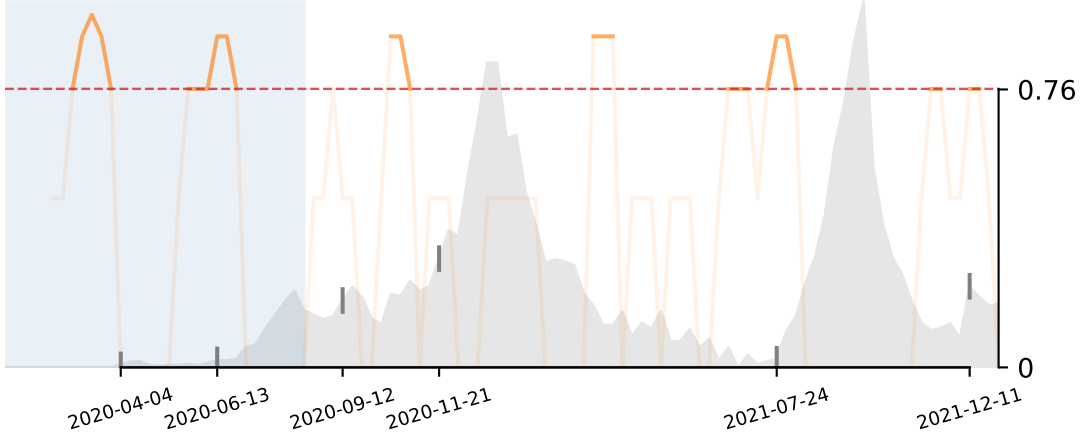
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) covid-19 who
(GT) fever
(GT) Chills



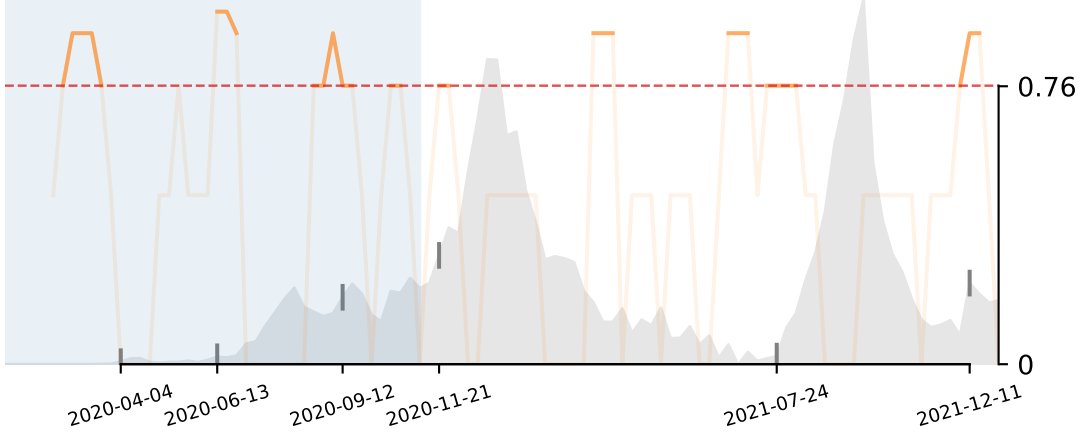
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Chills



Model 3

(GT) covid symptoms
(GT) fever
(GT) covid-19
(GT) Diarrhea
(GT) covid
(GT) chest pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	0	0	5
0.91	1	0	0	3	5	2
0.76	1	0	0	5	8	0
0.46	1	1	0	5	23	0
0.00	1	5	0	5	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	4
0.96	0	0	2	0	0	4
0.91	1	0	1	2	4	2
0.76	2	1	0	4	6	0
0.46	2	3	0	4	21	0
0.00	2	5	0	4	47	0

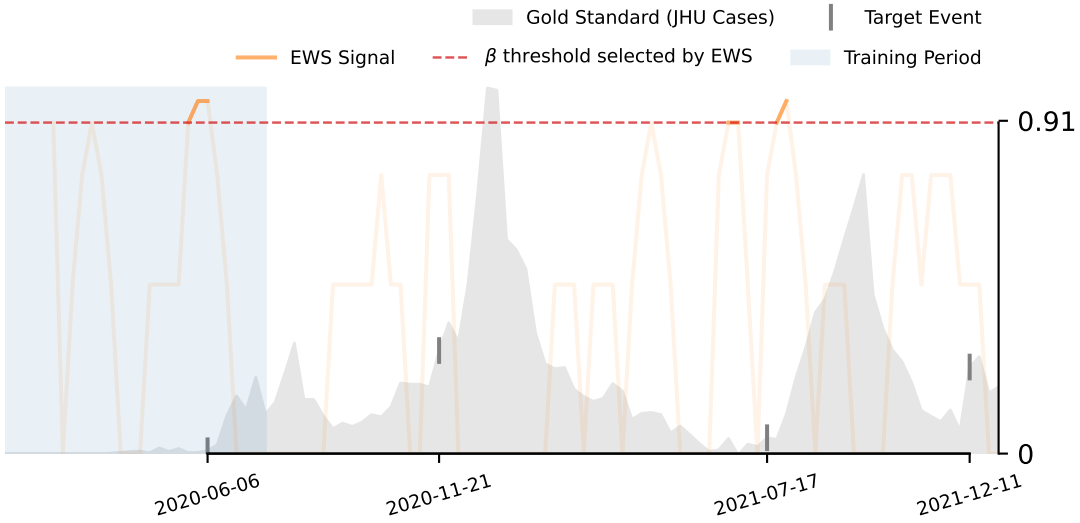
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	0	3	0	0	3
0.91	1	1	2	2	4	1
0.76	3	3	0	3	7	0
0.46	3	7	0	3	28	0
0.00	3	13	0	3	44	0

TN, Sevier

Proxies selected by the Multiple Sources method

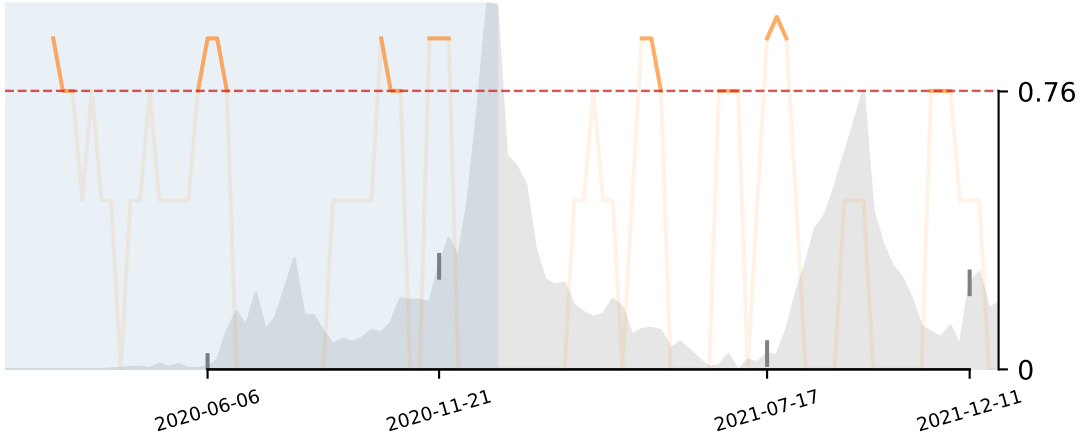
Model 1

(GT) covid
(GT) covid symptoms
(GT) Diarrhea
(GT) Dizziness
(GT) Fatigue
(GT) Nasal congestion



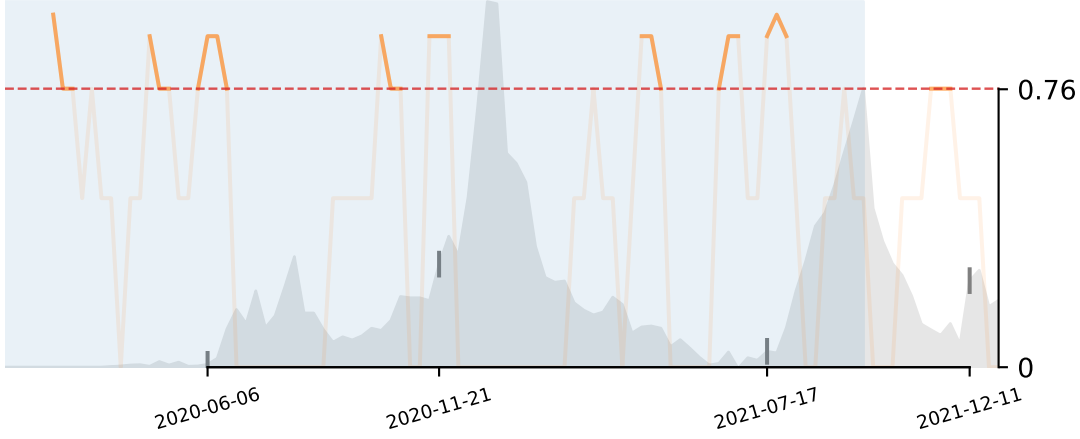
Model 2

(GT) covid
(GT) Vomiting
(GT) covid symptoms
(GT) Abdominal pain
(GT) Fatigue



Model 3

(GT) covid
(GT) Abdominal pain
(GT) Fatigue
(GT) Vomiting
(GT) covid symptoms
(GT) Diarrhea



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	1	2
0.91	1	0	0	1	3	2
0.76	1	2	0	3	8	0
0.46	1	5	0	3	27	0
0.00	1	10	0	3	55	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	2
0.96	0	0	2	0	1	1
0.91	0	0	2	1	4	1
0.76	2	4	0	2	6	0
0.46	2	10	0	2	16	0
0.00	2	21	0	2	38	0

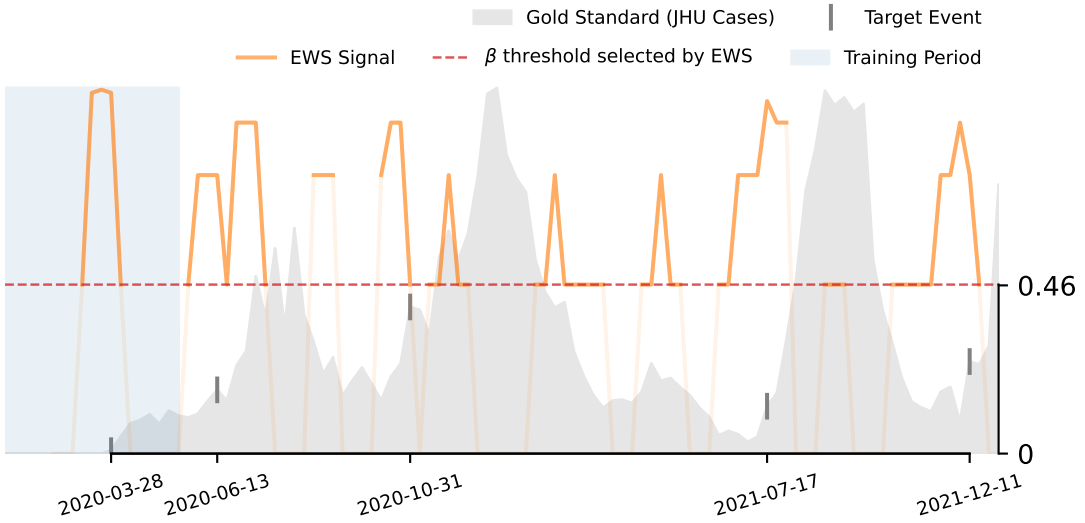
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	0	2	3	0	0	1
0.76	3	9	0	1	0	0
0.46	3	19	0	1	2	0
0.00	3	39	0	1	7	0

TN, Shelby

Proxies selected by the Multiple Sources method

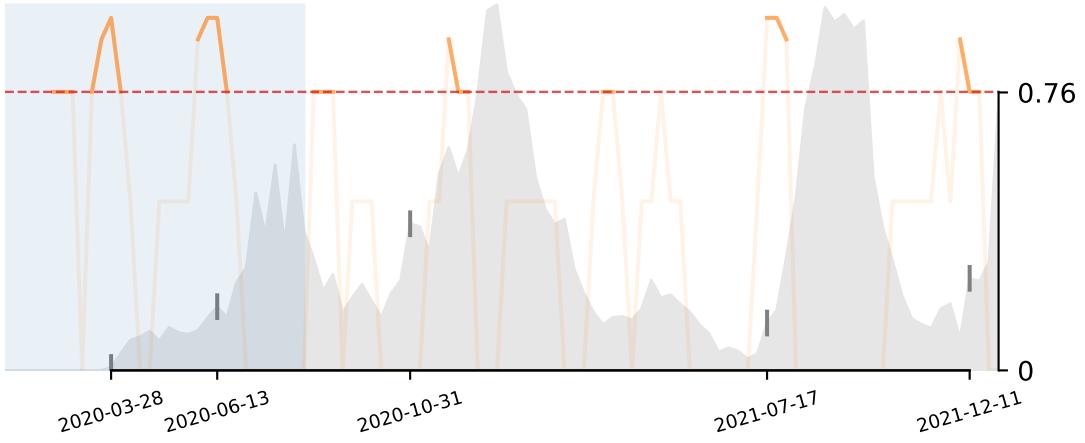
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



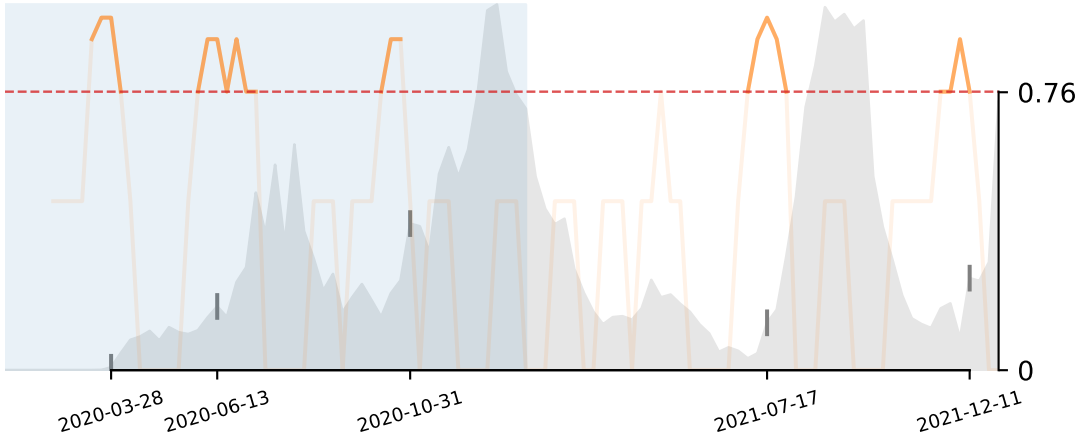
Model 2

(GT) covid-19
(GT) chest pain
(GT) fever
(GT) Ageusia
(GT) Diarrhea
(GT) Fatigue



Model 3

(GT) Ageusia
(GT) Otitis
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) quarantine



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	1	0	0	0	0	4
0.96	1	0	0	1	0	3
0.91	1	0	0	3	5	0
0.76	1	0	0	4	11	0
0.46	1	0	0	4	34	0
0.00	1	1	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	1	1	2
0.91	2	0	0	2	3	1
0.76	2	0	0	2	12	1
0.46	2	4	0	3	28	0
0.00	2	8	0	3	51	0

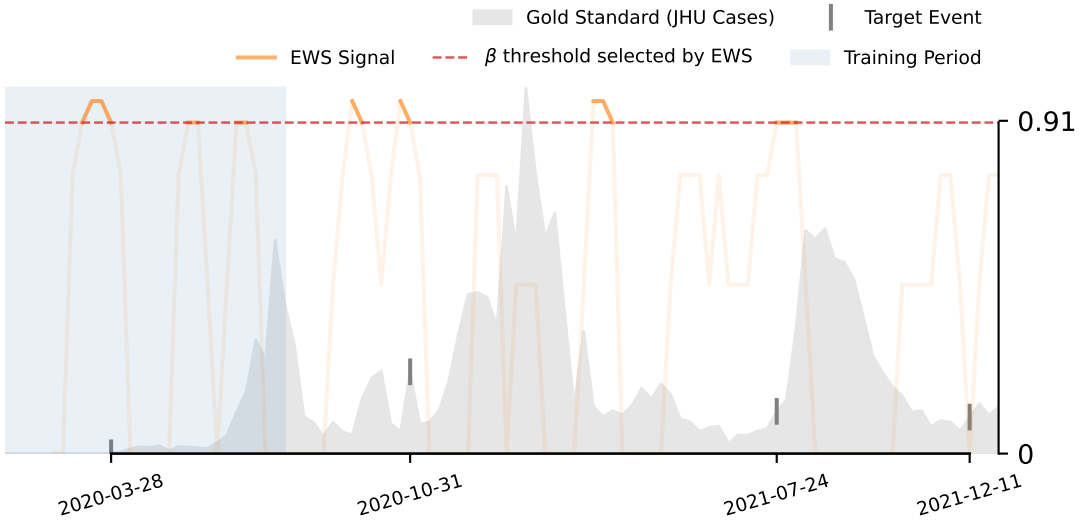
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	1	0	1
0.91	1	0	2	2	1	0
0.76	3	1	0	2	3	0
0.46	3	5	0	2	19	0
0.00	3	19	0	2	35	0

TX, Bexar

Proxies selected by the Multiple Sources method

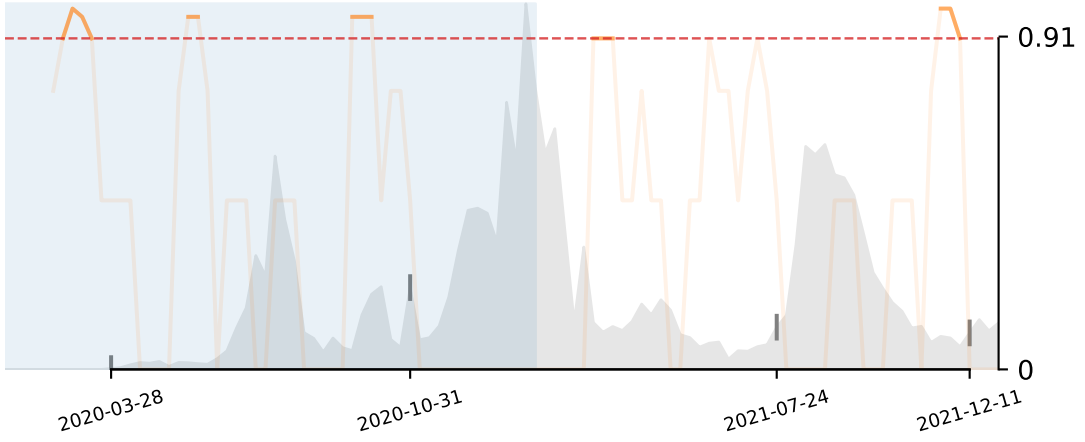
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



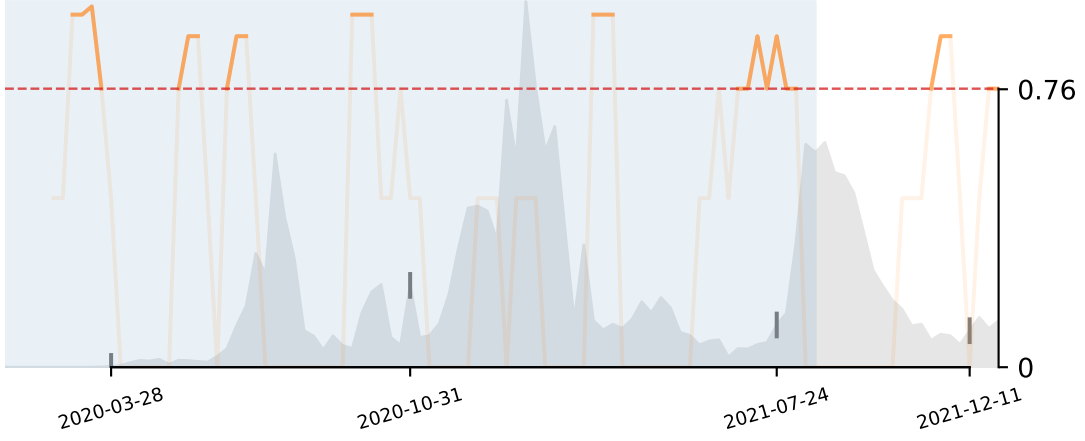
Model 2

(GT) covid
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia
(GT) Asphyxia
(GT) Asthma



Model 3

(GT) covid
(GT) covid symptoms
(GT) quarantine
(GT) Asthma
(GT) covid-19
(GT) Otitis



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	2	2
0.91	1	0	0	2	5	1
0.76	1	4	0	3	15	0
0.46	1	7	0	3	25	0
0.00	1	9	0	3	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	1	0	1
0.96	1	0	1	1	0	1
0.91	2	4	0	2	4	0
0.76	2	5	0	2	5	0
0.46	2	8	0	2	16	0
0.00	2	16	0	2	34	0

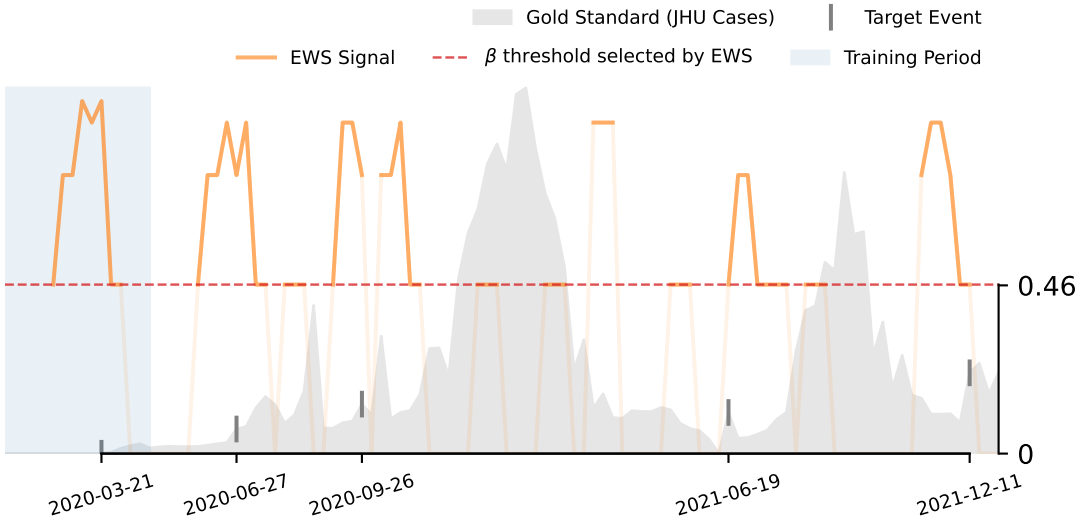
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	1	0	2	0	0	1
0.91	2	5	1	1	0	0
0.76	3	9	0	1	2	0
0.46	3	14	0	1	4	0
0.00	3	28	0	1	12	0

TX, Collin

Proxies selected by the Multiple Sources method

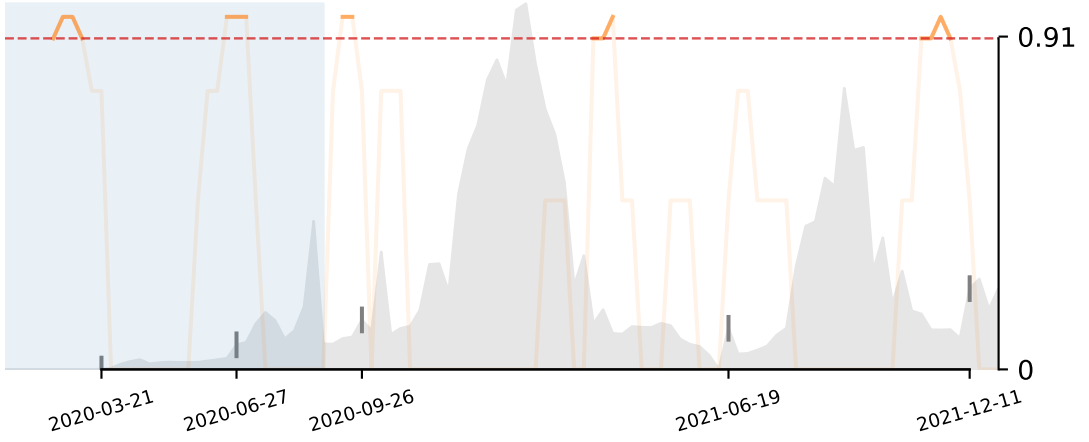
Model 1

(GT) covid
(GT) covid-19
(GT) loss taste
(GT) chest pain
(GT) covid symptoms
(GT) sars-cov-2



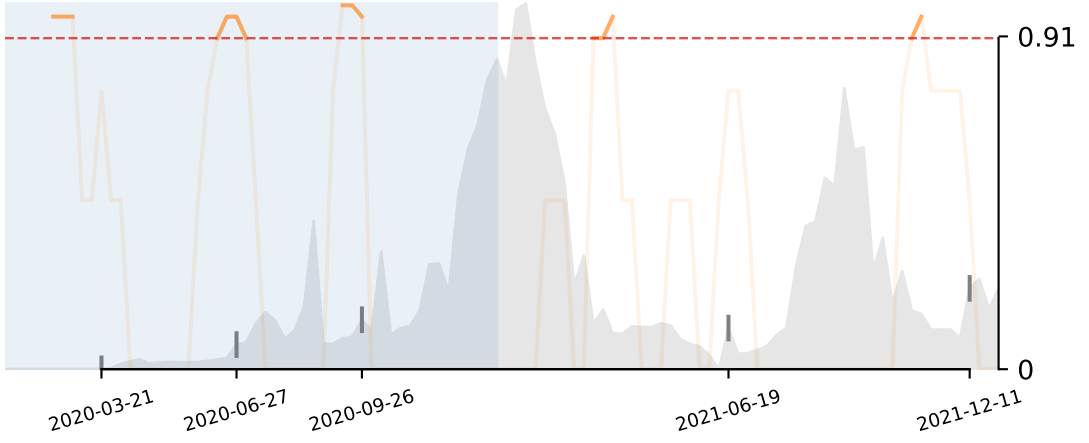
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Anosmia



Model 3

(GT) chest pain
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Anosmia
(GT) Bronchitis
(GT) Chills



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	0	4
0.91	1	0	0	3	5	1
0.76	1	0	0	3	9	0
0.46	1	0	0	4	28	0
0.00	1	3	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	2	1	1
0.91	2	1	0	2	3	1
0.76	2	2	0	2	8	0
0.46	2	2	0	3	18	0
0.00	2	3	0	3	52	0

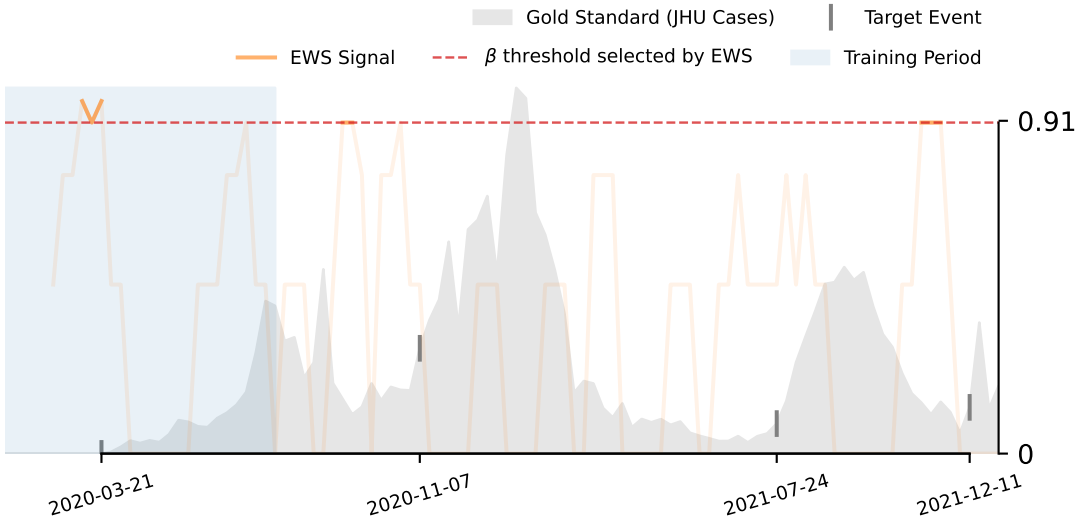
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	1	0	2	1	1	1
0.91	3	1	0	1	3	1
0.76	3	2	0	2	5	0
0.46	3	2	0	2	11	0
0.00	3	5	0	2	38	0

TX, Dallas

Proxies selected by the Multiple Sources method

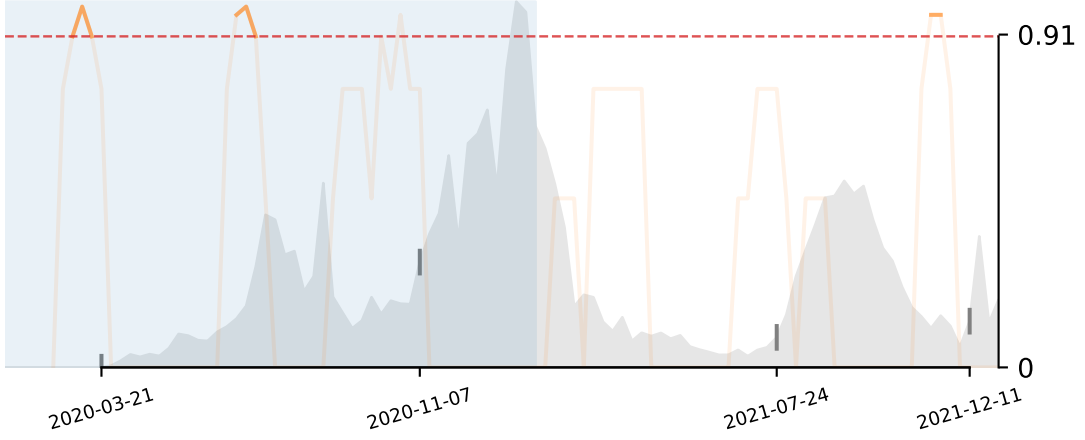
Model 1

(GT) sars-cov-2
(GT) Hyperventilation
(GT) covid
(GT) covid-19
(GT) loss taste
(GT) chest pain



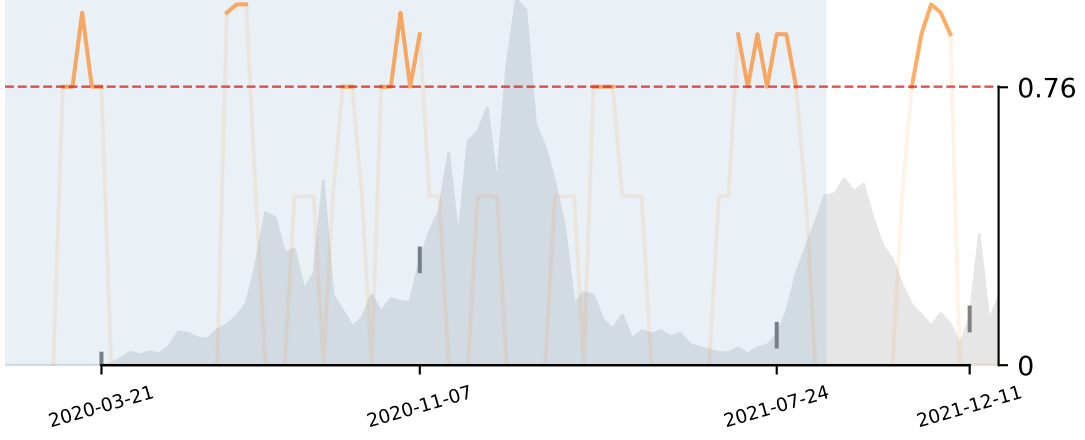
Model 2

(GT) covid
(GT) covid-19
(GT) Viral pneumonia
(GT) loss taste
(GT) Burning Chest Pain



Model 3

(GT) covid
(GT) covid-19
(GT) Burning Chest Pain
(GT) loss smell
(GT) loss of smell
(GT) Hyperventilation



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	0	3
0.91	1	0	0	2	2	1
0.76	1	1	0	3	7	0
0.46	1	3	0	3	24	0
0.00	1	11	0	3	54	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	2
0.96	1	1	1	1	0	1
0.91	2	2	0	1	0	1
0.76	2	3	0	2	6	0
0.46	2	7	0	2	13	0
0.00	2	10	0	2	34	0

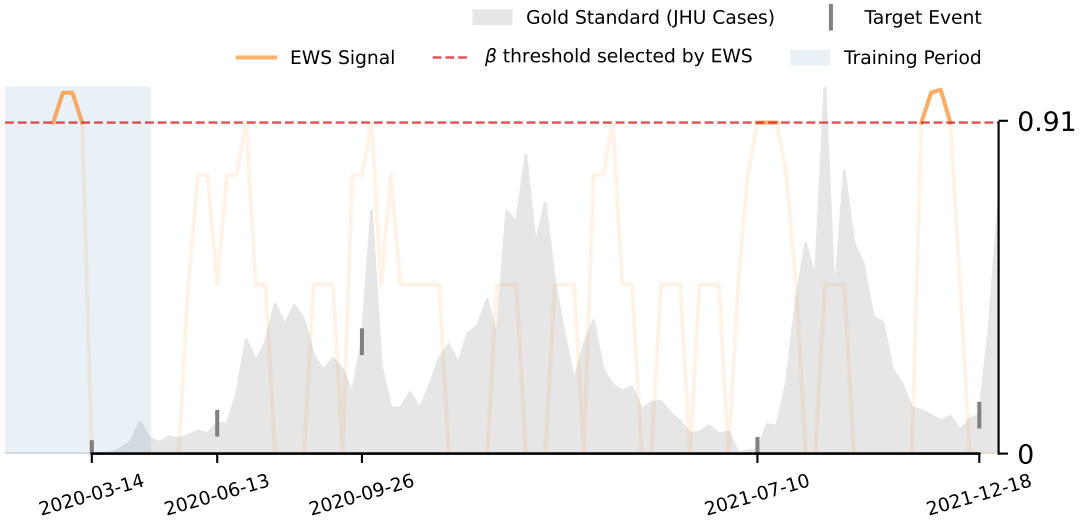
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	1	0	0
0.96	0	2	3	1	0	0
0.91	2	3	1	1	0	0
0.76	3	4	0	1	0	0
0.46	3	10	0	1	1	0
0.00	3	30	0	1	11	0

TX, Harris

Proxies selected by the Multiple Sources method

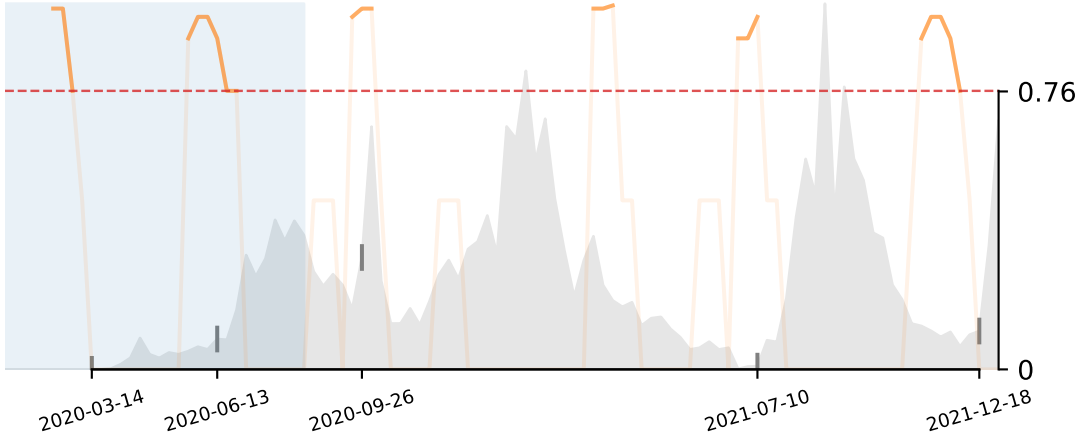
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



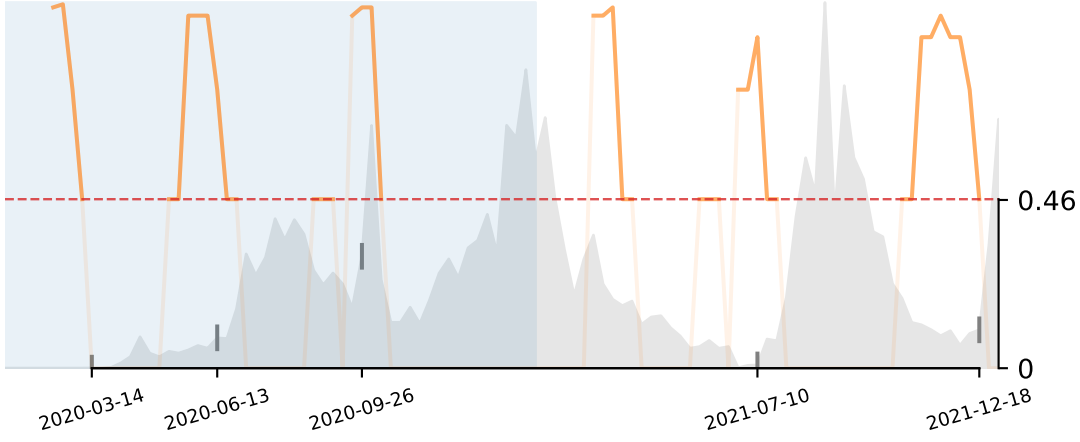
Model 2

(GT) covid symptoms
(GT) fever
(GT) Ageusia
(GT) Anosmia
(GT) Chills
(GT) Cough



Model 3

(GT) covid symptoms
(GT) fever
(GT) Ageusia
(GT) Anosmia
(GT) Cough
(GT) Diarrhea



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	1	0	3
0.99	0	0	1	1	0	3
0.96	1	0	0	1	0	3
0.91	1	0	0	2	5	1
0.76	1	0	0	4	11	0
0.46	1	0	0	4	34	0
0.00	1	0	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	1	3
0.99	0	0	2	1	4	2
0.96	1	0	1	3	4	0
0.91	2	0	0	3	4	0
0.76	2	0	0	3	4	0
0.46	2	2	0	3	13	0
0.00	2	2	0	3	52	0

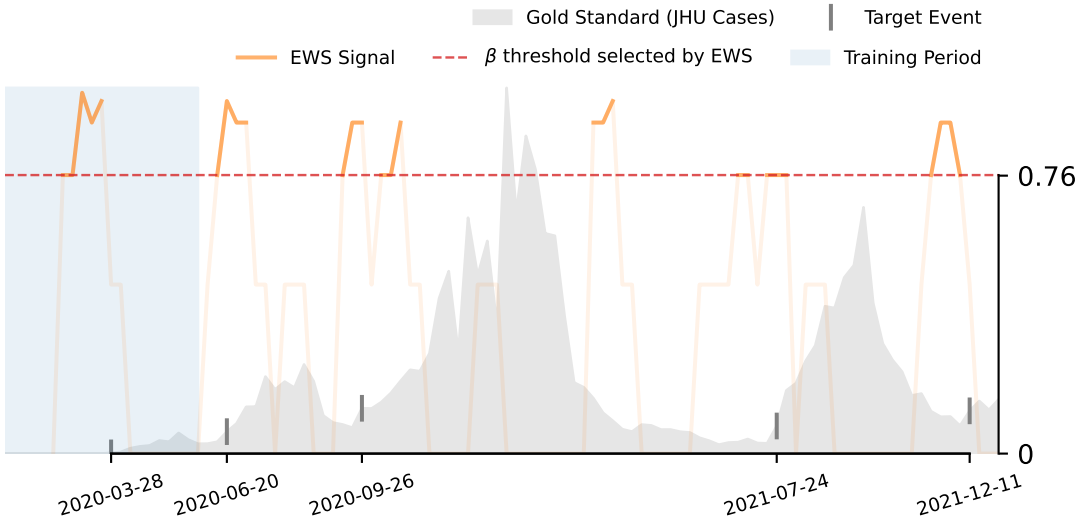
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	1	2
0.96	2	1	1	1	3	1
0.91	3	1	0	2	3	0
0.76	3	1	0	2	3	0
0.46	3	1	0	2	9	0
0.00	3	6	0	2	34	0

TX, Tarrant

Proxies selected by the Multiple Sources method

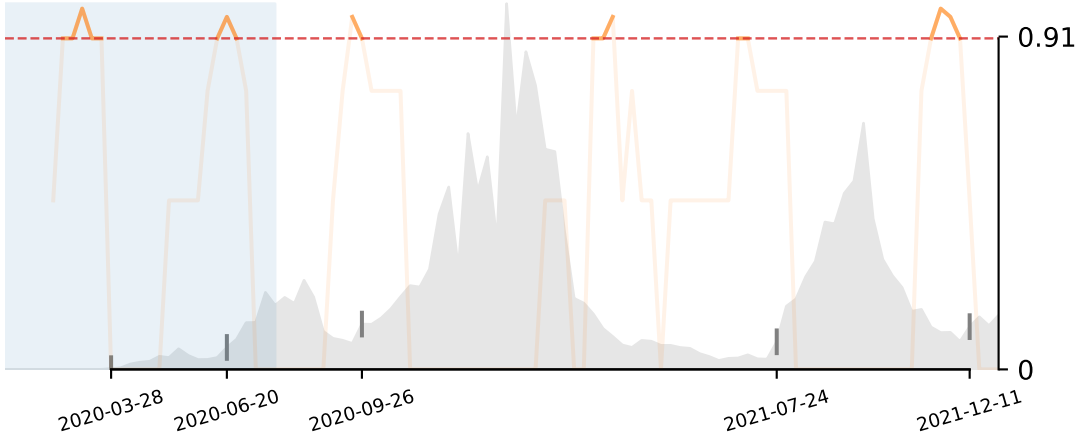
Model 1

(GT) covid
(GT) covid-19
(GT) loss taste
(GT) covid symptoms
(GT) sars-cov-2
(GT) Anosmia



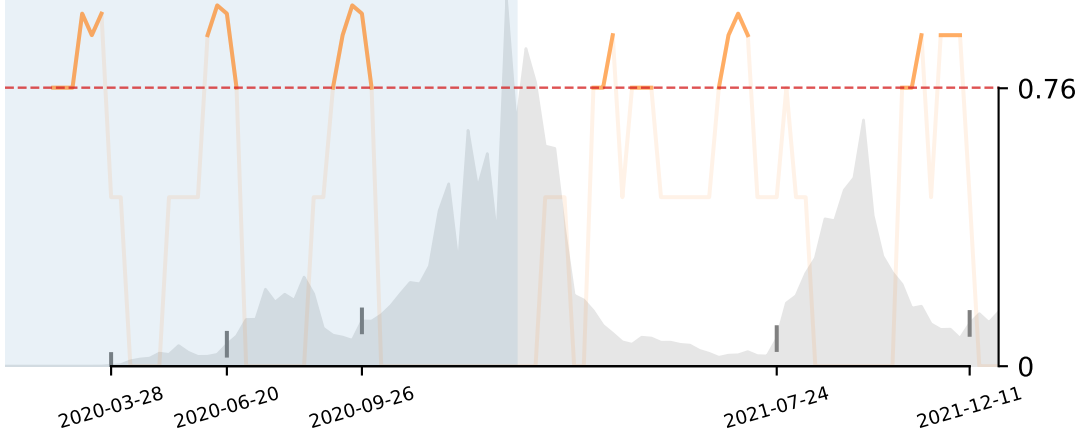
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia



Model 3

(GT) chest pain
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia
(GT) Hyperventilation
(GT) Chills



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	1	0	0	1	1	3
0.91	1	0	0	3	6	1
0.76	1	0	0	4	9	0
0.46	1	1	0	4	26	0
0.00	1	2	0	4	59	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	1	0	2
0.96	1	0	1	2	1	1
0.91	2	0	0	3	3	0
0.76	2	2	0	3	9	0
0.46	2	3	0	3	20	0
0.00	2	6	0	3	54	0

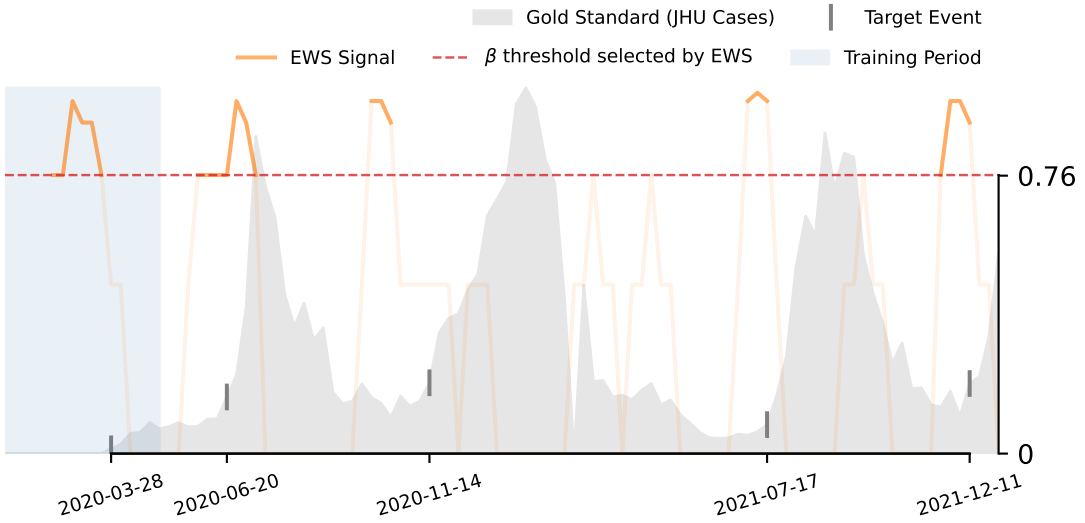
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	2	0	1	1	0	1
0.91	3	0	0	2	1	0
0.76	3	0	0	2	8	0
0.46	3	4	0	2	20	0
0.00	3	8	0	2	36	0

TX, Travis

Proxies selected by the Multiple Sources method

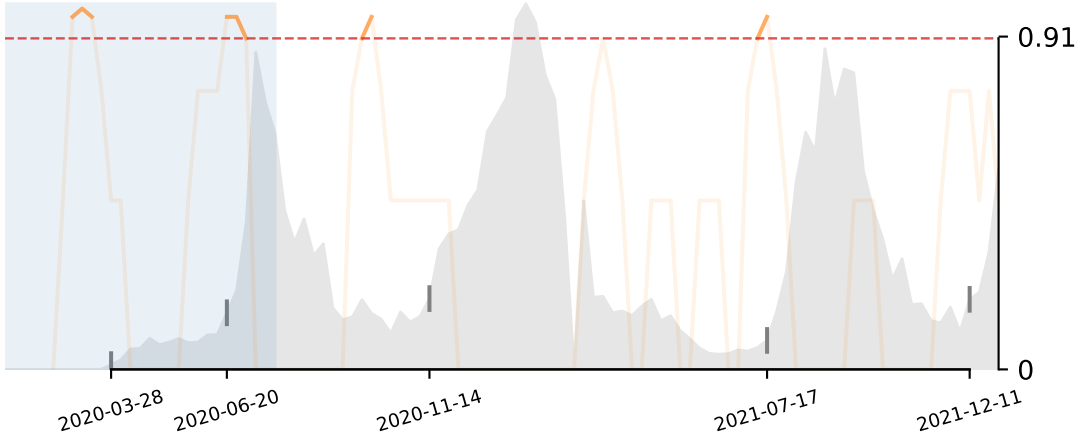
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who
(GT) fever



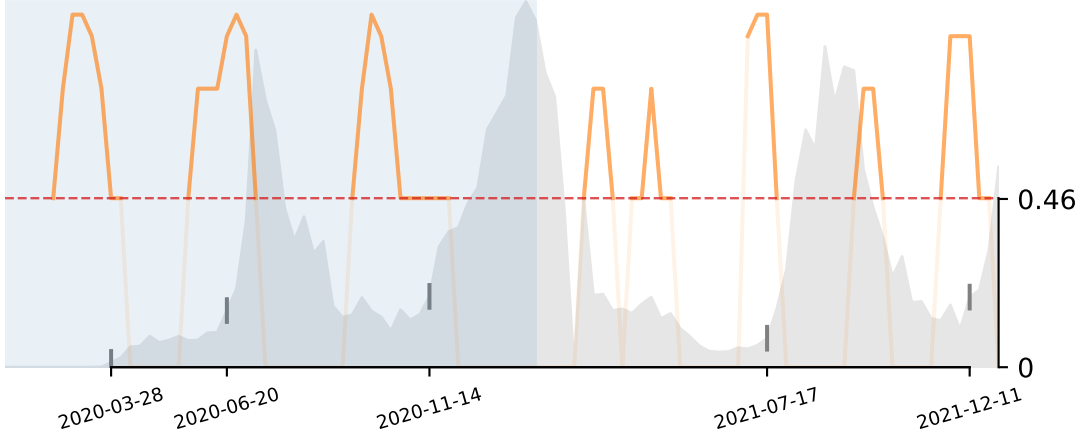
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) covid-19 who
(GT) Acute bronchitis
(GT) Anosmia



Model 3

(GT) covid
(GT) covid-19
(GT) covid-19 who
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	3	1	0
0.91	1	0	0	3	2	0
0.76	1	0	0	4	6	0
0.46	1	2	0	4	27	0
0.00	1	3	0	4	59	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	2	0	1
0.91	2	1	0	2	2	1
0.76	2	2	0	3	7	0
0.46	2	2	0	3	21	0
0.00	2	4	0	3	54	0

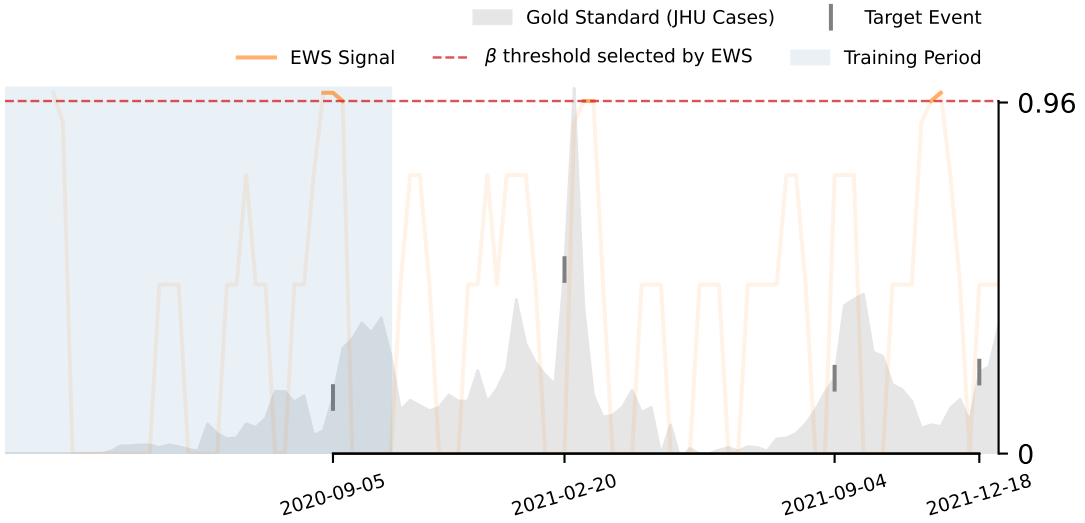
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	1	0	1
0.91	1	2	2	2	0	0
0.76	2	4	1	2	5	0
0.46	3	6	0	2	16	0
0.00	3	12	0	2	34	0

VA, Charlottesville

Proxies selected by the Multiple Sources method

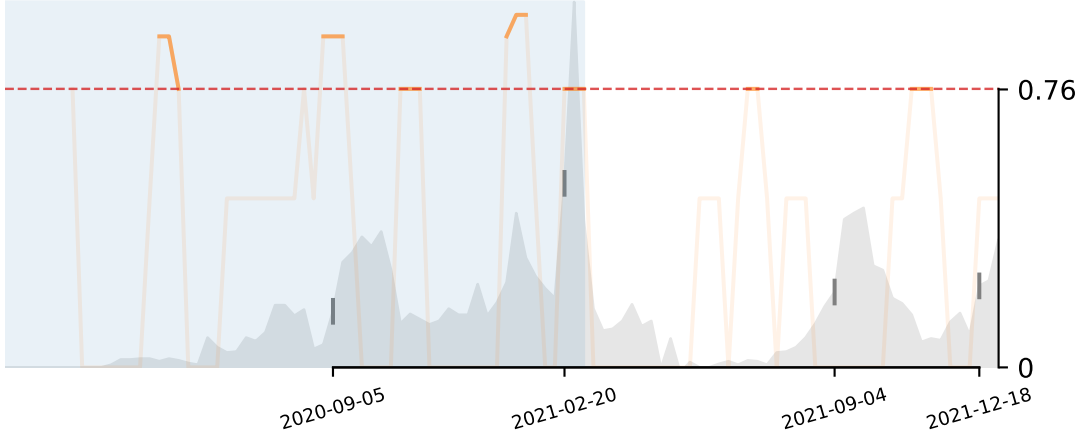
Model 1

(GT) Abdominal pain
(GT) Chest pain
(GT) Nasal congestion
(GT) Vertigo
(GT) Cough
(GT) Diarrhea



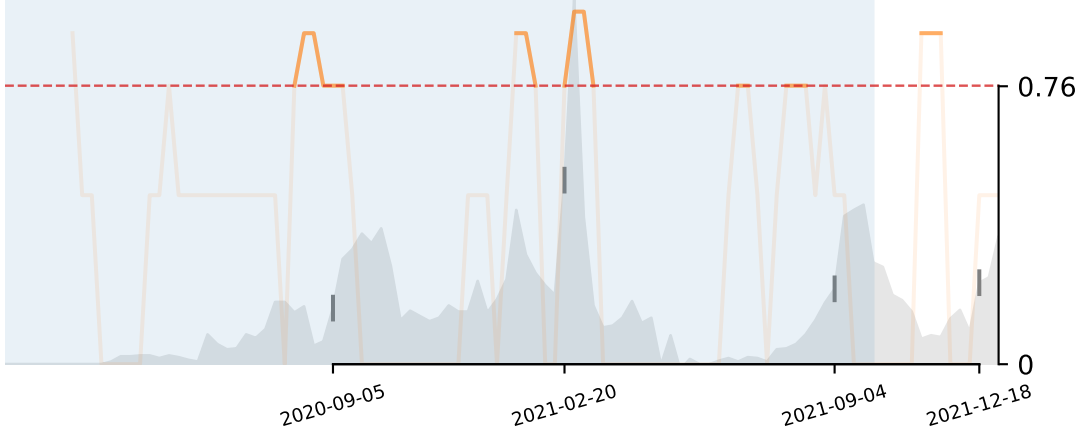
Model 2

(GT) Cough
(GT) Otitis
Apple Mobility (transit)
(GT) Diarrhea
(GT) Vomiting



Model 3

(GT) Cough
Apple Mobility (transit)
(GT) Chest pain
(GT) Otitis
(GT) Pneumonia
(GT) Sore throat



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	1	0	2
0.96	1	1	0	1	2	1
0.91	1	2	0	1	3	1
0.76	1	3	0	3	8	0
0.46	1	4	0	3	28	0
0.00	1	11	0	3	42	0

β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	2
0.96	0	0	2	0	0	2
0.91	1	1	1	0	0	2
0.76	2	5	0	1	3	1
0.46	2	12	0	2	12	0
0.00	2	21	0	2	29	0

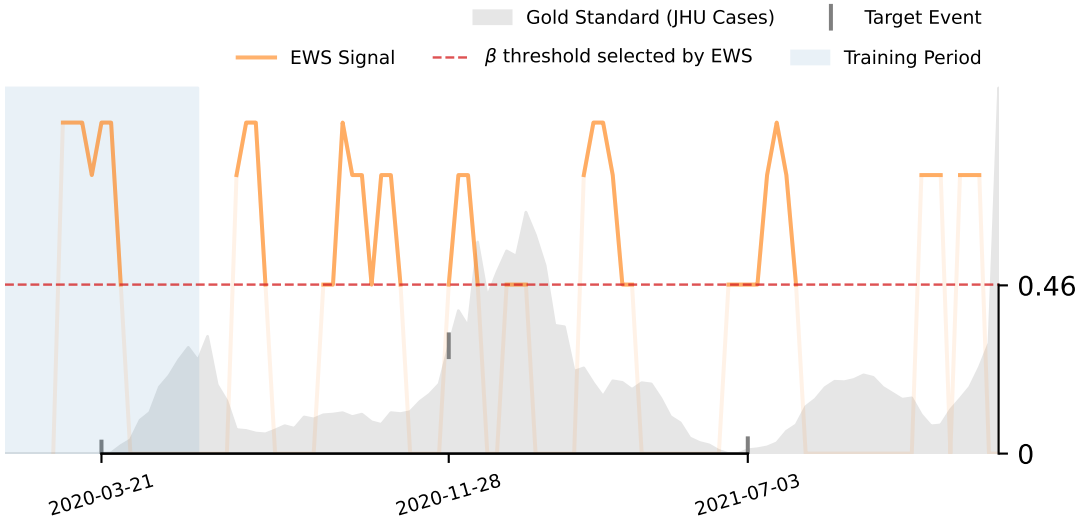
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	0	2	3	1	0	0
0.76	2	4	1	1	0	0
0.46	3	10	0	1	2	0
0.00	3	34	0	1	6	0

VA, Fairfax

Proxies selected by the Multiple Sources method

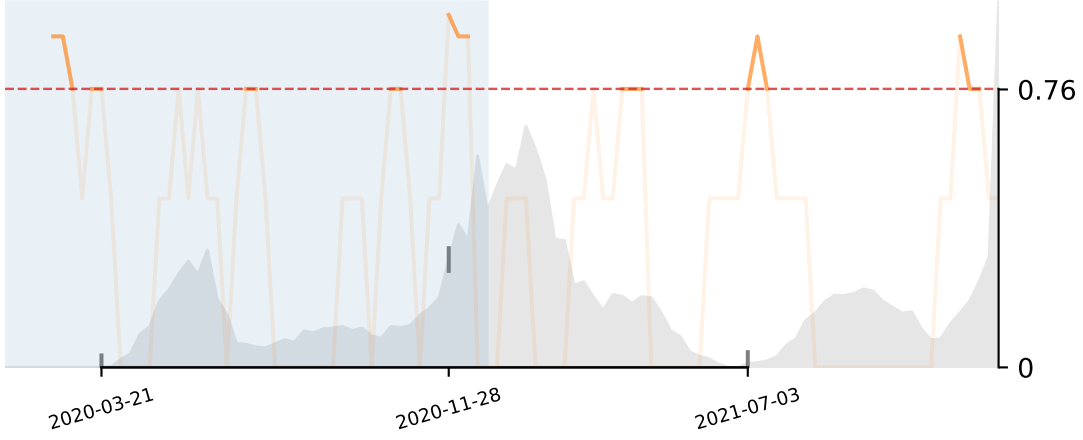
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid-19 who
(GT) sars-cov-2



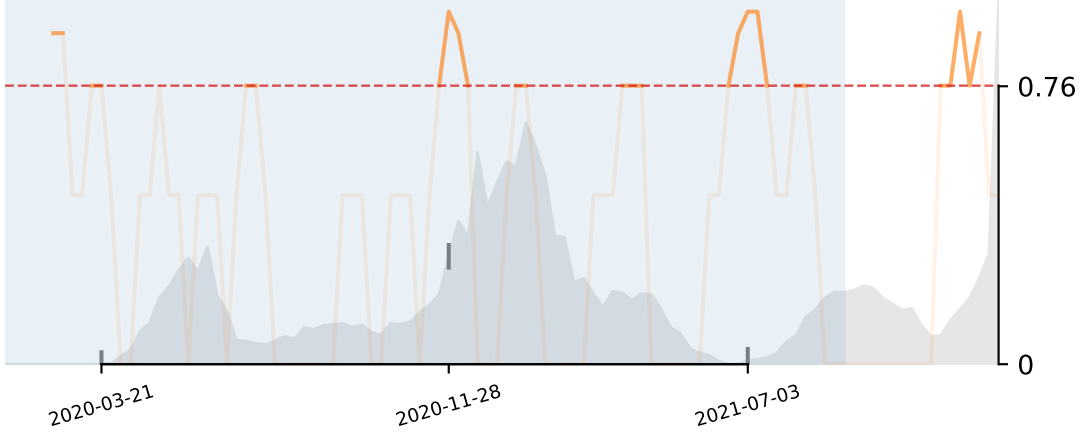
Model 2

(GT) covid symptoms
(GT) sars-cov-2
(GT) Chest pain
(GT) Ageusia
(GT) Otitis



Model 3

(GT) covid symptoms
(GT) Ageusia
(GT) Chest pain
(GT) loss of smell
(GT) sars-cov-2
(GT) Fatigue



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	2
0.99	0	0	1	0	0	2
0.96	0	0	1	0	0	2
0.91	0	0	1	0	6	2
0.76	1	1	0	1	22	0
0.46	1	1	0	2	34	0
0.00	1	2	0	2	69	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	1
0.96	0	0	2	0	0	1
0.91	1	0	1	0	2	0
0.76	2	3	0	1	9	0
0.46	2	9	0	1	24	0
0.00	2	21	0	1	46	0

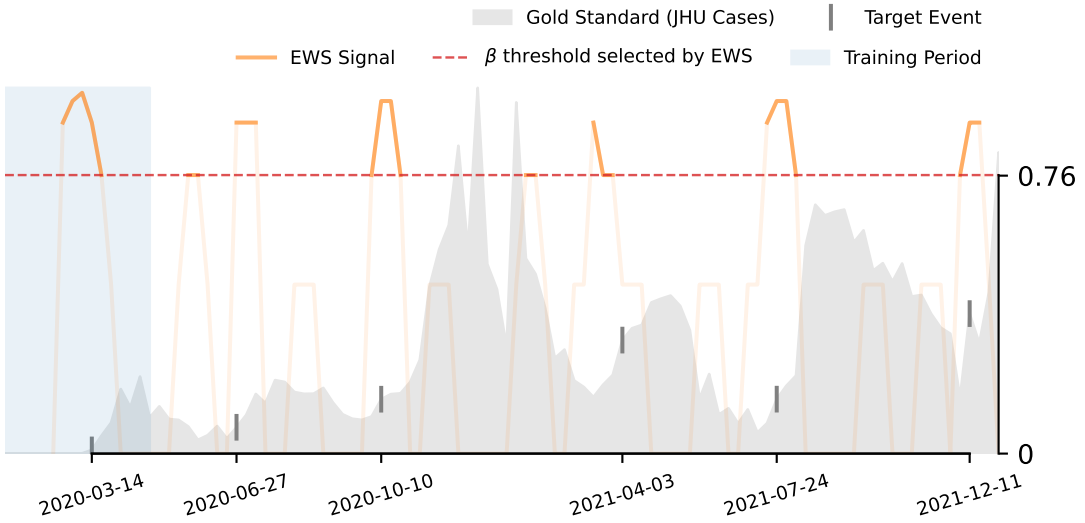
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	0
0.99	0	0	3	0	0	0
0.96	0	0	3	0	1	0
0.91	2	1	1	0	2	0
0.76	3	3	0	0	5	0
0.46	3	15	0	0	7	0
0.00	3	38	0	0	16	0

WA, King

Proxies selected by the Multiple Sources method

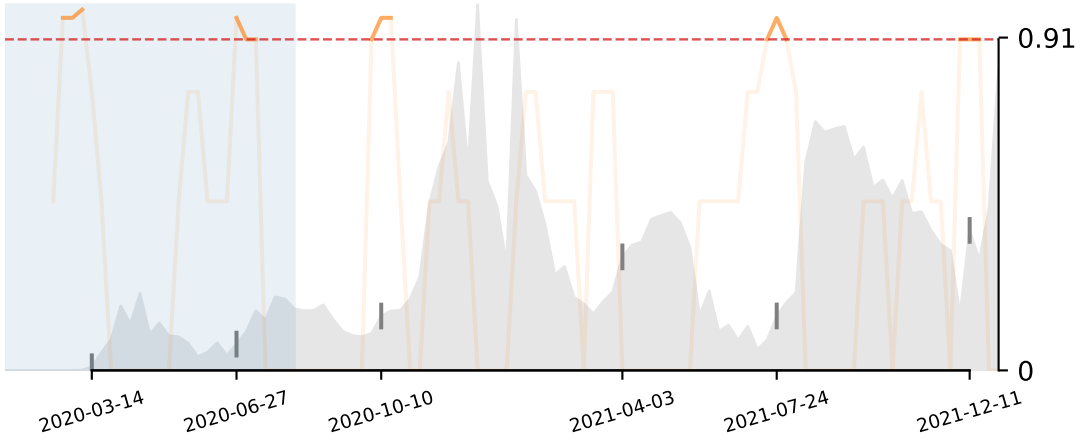
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



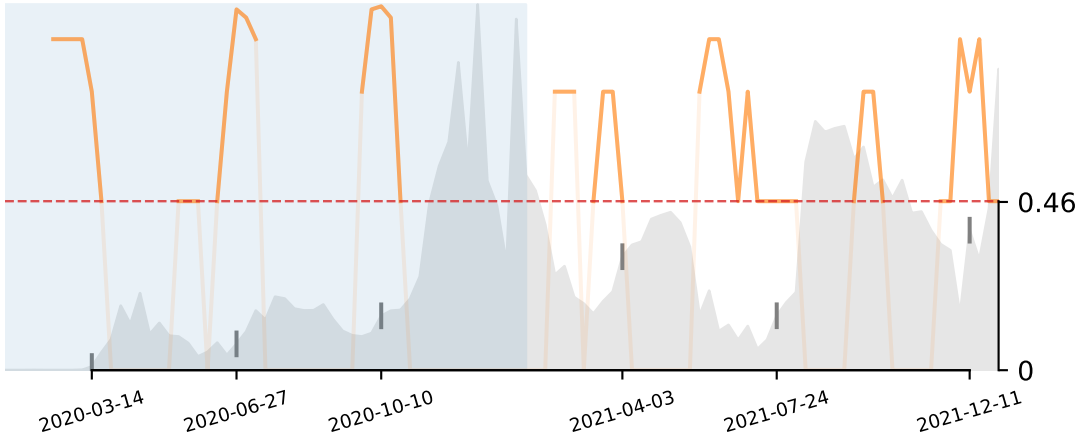
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Ageusia



Model 3

(GT) chest pain
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia
(GT) Throat irritation
up2date



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	1	0	0	2	2	3
0.91	1	0	0	5	5	0
0.76	1	0	0	5	9	0
0.46	1	1	0	5	25	0
0.00	1	2	0	5	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	1	0	1	2	1	2
0.91	2	0	0	3	3	1
0.76	2	2	0	4	7	0
0.46	2	3	0	4	21	0
0.00	2	5	0	4	45	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	1	0	2	0	0	3
0.96	2	0	1	0	0	3
0.91	2	2	1	2	2	1
0.76	3	3	0	3	6	0
0.46	3	3	0	3	12	0
0.00	3	7	0	3	28	0

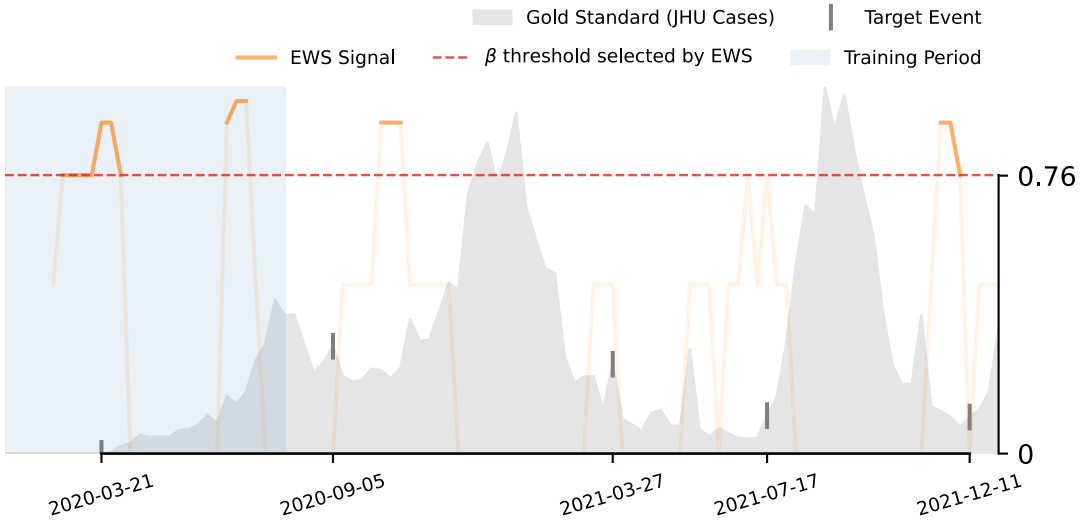
Figures S140-S187.
Visualization of the multiple sources model as a function of time. The model's output (orange) is compared against the onsets (vertical gray tick marks) of the COVID-19 reported cases (gray-filled curve). As more information becomes available, the EWS model is re-trained to select the proxies that best fit the training data available (represented by the blue shading on each Figure). A list of the selected proxies for each model, along with a performance table are also presented.

Alabama

Proxies selected by the Multiple Sources method

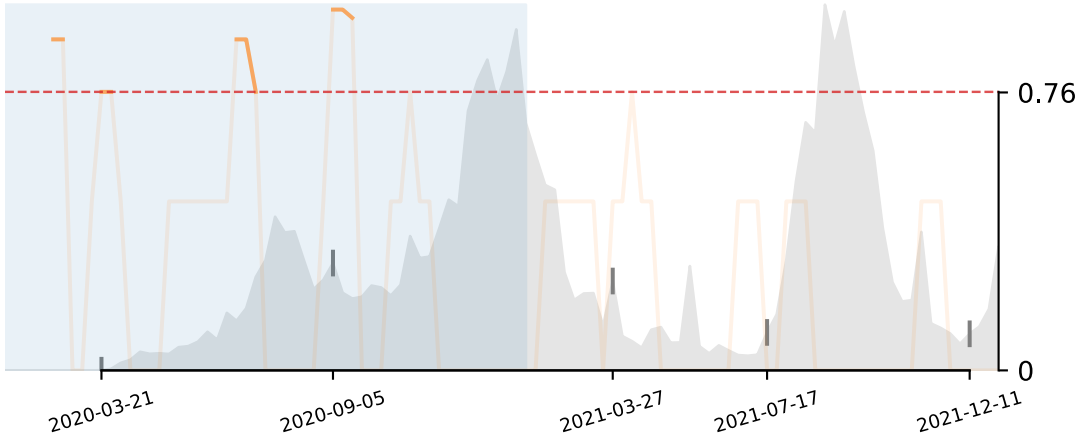
Model 1

(GT) chest tightness
(GT) sars-cov-2
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine



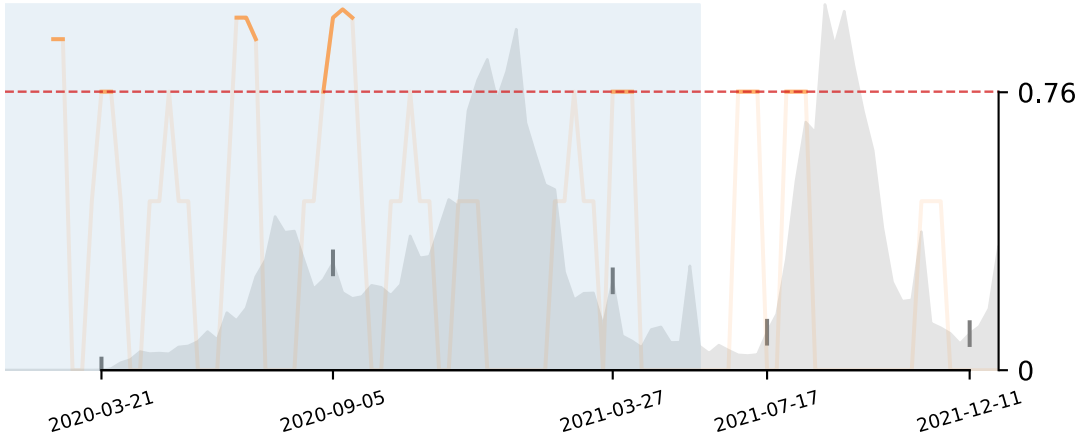
Model 2

(GT) Acute bronchitis
(GT) Nasal congestion
(GT) Wheeze
(GT) Ageusia
(GT) Burning Chest Pain



Model 3

(GT) Acute bronchitis
(GT) Nasal congestion
(GT) loss taste
(GT) Ageusia
(GT) Bronchitis
(GT) Burning Chest Pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	0	4
0.91	0	2	1	1	3	3
0.76	1	4	0	2	3	2
0.46	1	5	0	3	19	0
0.00	1	7	0	4	48	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	3
0.96	1	1	1	0	0	3
0.91	1	2	1	0	0	3
0.76	2	5	0	0	1	2
0.46	2	8	0	3	8	0
0.00	2	20	0	3	28	0

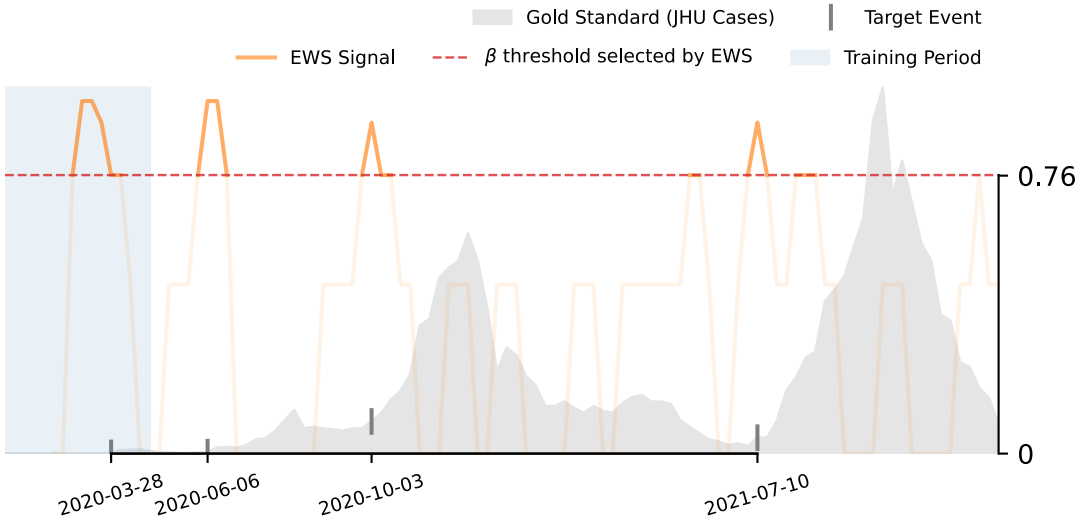
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	1	3	0	0	2
0.91	1	4	2	0	0	2
0.76	2	6	1	1	3	1
0.46	3	11	0	2	3	0
0.00	3	27	0	2	17	0

Alaska

Proxies selected by the Multiple Sources method

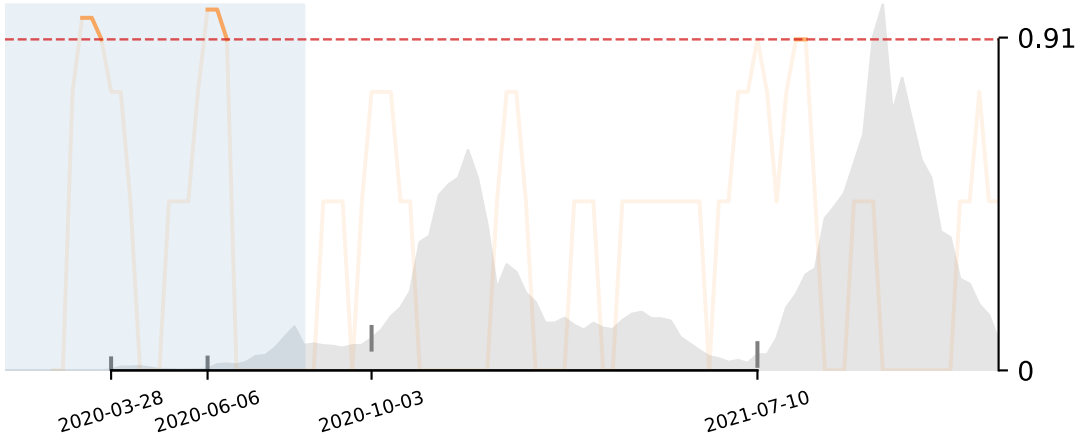
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) fever



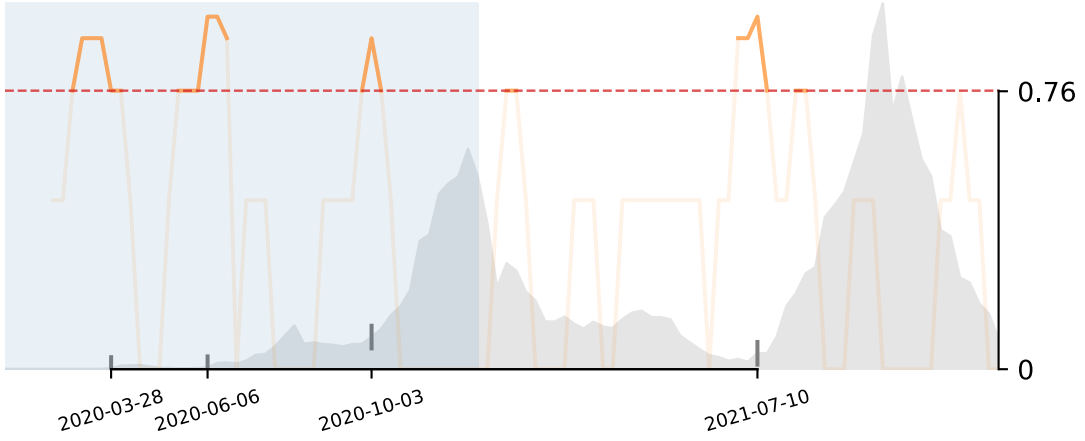
Model 2

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Cardiac arrest



Model 3

(JHU) cases
(GT) covid
(GT) covid symptoms
(GT) Asthma
(GT) fever
(GT) Cardiac arrest



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	1	2
0.91	1	0	0	3	1	0
0.76	1	0	0	3	10	0
0.46	1	1	0	3	39	0
0.00	1	2	0	3	68	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	1	1	1	0	0	2
0.91	2	1	0	1	2	1
0.76	2	2	0	2	9	0
0.46	2	3	0	2	33	0
0.00	2	4	0	2	58	0

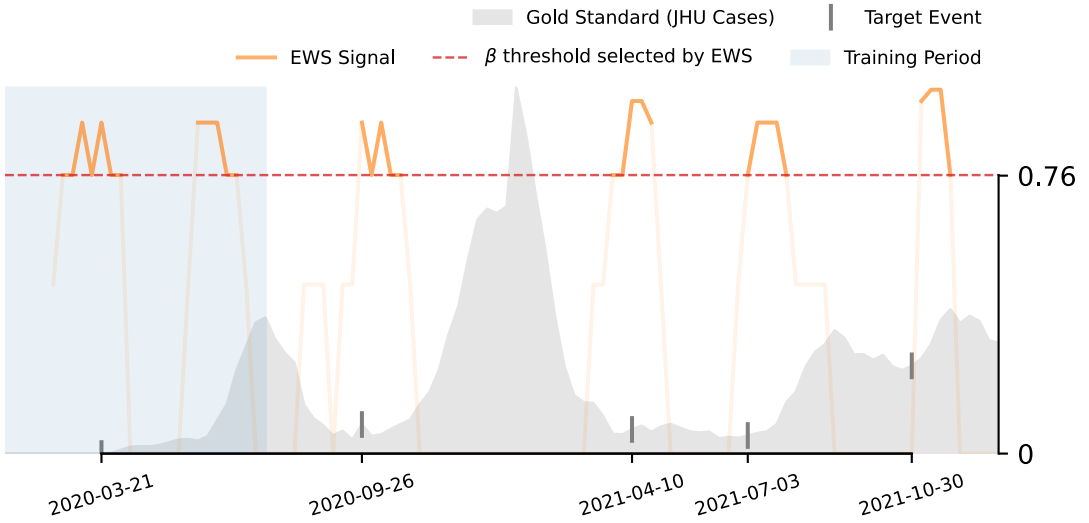
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	1	0	0
0.91	1	1	2	1	0	0
0.76	3	2	0	1	6	0
0.46	3	4	0	1	29	0
0.00	3	12	0	1	47	0

Arizona

Proxies selected by the Multiple Sources method

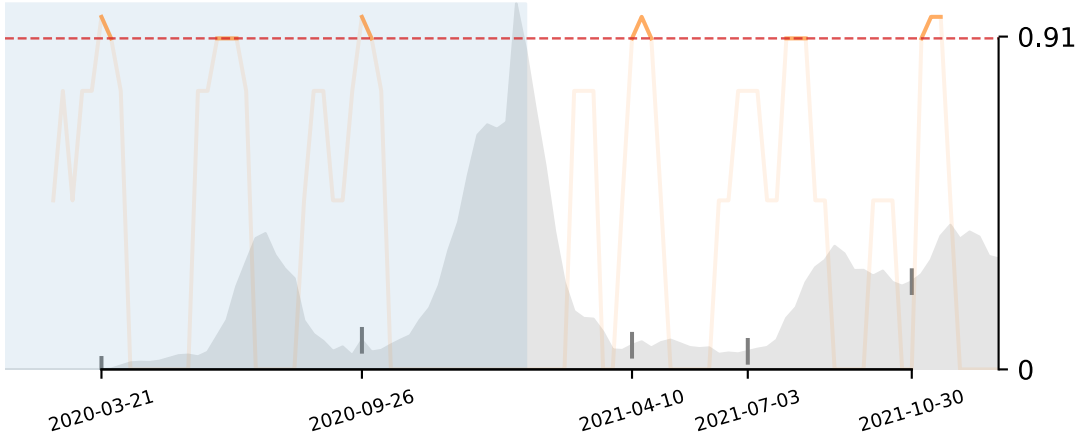
Model 1

(JHU) cases
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms



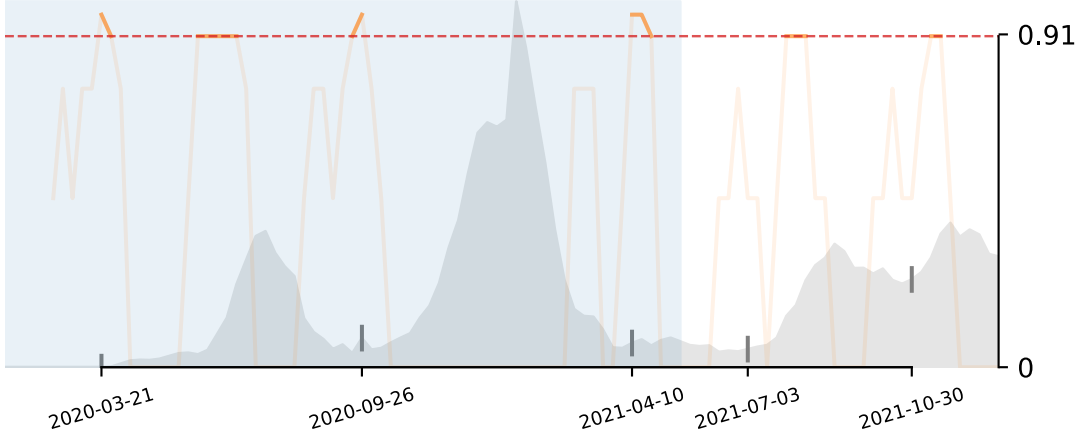
Model 2

(JHU) cases
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Acute bronchitis



Model 3

(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Acute bronchitis
(GT) Chills



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	2	3
0.99	0	0	1	0	2	3
0.96	0	0	1	1	4	2
0.91	0	0	1	2	9	0
0.76	1	3	0	3	14	0
0.46	1	7	0	3	20	0
0.00	1	10	0	4	48	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	0	3	1
0.91	2	0	0	1	8	1
0.76	2	5	0	2	9	0
0.46	2	11	0	3	15	0
0.00	2	13	0	3	28	0

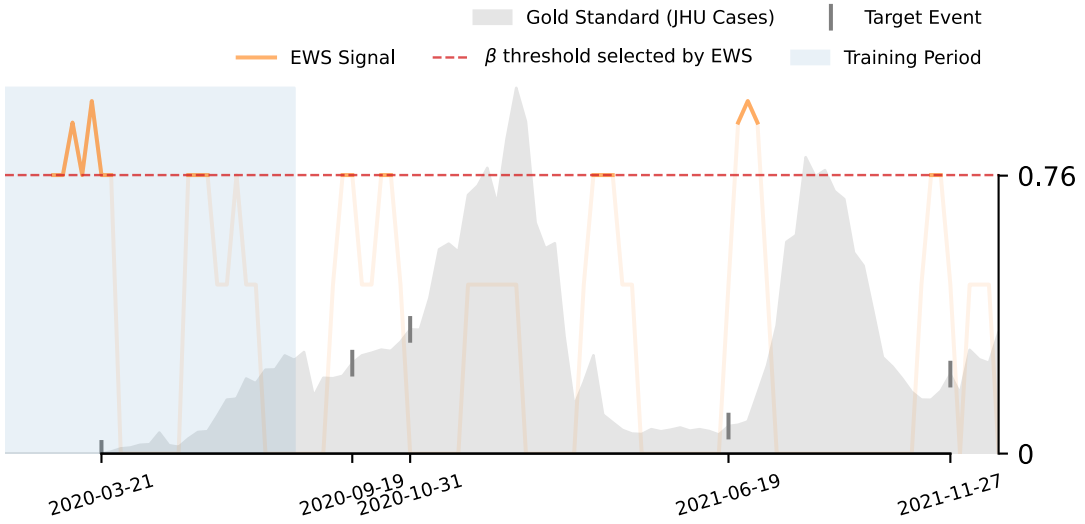
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	3	1	0	0	5	1
0.76	3	8	0	2	6	0
0.46	3	14	0	2	11	0
0.00	3	18	0	2	19	0

Arkansas

Proxies selected by the Multiple Sources method

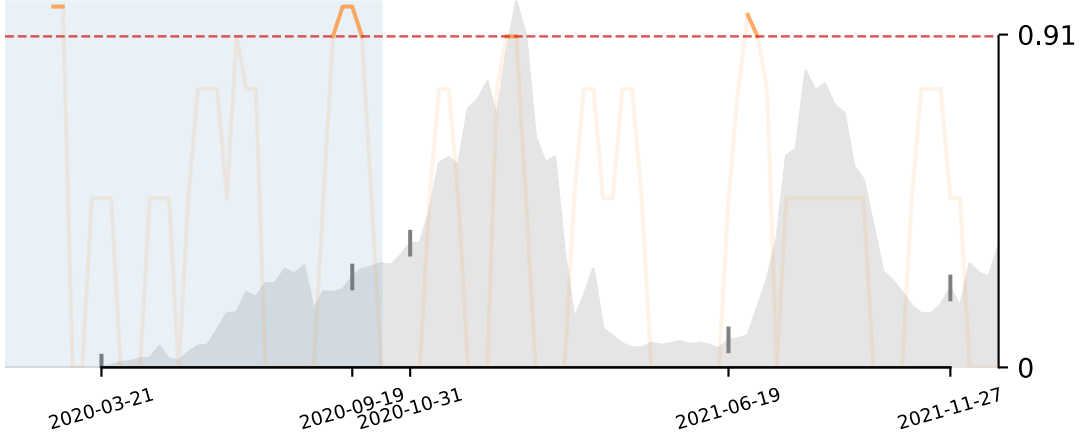
Model 1

(GT) chest tightness
(GT) Viral pneumonia
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms



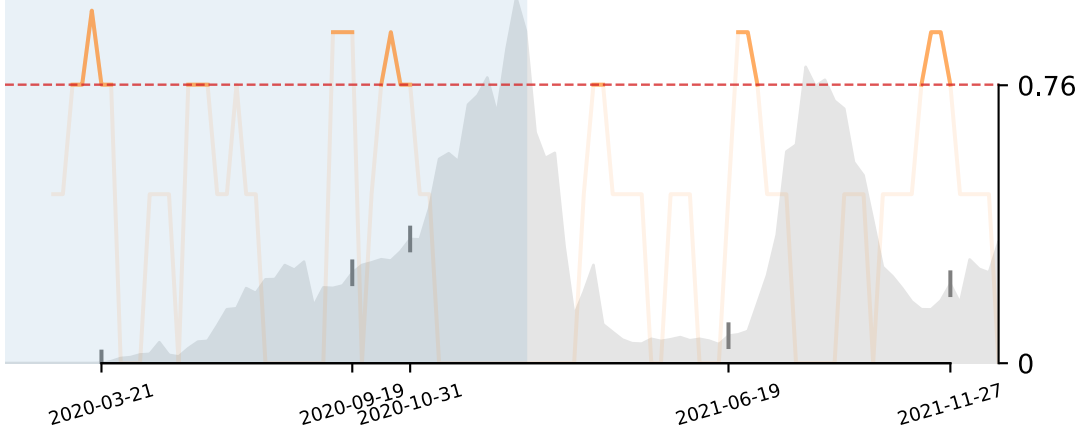
Model 2

(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Abdominal pain
(GT) Acute bronchitis
(GT) Asthma



Model 3

(GT) Burning Chest Pain
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Abdominal pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	1	3
0.91	1	0	0	0	3	3
0.76	1	0	0	3	6	0
0.46	1	6	0	4	19	0
0.00	1	10	0	4	47	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	2	1	0	0	1	2
0.91	2	1	0	0	4	2
0.76	2	3	0	1	13	1
0.46	2	8	0	2	30	0
0.00	2	15	0	3	47	0

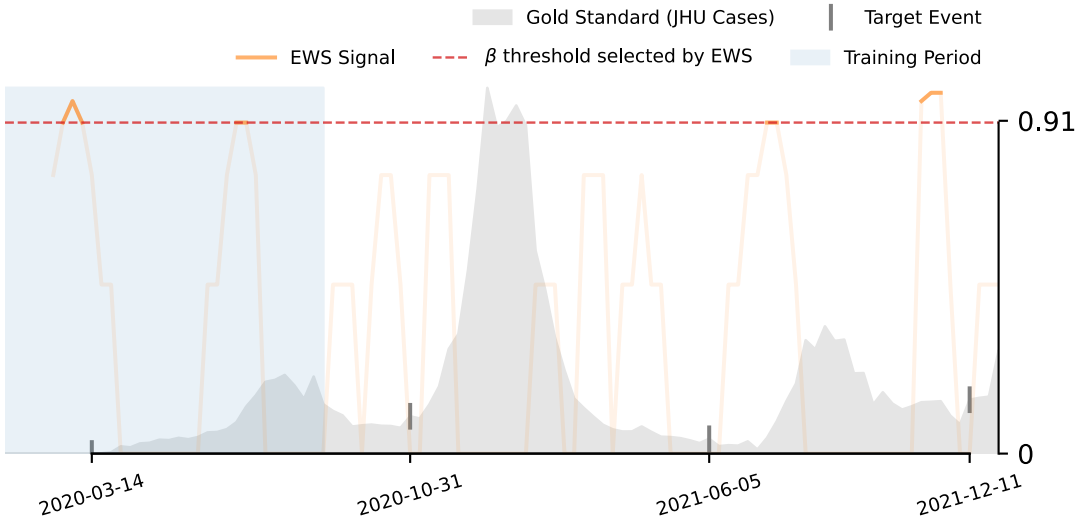
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	1	2	0
0.76	3	0	0	1	5	0
0.46	3	5	0	2	21	0
0.00	3	15	0	2	35	0

California

Proxies selected by the Multiple Sources method

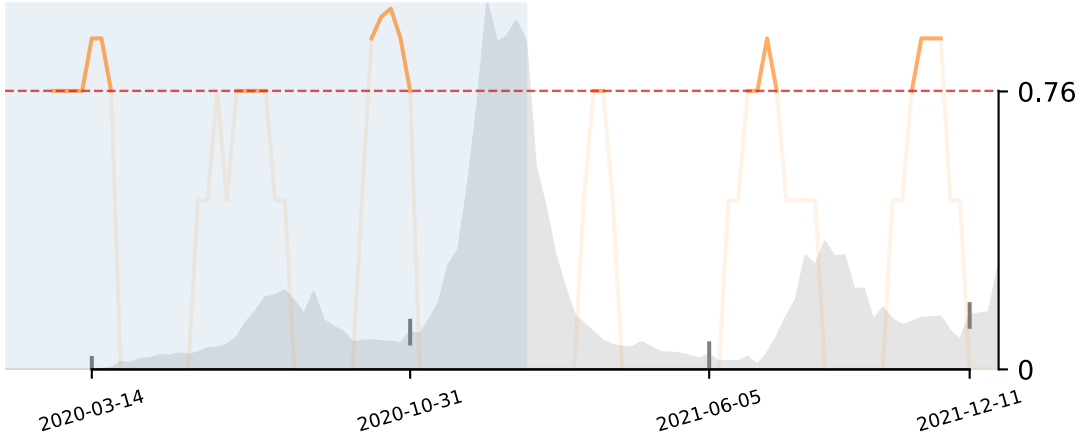
Model 1

(JHU) cases
(GT) Anxiety
(GT) covid
(GT) covid-19
(GT) loss taste
(GT) loss of smell



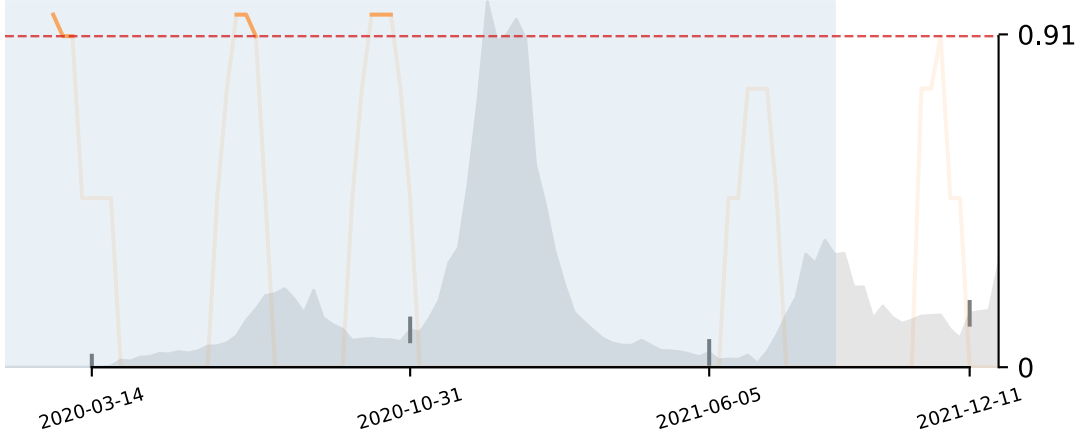
Model 2

(JHU) cases
(GT) loss of smell
(GT) chest tightness
(GT) quarantine
(GT) sars-cov-2
(GT) Ageusia



Model 3

(JHU) cases
(GT) Ageusia
(GT) Anosmia
(GT) Viral pneumonia
(GT) loss of smell
(GT) quarantine



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	1	0	2
0.96	0	0	1	1	0	2
0.91	1	0	0	1	2	2
0.76	1	2	0	2	12	1
0.46	1	4	0	3	25	0
0.00	1	8	0	3	49	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	1	0	1	0	0	2
0.91	1	0	1	1	1	1
0.76	2	1	0	1	6	1
0.46	2	7	0	1	16	0
0.00	2	13	0	2	35	0

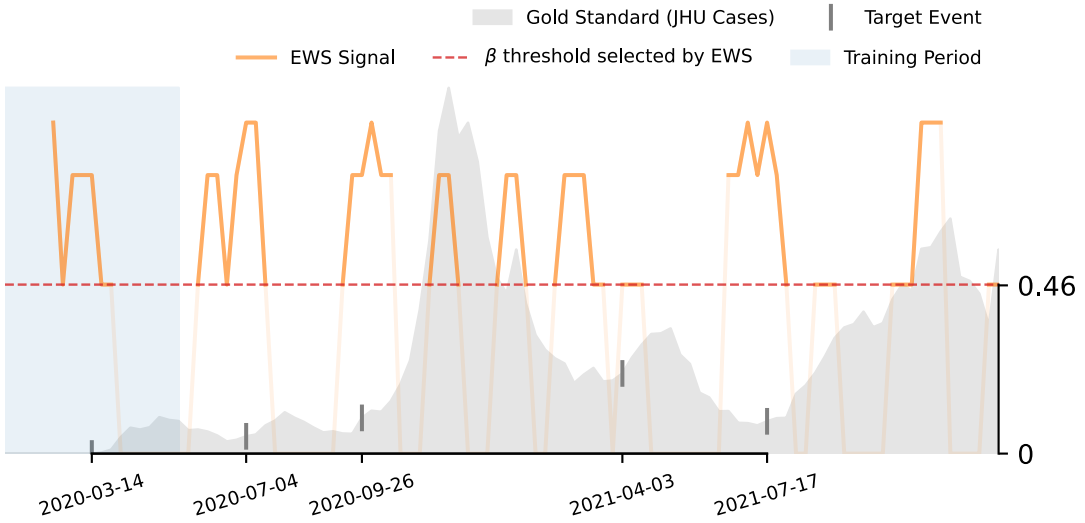
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	2	2	1	1	0	0
0.76	2	3	1	1	0	0
0.46	2	8	1	1	0	0
0.00	2	16	1	1	10	0

Colorado

Proxies selected by the Multiple Sources method

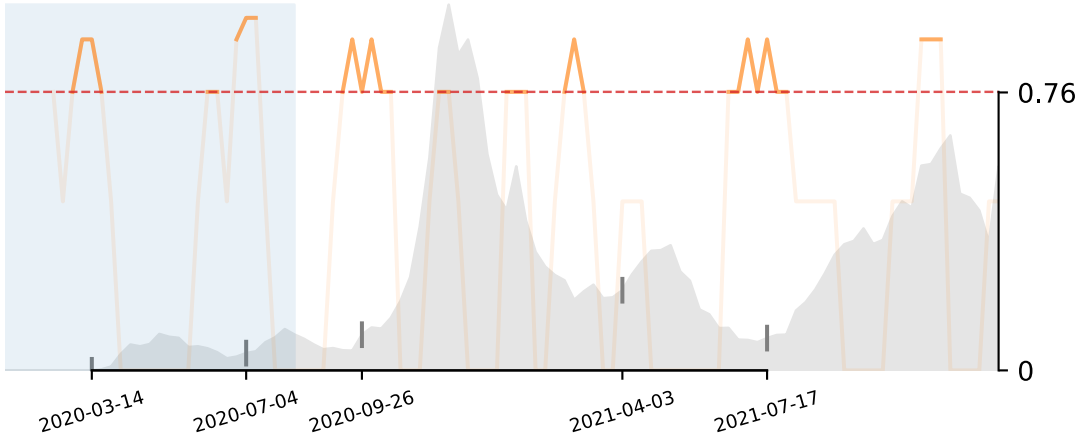
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) nose bleed



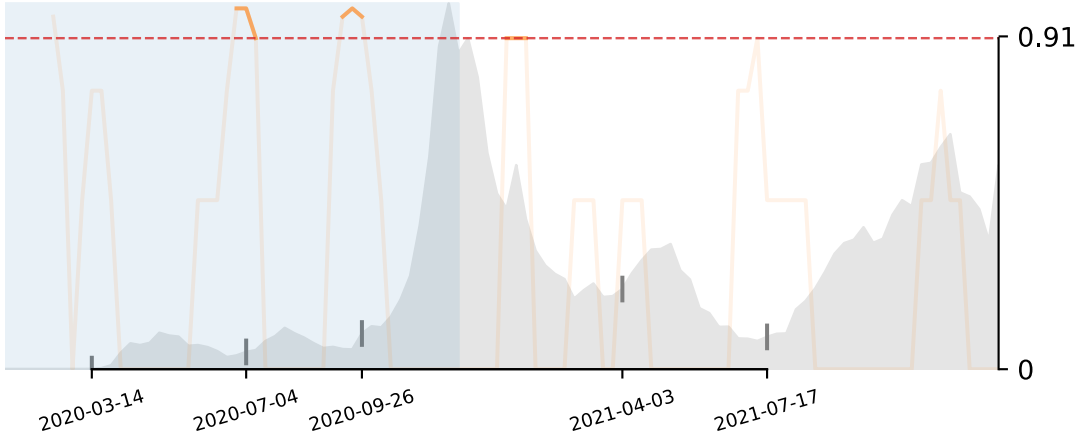
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis



Model 3

(GT) covid symptoms
(GT) Acute bronchitis
(GT) Ageusia
(GT) Anosmia
(GT) Asthma
(GT) Bronchitis



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	0	4
0.91	0	0	1	2	5	1
0.76	1	0	0	4	12	0
0.46	1	0	0	4	29	0
0.00	1	2	0	4	57	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	0	0	2	0	0	3
0.91	1	1	1	3	4	0
0.76	2	1	0	3	13	0
0.46	2	2	0	3	28	0
0.00	2	5	0	3	52	0

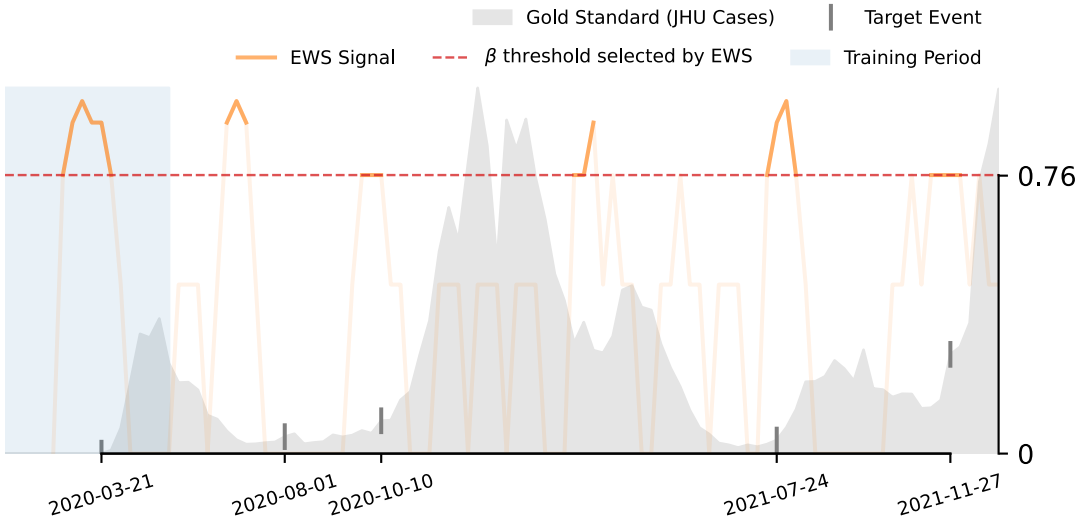
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	2	0	1	0	0	2
0.91	3	0	0	1	3	1
0.76	3	1	0	1	4	1
0.46	3	3	0	2	14	0
0.00	3	6	0	2	42	0

Connecticut

Proxies selected by the Multiple Sources method

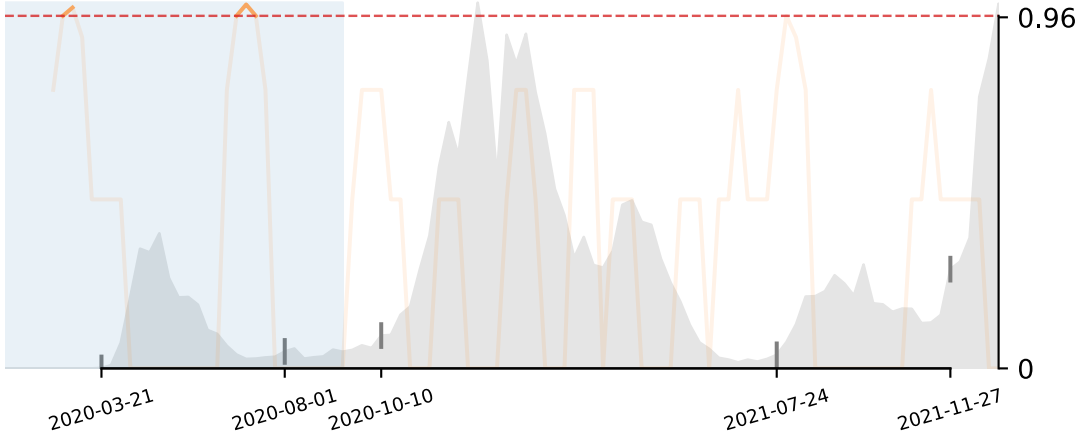
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) covid-19 who



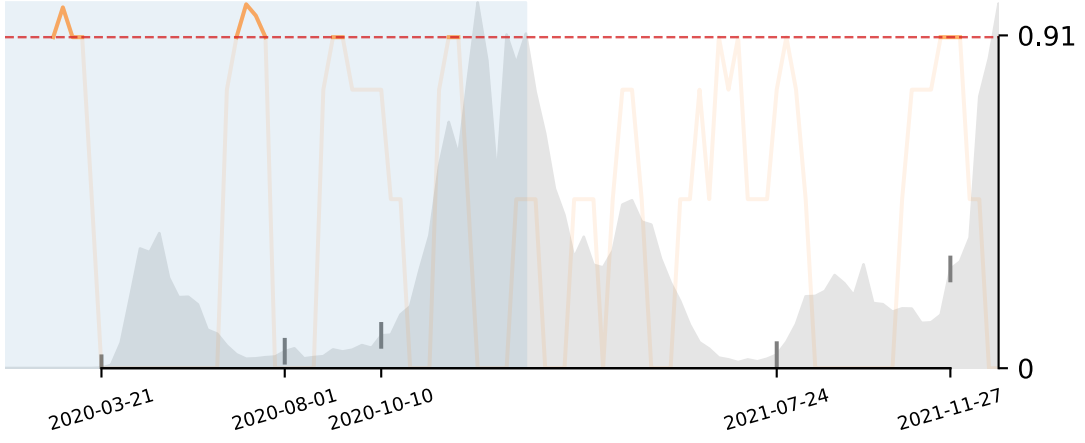
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) Acute bronchitis
(GT) Ageusia
(GT) Bronchitis



Model 3

(GT) covid
(GT) Asthma
(GT) covid-19
(GT) chest pain
(GT) Chest pain
(GT) Shortness of breath



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	1	2
0.91	1	0	0	2	2	2
0.76	1	0	0	4	9	0
0.46	1	1	0	4	35	0
0.00	1	2	0	4	58	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	0	1	0	0	3
0.96	2	0	0	0	1	2
0.91	2	1	0	0	2	2
0.76	2	1	0	3	8	0
0.46	2	3	0	3	24	0
0.00	2	5	0	3	50	0

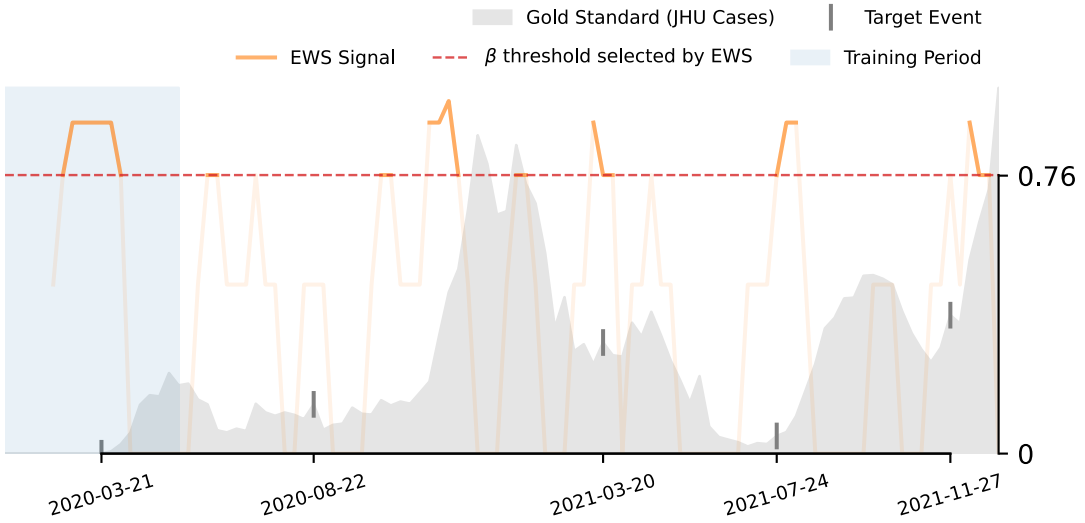
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	2	0	1	0	0	2
0.91	2	0	1	2	2	0
0.76	3	5	0	2	6	0
0.46	3	8	0	2	18	0
0.00	3	13	0	2	35	0

Delaware

Proxies selected by the Multiple Sources method

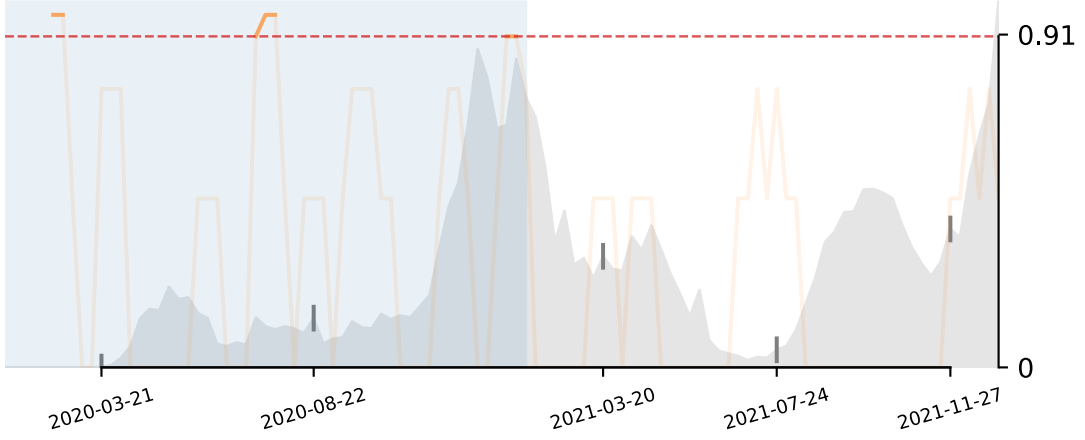
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) fever
(GT) Acute bronchitis



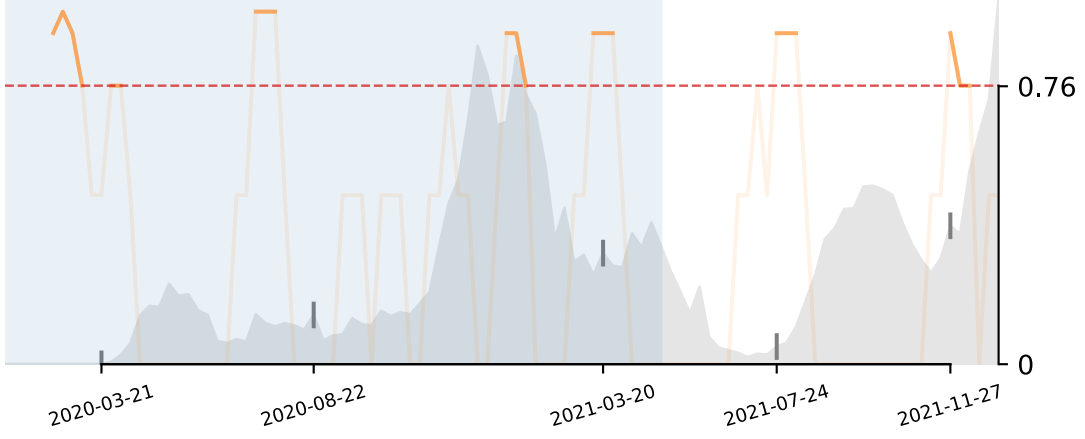
Model 2

(GT) quarantine
(GT) Throat irritation
(GT) Bronchitis
(GT) Wheeze
(GT) covid symptoms



Model 3

(GT) quarantine
(JHU) cases
(GT) Throat irritation
(GT) covid
(GT) Acute bronchitis
(GT) Bronchitis



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	1	4
0.91	0	0	1	1	6	1
0.76	1	1	0	4	17	0
0.46	1	2	0	4	37	0
0.00	1	3	0	4	57	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	3
0.96	0	0	2	0	0	3
0.91	2	2	0	0	0	3
0.76	2	5	0	1	2	1
0.46	2	13	0	3	11	0
0.00	2	23	0	3	28	0

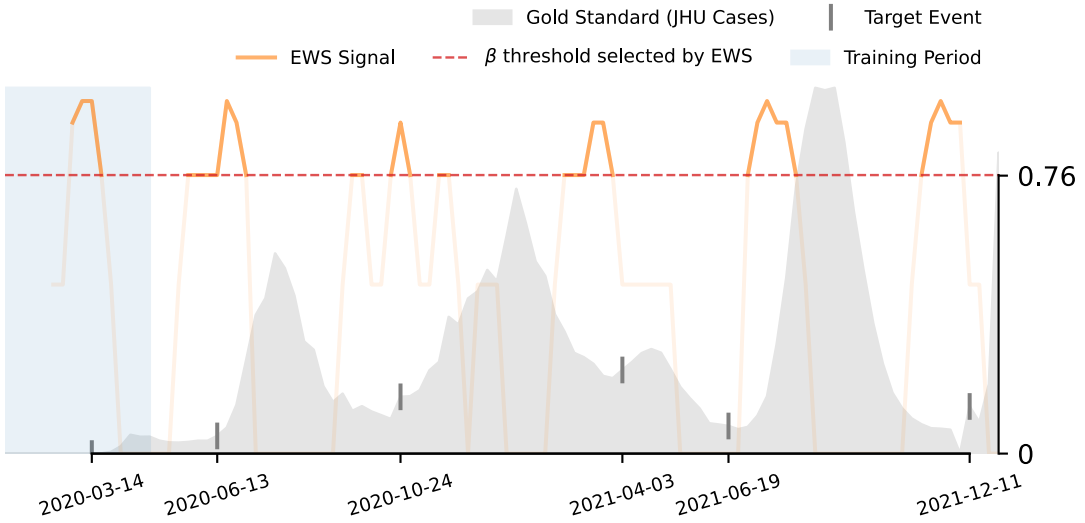
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	2	2	1	2	2	0
0.76	3	6	0	2	4	0
0.46	3	10	0	2	7	0
0.00	3	25	0	2	21	0

Florida

Proxies selected by the Multiple Sources method

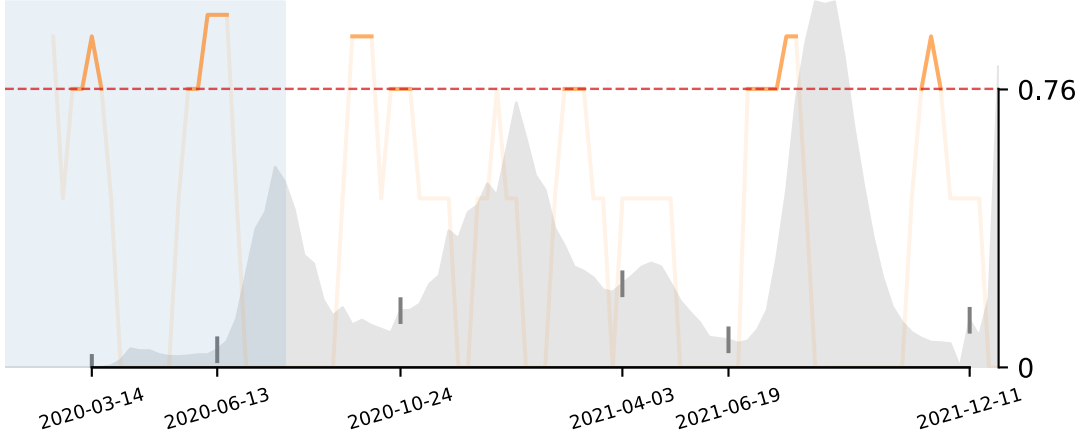
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) loss taste
(GT) chest pain
(GT) covid symptoms



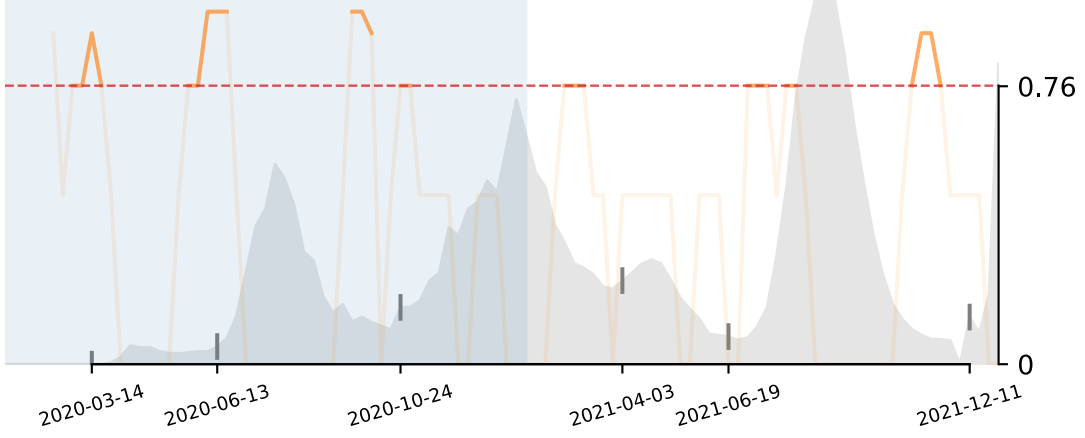
Model 2

(GT) how long does covid last
(GT) loss taste
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness
(GT) Ageusia



Model 3

(GT) how long does covid last
(GT) loss taste
(GT) Ageusia
(GT) Shortness of breath
(GT) chest pain
(GT) covid symptoms



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	1	2	3
0.91	1	0	0	3	6	1
0.76	1	0	0	4	12	0
0.46	1	1	0	5	25	0
0.00	1	2	0	5	53	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	0	0	2	0	0	4
0.91	1	1	1	2	2	2
0.76	2	1	0	3	8	0
0.46	2	2	0	4	23	0
0.00	2	4	0	4	46	0

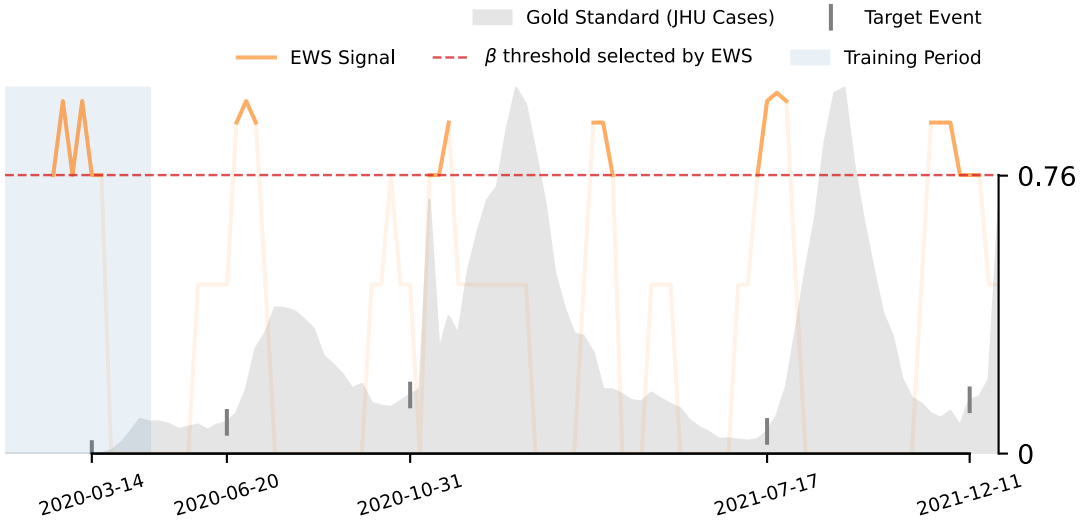
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	0	3	0	0	3
0.91	2	2	1	1	0	2
0.76	3	2	0	2	5	0
0.46	3	4	0	3	14	0
0.00	3	14	0	3	28	0

Georgia

Proxies selected by the Multiple Sources method

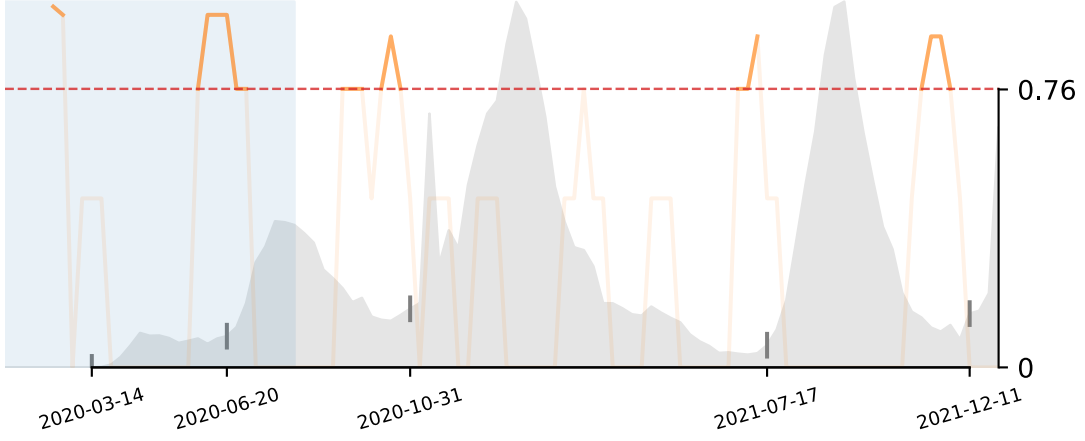
Model 1

(GT) covid
(GT) covid-19
(GT) loss taste
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



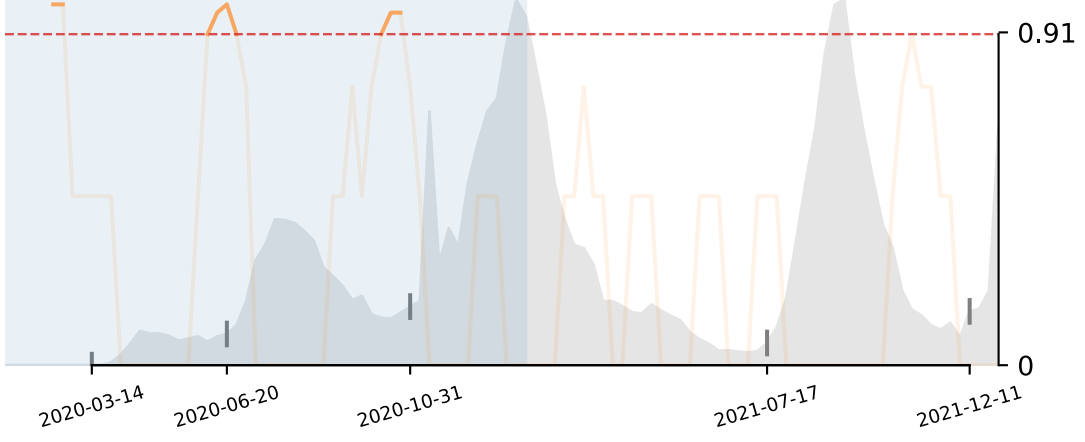
Model 2

(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Ageusia
(GT) Anosmia
(GT) Asthma



Model 3

(GT) fever
(GT) Ageusia
(GT) Chills
(GT) Shortness of breath
(GT) chest pain
(GT) Burning Chest Pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	1	3
0.96	0	0	1	1	3	2
0.91	1	0	0	2	8	1
0.76	1	0	0	3	12	0
0.46	1	1	0	4	28	0
0.00	1	1	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	0	0	3
0.91	2	0	0	3	0	0
0.76	2	0	0	3	2	0
0.46	2	2	0	3	16	0
0.00	2	3	0	3	52	0

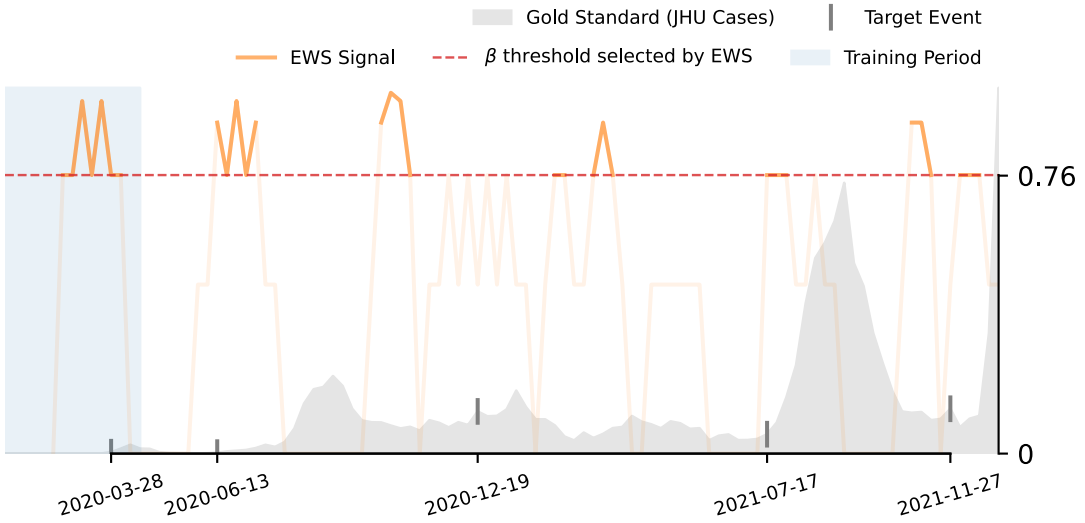
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	2	0	1	0	0	2
0.91	3	0	0	1	0	1
0.76	3	1	0	1	2	1
0.46	3	3	0	2	12	0
0.00	3	12	0	2	35	0

Hawaii

Proxies selected by the Multiple Sources method

Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Otitis

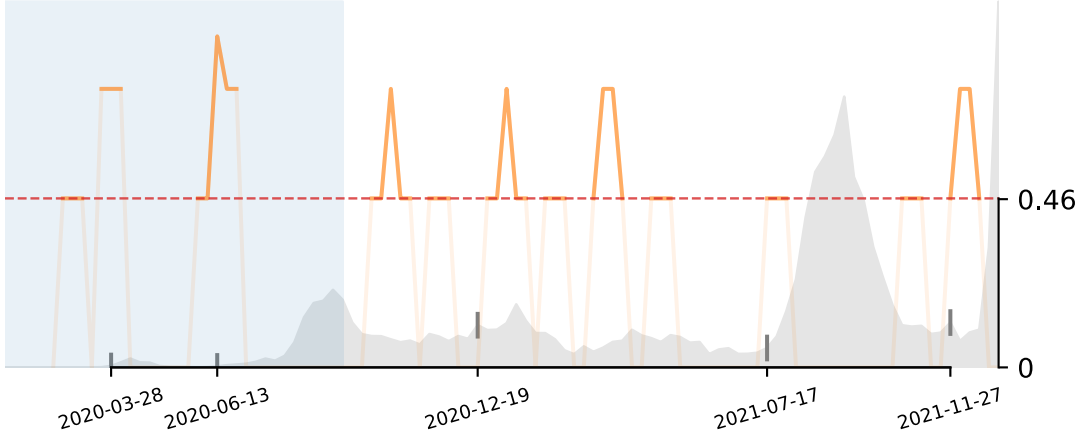


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	1	4
0.96	0	0	1	0	3	3
0.91	1	0	0	2	6	2
0.76	1	0	0	4	21	0
0.46	1	2	0	4	43	0
0.00	1	2	0	4	61	0

Model 2

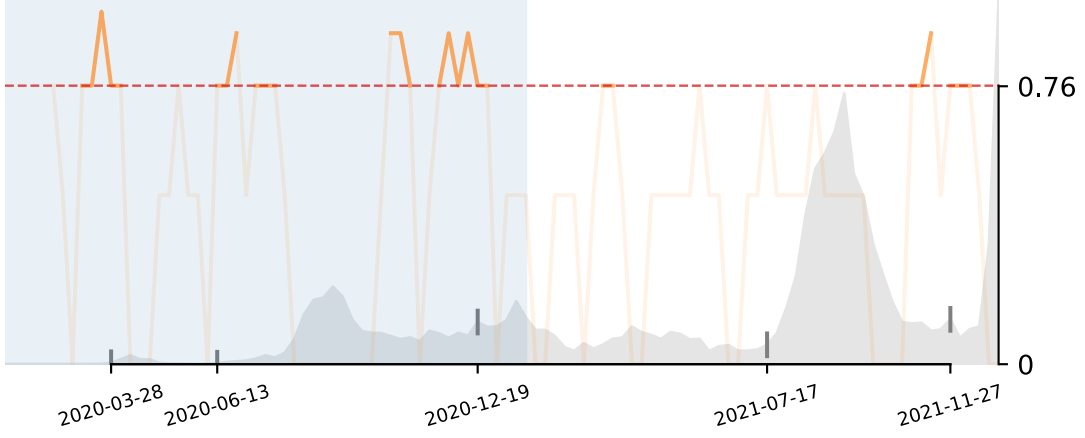
(JHU) cases
(GT) covid symptoms
(GT) Otitis



β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	0	0	3
0.76	1	0	1	0	6	2
0.46	2	3	0	3	25	0
0.00	2	4	0	3	47	0

Model 3

(JHU) cases
(GT) Vomiting
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) fever



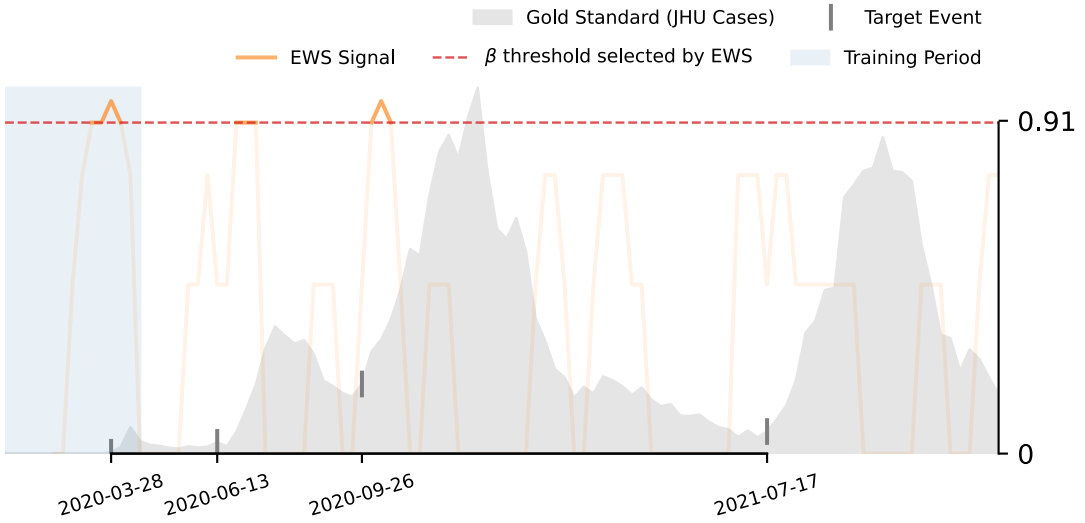
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	0	2	1	0	1
0.76	2	3	1	2	6	0
0.46	3	11	0	2	26	0
0.00	3	21	0	2	35	0

Idaho

Proxies selected by the Multiple Sources method

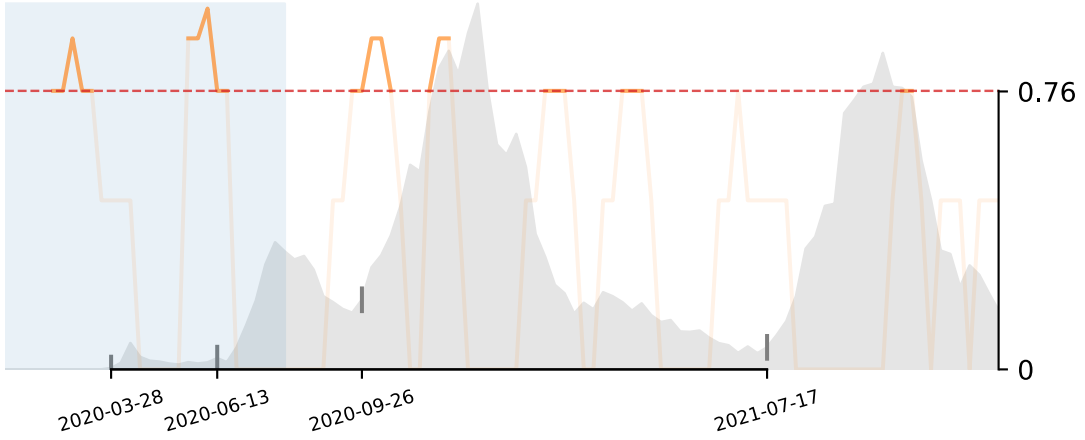
Model 1

(JHU) cases
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) quarantine
(GT) fever



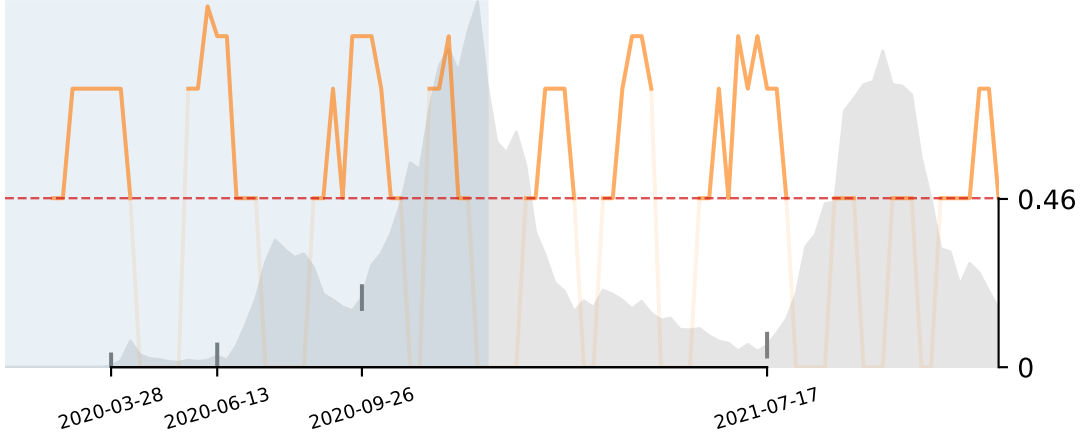
Model 2

(JHU) cases
(GT) covid-19
(GT) Chest pain
(GT) Chills
(GT) Otitis



Model 3

(JHU) cases
(GT) Chest pain
(GT) Chills
(GT) covid-19
(GT) covid symptoms
(GT) fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	1	2
0.91	1	0	0	0	6	1
0.76	1	1	0	2	15	0
0.46	1	2	0	3	36	0
0.00	1	2	0	3	68	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	2
0.96	1	0	1	0	0	2
0.91	1	0	1	0	4	1
0.76	2	0	0	2	14	0
0.46	2	3	0	2	32	0
0.00	2	5	0	2	60	0

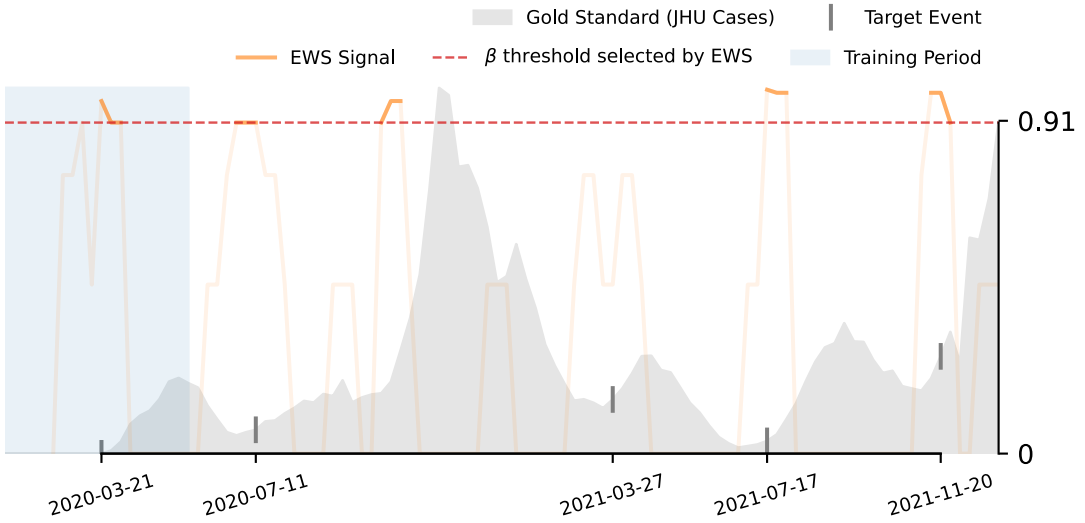
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	1	0	2	0	0	1
0.91	1	0	2	1	2	0
0.76	2	3	1	1	10	0
0.46	3	7	0	1	28	0
0.00	3	18	0	1	46	0

Illinois

Proxies selected by the Multiple Sources method

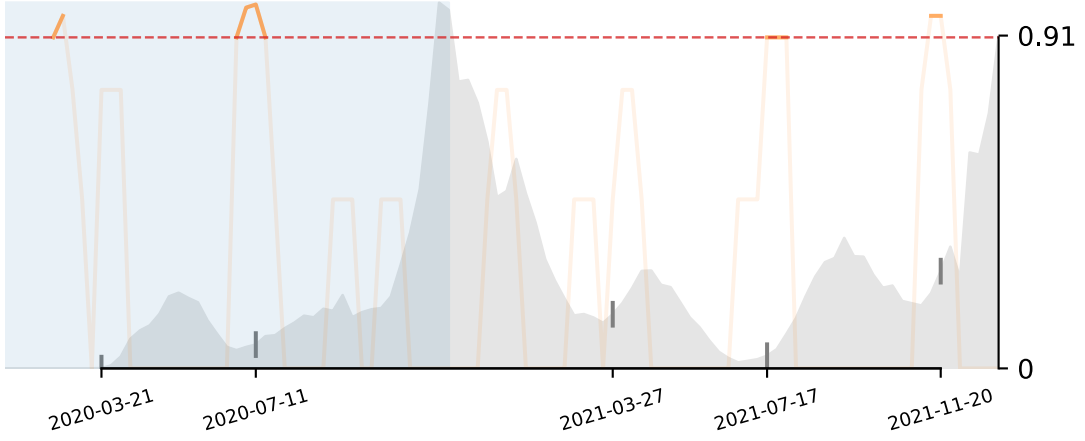
Model 1

(JHU) cases
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness



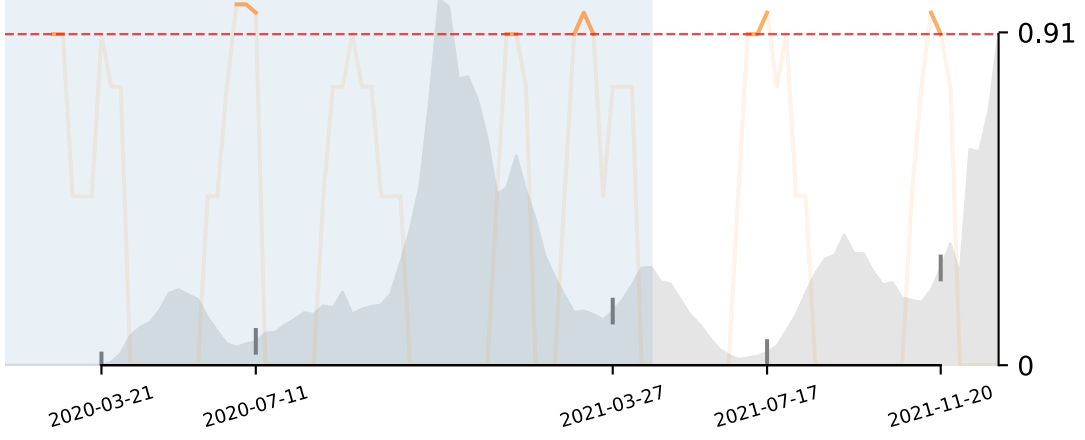
Model 2

(JHU) cases
(GT) Anosmia
(GT) Nasal congestion
(GT) Viral pneumonia
(GT) covid
(GT) how long does covid last



Model 3

(GT) how long does covid last
(GT) covid symptoms
(GT) Hyperventilation
(GT) Nasal congestion
(GT) Acute bronchitis
(GT) Cough



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	1	0	3
0.99	0	0	1	2	2	2
0.96	0	0	1	2	4	2
0.91	1	0	0	3	6	1
0.76	1	2	0	4	10	0
0.46	1	2	0	4	22	0
0.00	1	2	0	4	56	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	0	1	0	0	3
0.96	1	0	1	1	0	2
0.91	2	0	0	2	2	1
0.76	2	2	0	2	7	0
0.46	2	4	0	3	10	0
0.00	2	11	0	3	36	0

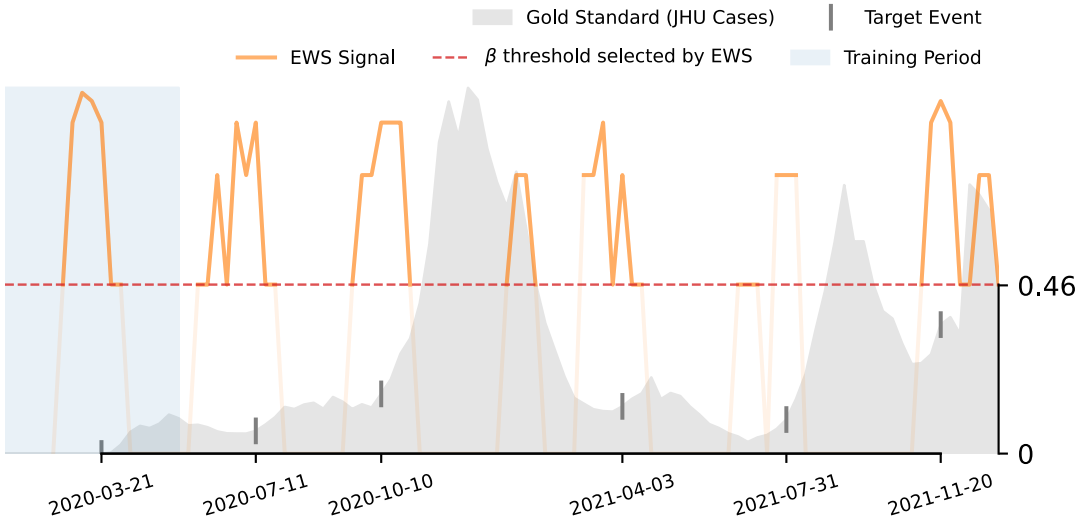
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	0	2	2	0	0
0.91	2	0	1	2	1	0
0.76	3	4	0	2	3	0
0.46	3	13	0	2	5	0
0.00	3	20	0	2	22	0

Indiana

Proxies selected by the Multiple Sources method

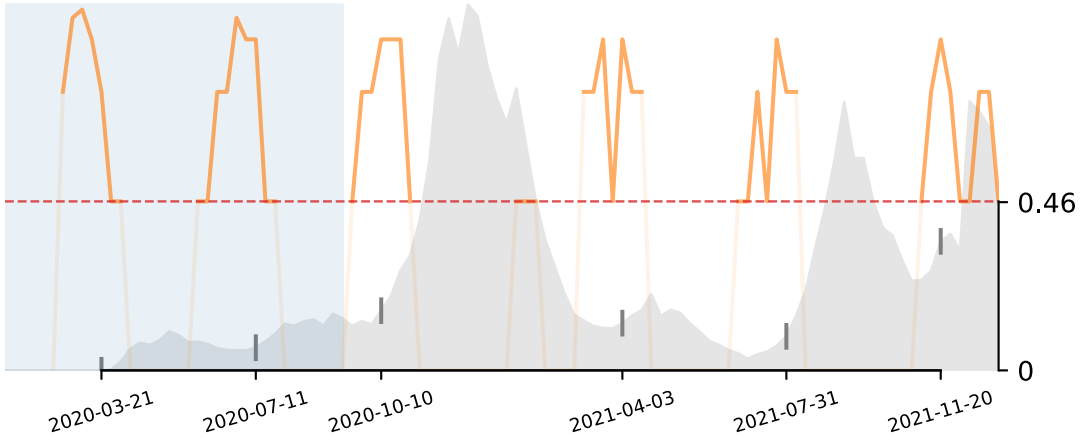
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) covid-19 who



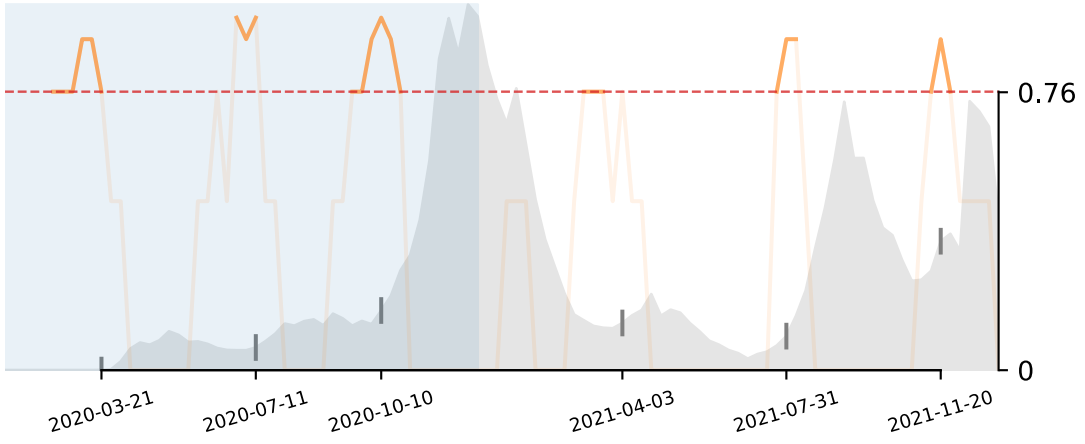
Model 2

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) fever



Model 3

(JHU) cases
(GT) covid
(GT) covid symptoms
(GT) chest tightness
(GT) Acute bronchitis
(GT) Ageusia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	1	0	0	1	0	4
0.91	1	0	0	4	3	1
0.76	1	0	0	5	8	0
0.46	1	0	0	5	18	0
0.00	1	2	0	5	50	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	1	0	1	0	0	4
0.91	2	0	0	4	2	0
0.76	2	0	0	4	8	0
0.46	2	0	0	4	15	0
0.00	2	6	0	4	43	0

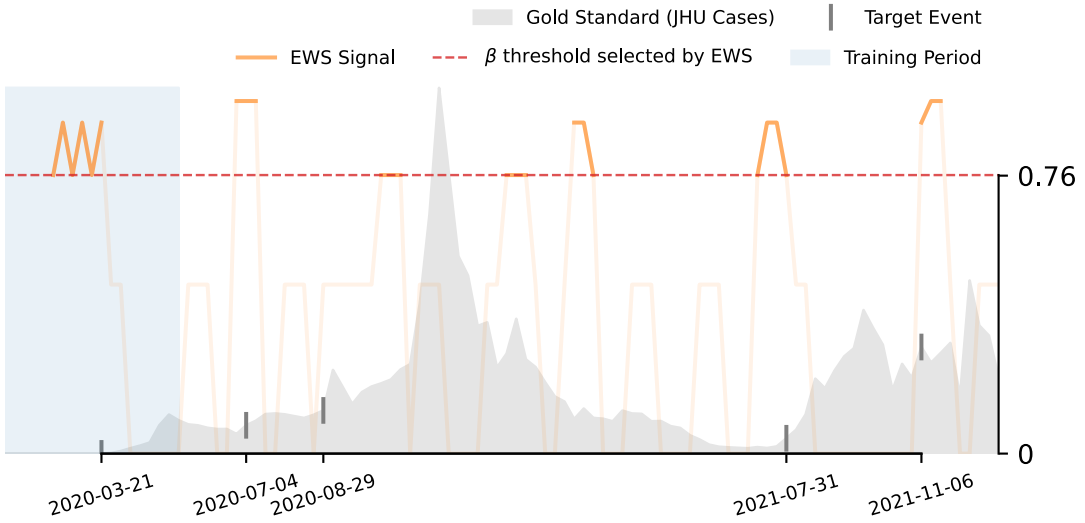
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	0	3	0	0	3
0.91	2	0	1	2	1	1
0.76	3	1	0	3	2	0
0.46	3	3	0	3	12	0
0.00	3	10	0	3	33	0

Iowa

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Acute bronchitis

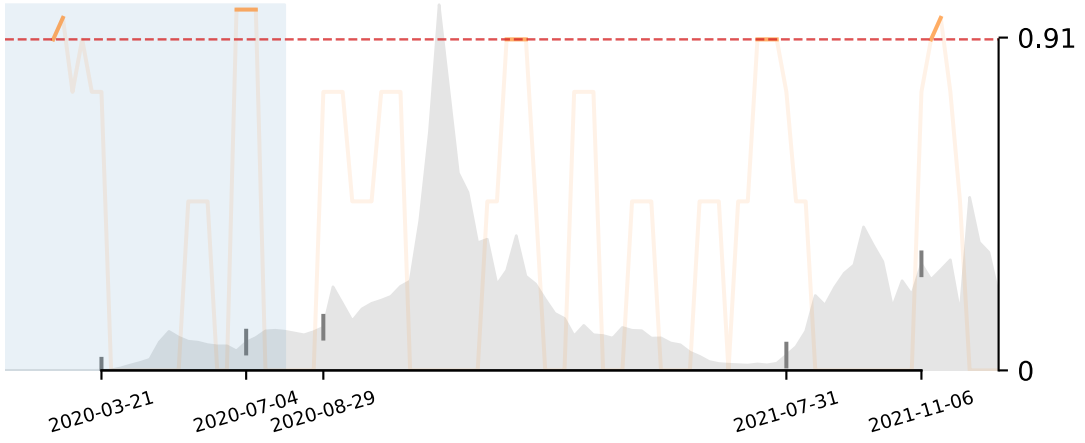


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	3	2
0.91	0	0	1	3	5	1
0.76	1	0	0	3	12	1
0.46	1	1	0	4	36	0
0.00	1	3	0	4	57	0

Model 2

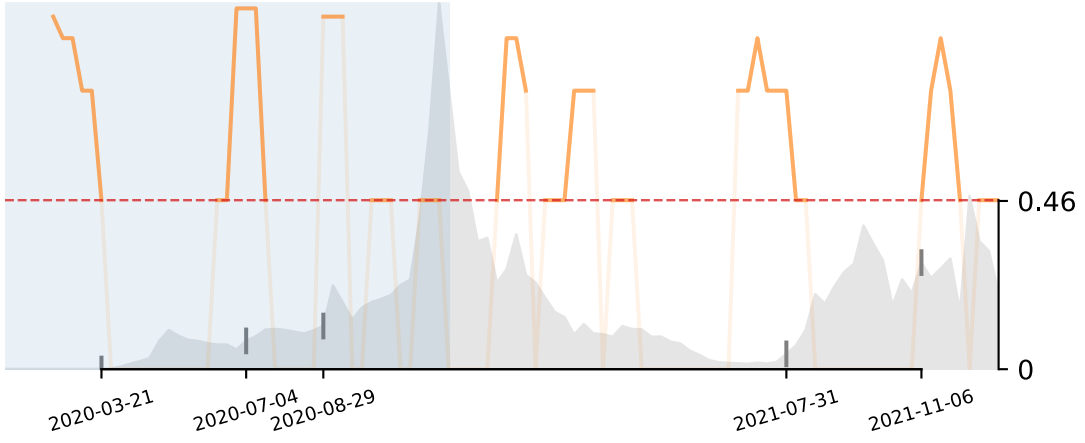
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) fever
(GT) Acute bronchitis
(GT) Asthma



β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	1	1	0	1	2
0.91	2	1	0	1	5	1
0.76	2	2	0	3	14	0
0.46	2	2	0	3	29	0
0.00	2	4	0	3	56	0

Model 3

(GT) covid symptoms
(GT) Asthma
Twitter (state level signal)
(GT) Acute bronchitis
(GT) Anosmia
(GT) Nasal congestion



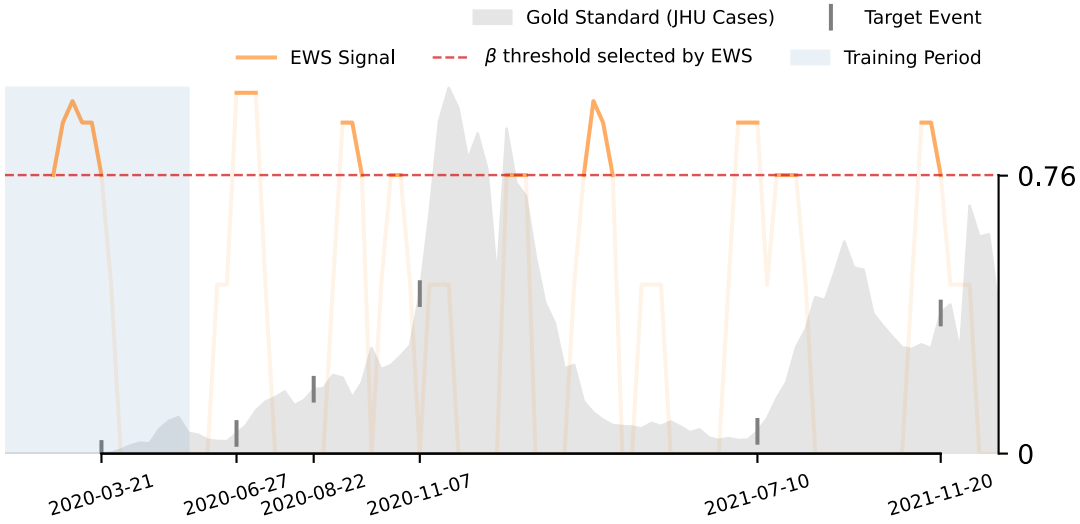
β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	1	2	0	0	2
0.91	2	4	1	1	3	0
0.76	3	4	0	1	9	0
0.46	3	4	0	2	22	0
0.00	3	11	0	2	43	0

Kansas

Proxies selected by the Multiple Sources method

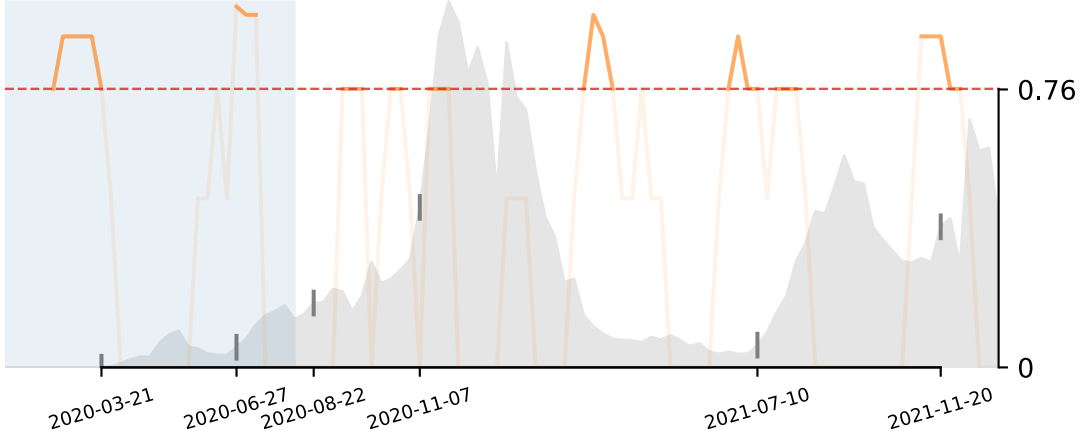
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis
(GT) Bronchitis



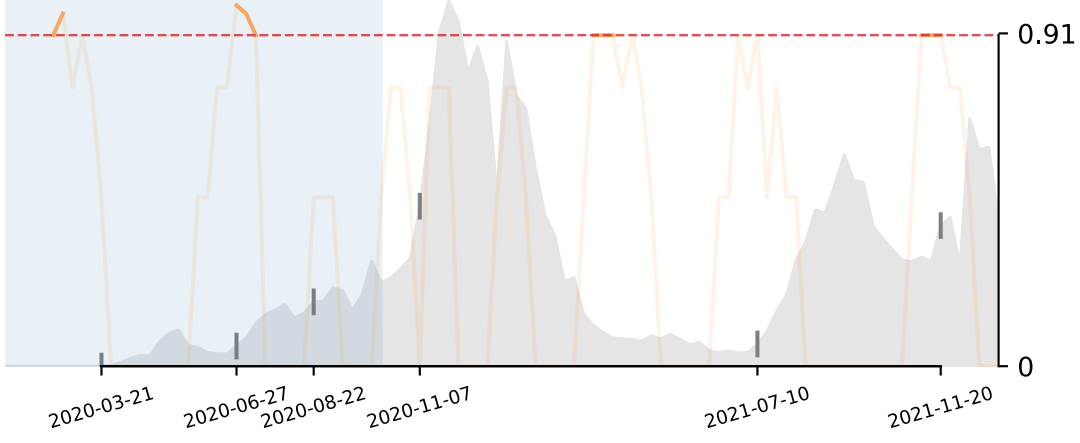
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis
(GT) Chest pain



Model 3

(GT) Wheeze
(GT) covid-19
(GT) quarantine
(GT) Chest pain
(GT) Nasal congestion
(GT) covid



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	2	1	3
0.96	0	0	1	2	2	3
0.91	1	0	0	4	5	1
0.76	1	0	0	5	13	0
0.46	1	1	0	5	26	0
0.00	1	2	0	5	51	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	1	0	1	0	1	4
0.91	1	2	1	2	2	2
0.76	2	2	0	3	15	1
0.46	2	3	0	3	26	1
0.00	2	4	0	4	50	0

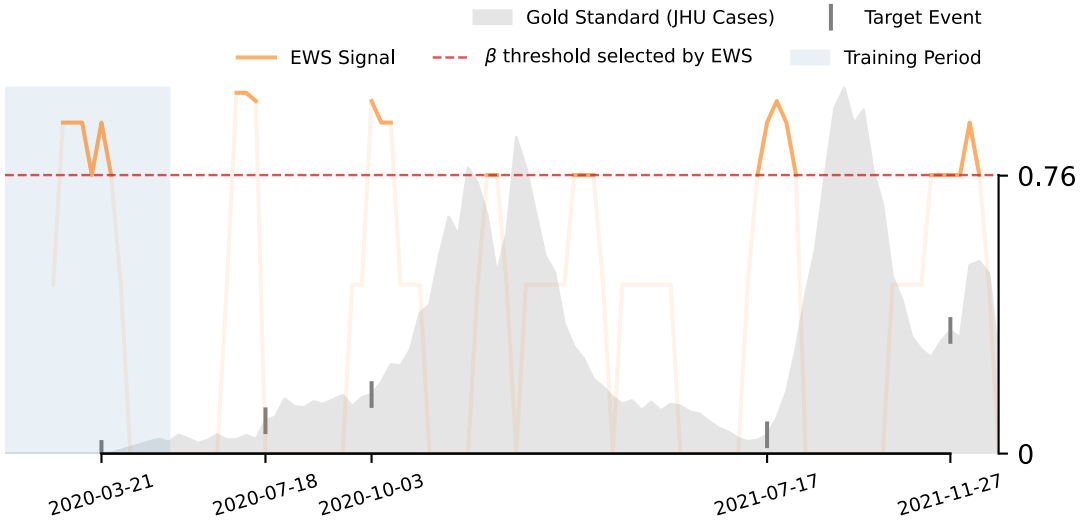
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	1	0	2	0	0	3
0.91	2	1	1	2	4	1
0.76	2	3	1	3	14	0
0.46	2	3	1	3	22	0
0.00	3	6	0	3	46	0

Kentucky

Proxies selected by the Multiple Sources method

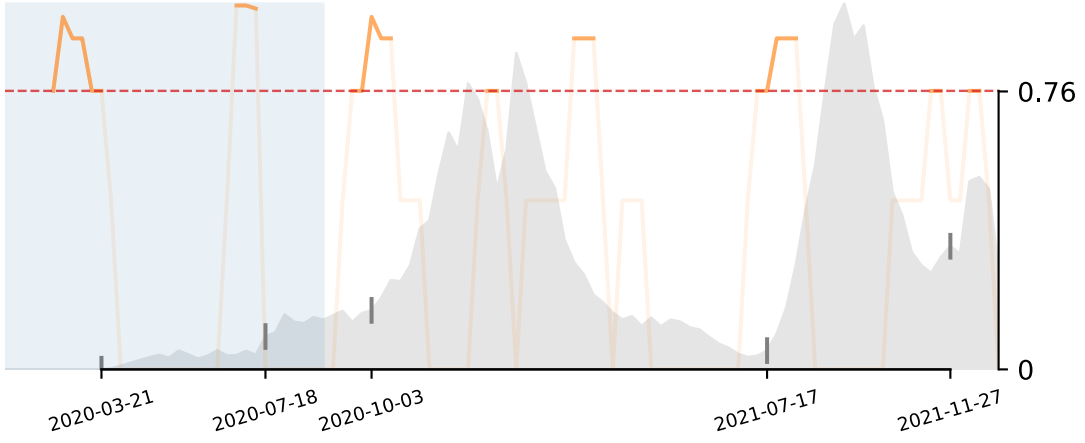
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) fever



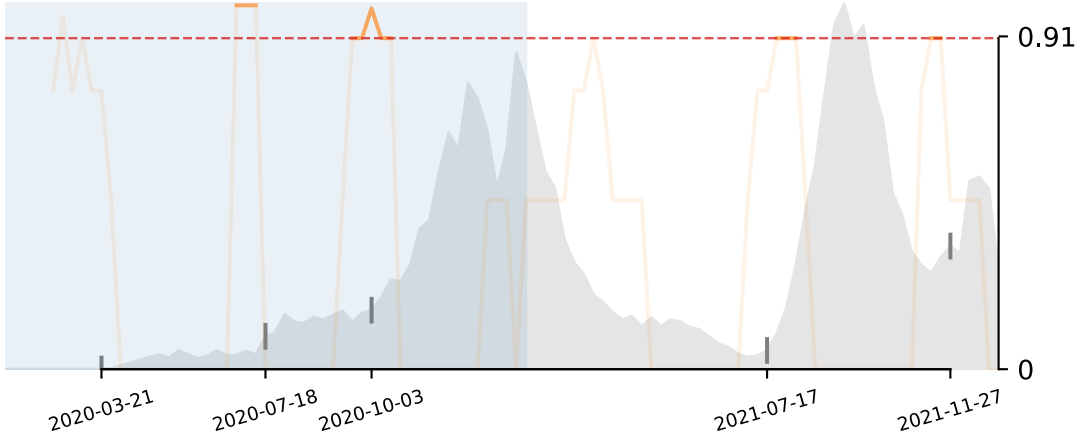
Model 2

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) fever
(GT) Acute bronchitis



Model 3

(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis
(GT) Pneumonia
(GT) covid
(GT) covid-19



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	0	0	1	2	1	1
0.91	0	0	1	3	5	0
0.76	1	0	0	4	13	0
0.46	1	1	0	4	31	0
0.00	1	3	0	4	58	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	0	1	0	0	3
0.96	1	0	1	1	0	2
0.91	2	0	0	1	8	1
0.76	2	0	0	3	12	0
0.46	2	1	0	3	29	0
0.00	2	2	0	3	51	0

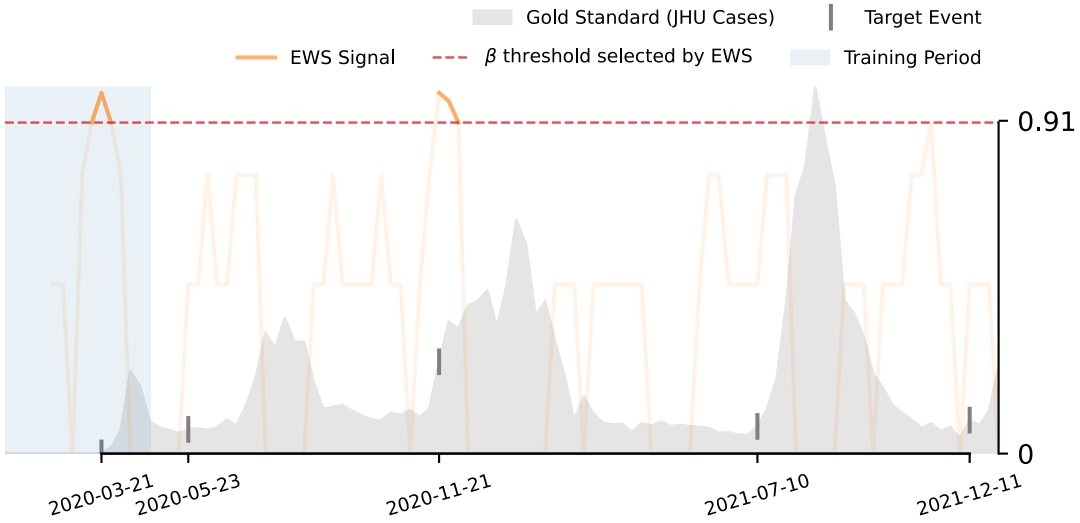
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	2	0	1	0	0	2
0.91	3	0	0	1	4	0
0.76	3	2	0	2	7	0
0.46	3	3	0	2	19	0
0.00	3	8	0	2	35	0

Louisiana

Proxies selected by the Multiple Sources method

Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) covid-19 who
(GT) Abdominal pain

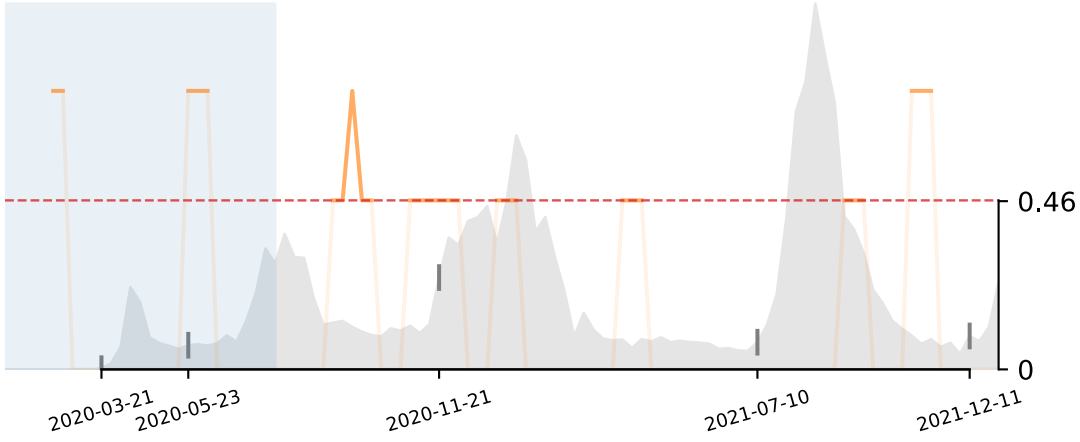


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	1	0	0	1	1	3
0.91	1	0	0	2	2	2
0.76	1	1	0	3	10	0
0.46	1	2	0	4	36	0
0.00	1	3	0	4	63	0

Model 2

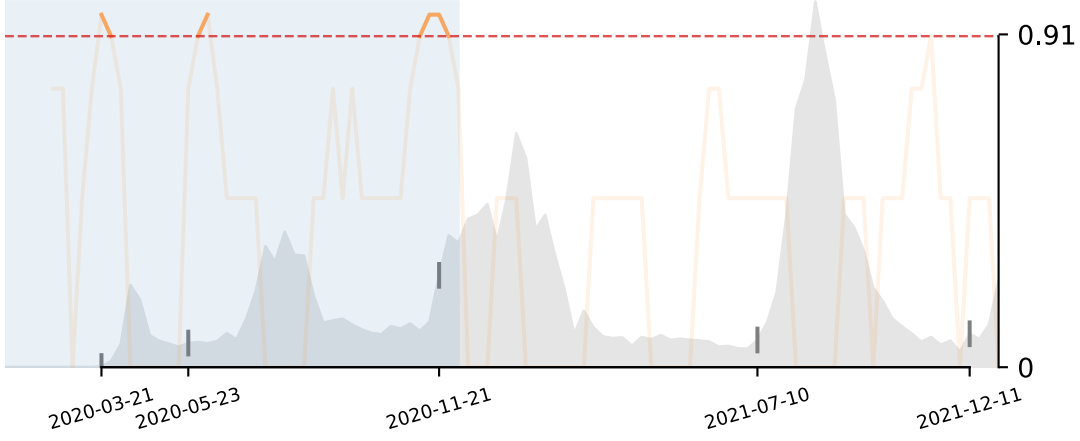
(GT) Abdominal pain
(GT) Diarrhea



β	tp	fp	fn	tp	fp	fn
0.76	0	0	2	1	1	2
0.46	2	3	0	2	16	1
0.00	2	3	0	3	54	0

Model 3

(GT) Abdominal pain
(GT) Diarrhea
(GT) covid
(GT) chest pain
(GT) covid symptoms
(GT) Ageusia



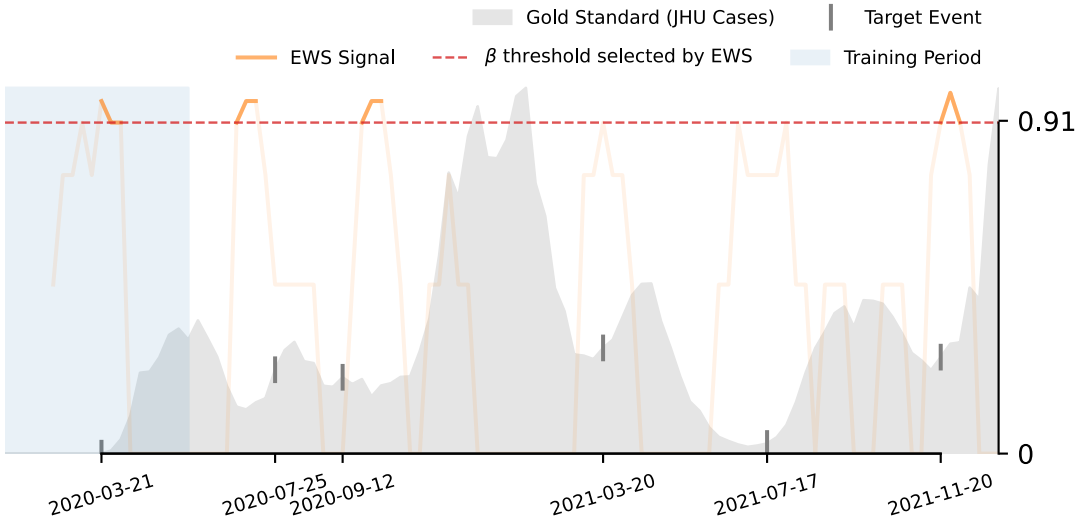
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	2	1	1	1	0	1
0.76	2	4	1	2	0	0
0.46	3	10	0	2	20	0
0.00	3	21	0	2	42	0

Maryland

Proxies selected by the Multiple Sources method

Model 1

(JHU) cases
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms

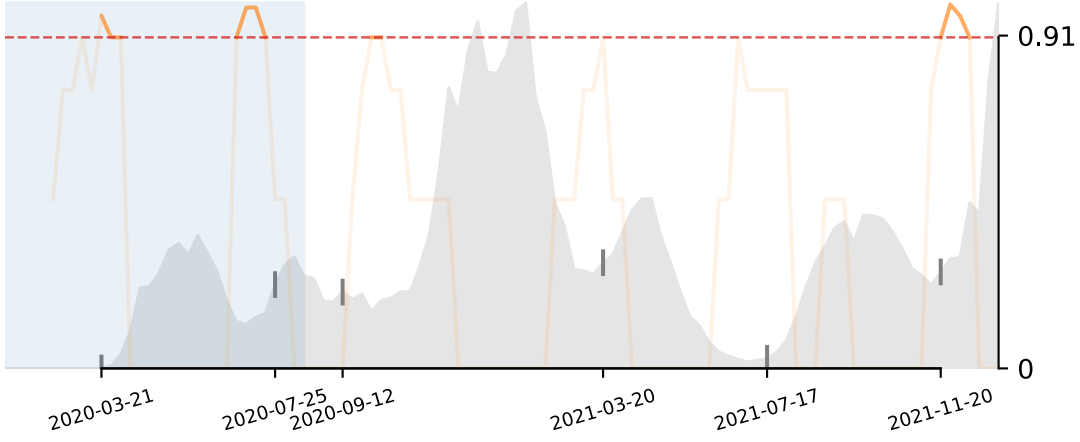


Performance as a function of β

β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	1	4
0.96	0	0	1	1	3	3
0.91	1	0	0	4	6	0
0.76	1	2	0	4	12	0
0.46	1	2	0	5	24	0
0.00	1	3	0	5	49	0

Model 2

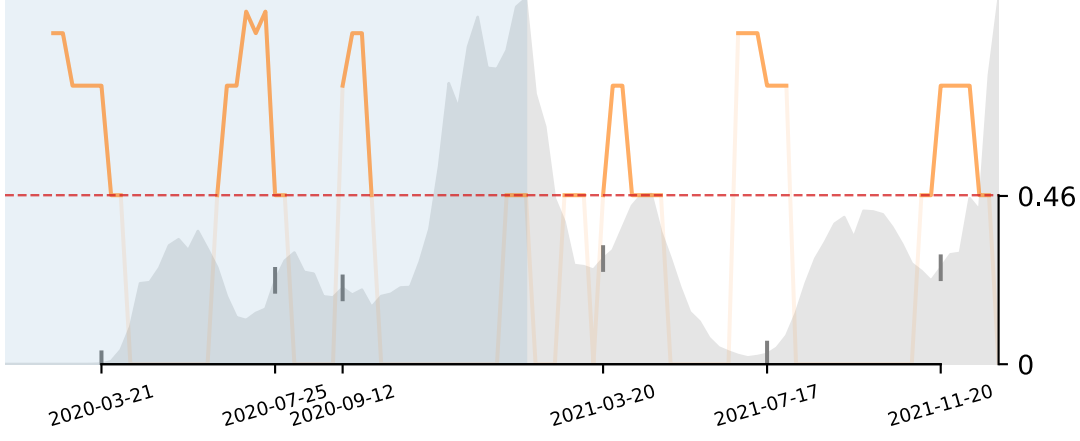
(JHU) cases
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	2	0	1	3
0.99	0	0	2	0	1	3
0.96	1	0	1	0	2	3
0.91	2	0	0	3	5	1
0.76	2	2	0	3	10	0
0.46	2	2	0	3	21	0
0.00	2	4	0	4	47	0

Model 3

(GT) Bronchitis
(GT) Asthma
(GT) covid-19 who
(GT) Hyperventilation
(GT) Nasal congestion
(JHU) cases



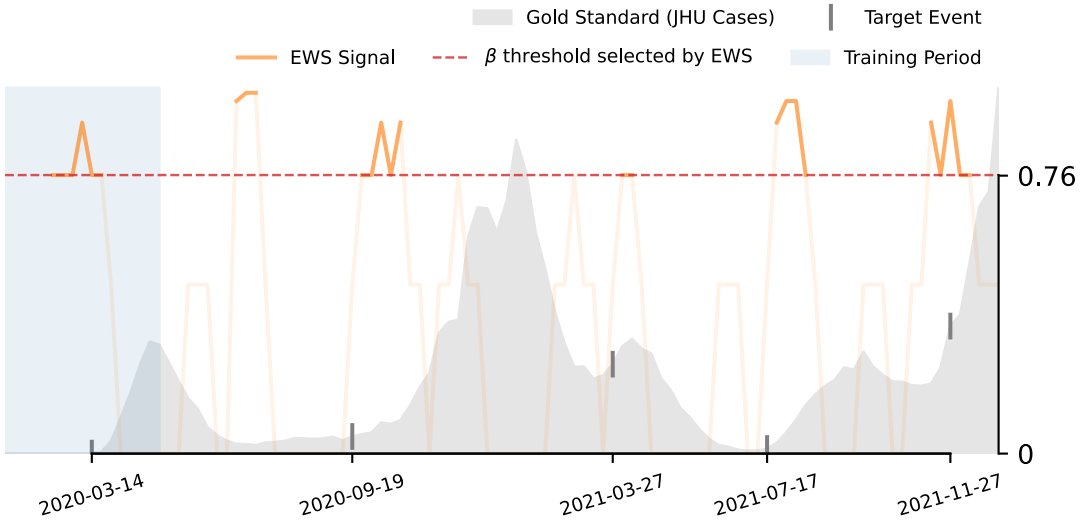
β	Training tp	Training fp	Training fn	Out of sample tp	Out of sample fp	Out of sample fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	0	3	0	0	3
0.91	1	0	2	1	0	2
0.76	2	3	1	2	7	0
0.46	3	4	0	3	13	0
0.00	3	12	0	3	28	0

Massachusetts

Proxies selected by the Multiple Sources method

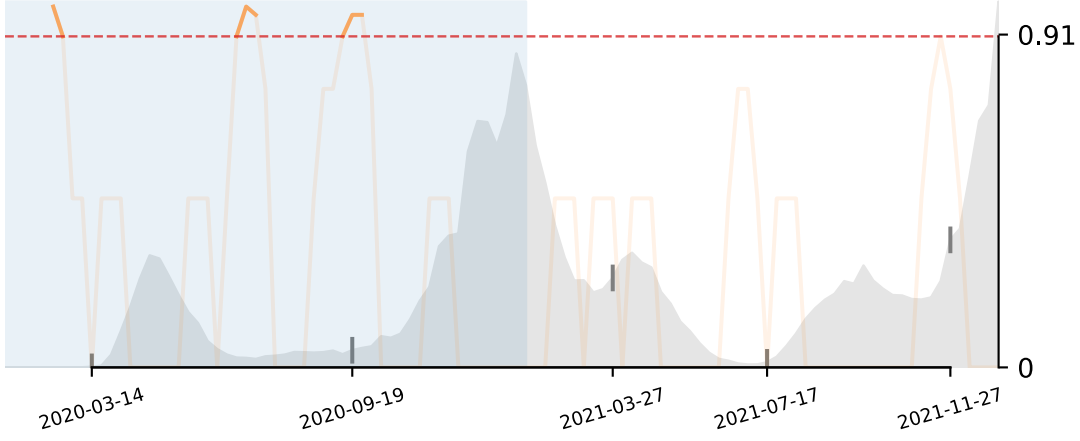
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine



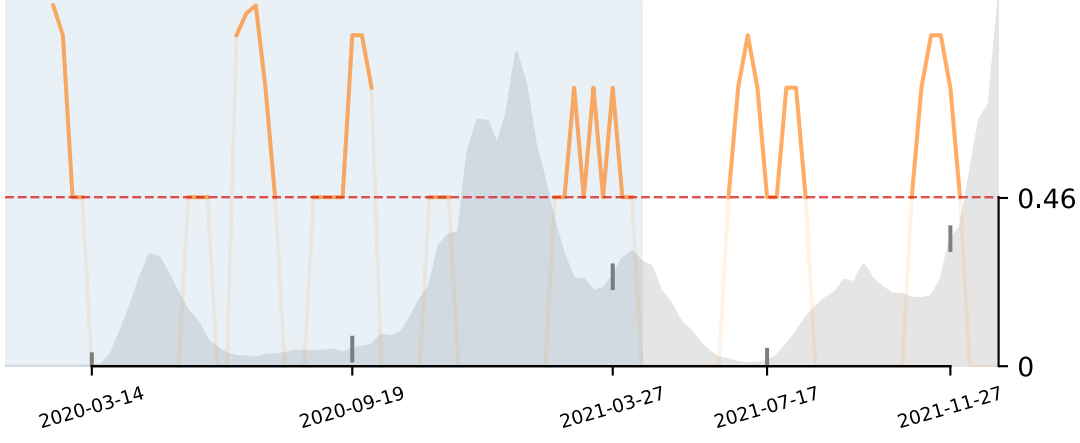
Model 2

(GT) covid-19
(GT) Ageusia
(GT) Asthma
(GT) Wheeze
(GT) Anosmia
(GT) Fever



Model 3

(GT) covid-19
(GT) Fever
(GT) Acute bronchitis
(GT) Ageusia
(GT) Asthma
(GT) Cough



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	2	4
0.96	0	0	1	1	5	2
0.91	0	0	1	1	8	2
0.76	1	0	0	2	17	0
0.46	1	1	0	4	35	0
0.00	1	2	0	4	59	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	1	1	0	0	3
0.91	2	3	0	1	0	2
0.76	2	4	0	2	0	1
0.46	2	6	0	3	7	0
0.00	2	16	0	3	28	0

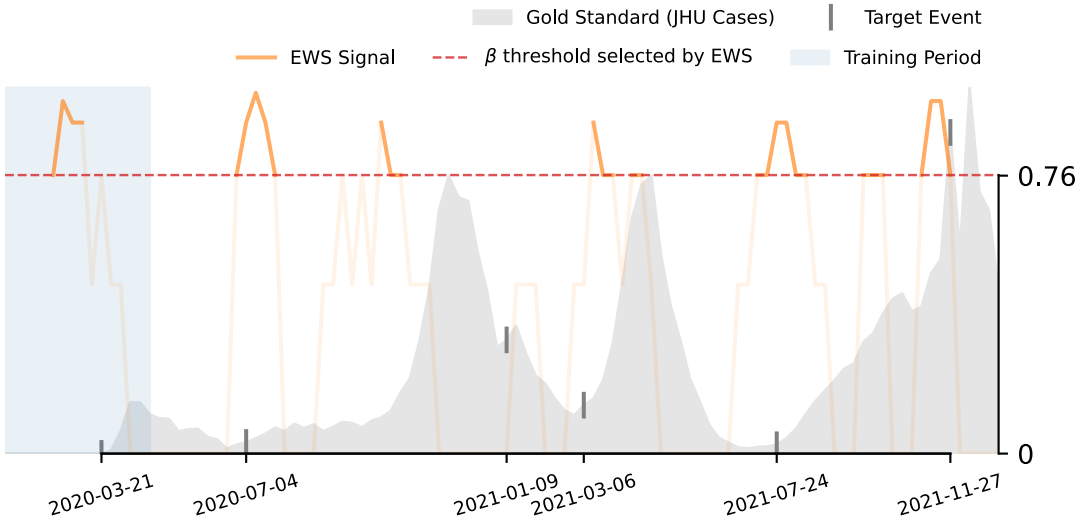
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	1	2	0	0	2
0.91	1	2	2	2	0	0
0.76	2	4	1	2	2	0
0.46	3	6	0	2	5	0
0.00	3	17	0	2	23	0

Michigan

Proxies selected by the Multiple Sources method

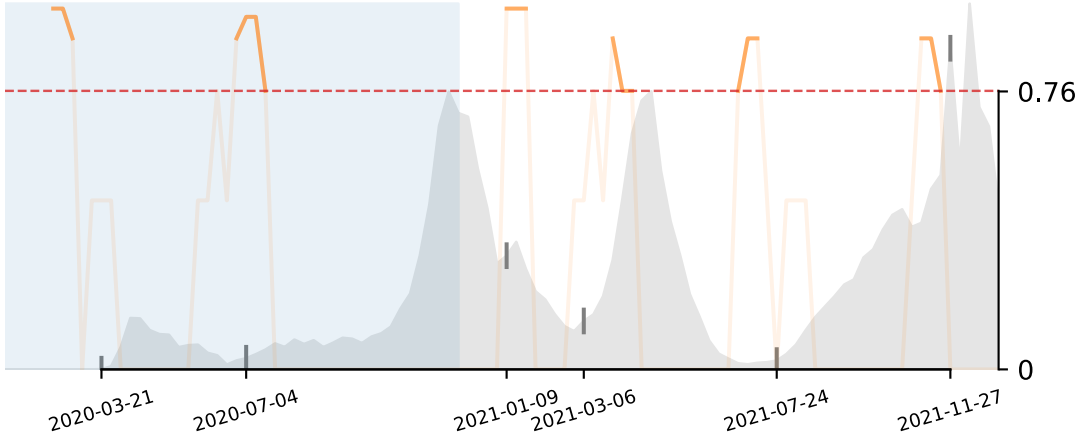
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



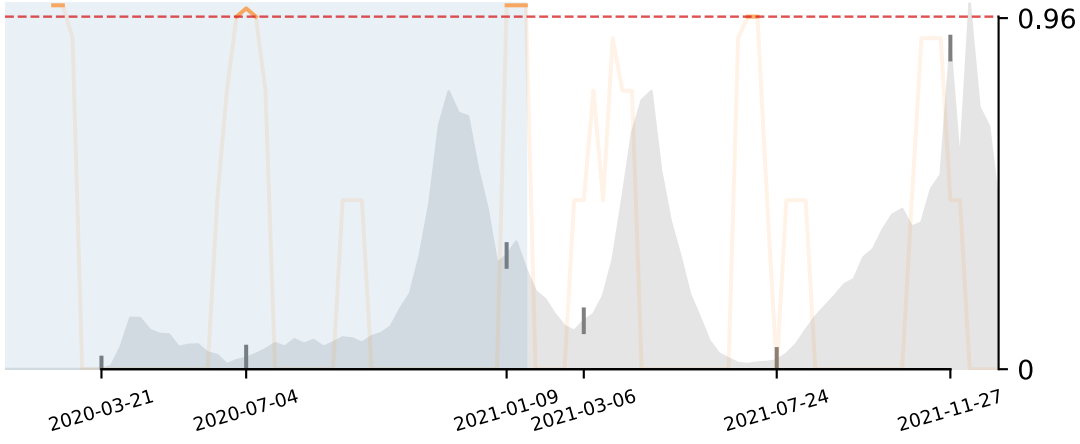
Model 2

(GT) covid-19 who
(GT) Acute bronchitis
(GT) Bronchitis
(GT) Cough
(GT) Nasal congestion
(GT) Pneumonia



Model 3

(GT) Acute bronchitis
(GT) Bronchitis
(GT) Cough
(GT) Nasal congestion
(GT) Pneumonia
(GT) Asthma



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	1	4
0.96	0	0	1	1	1	3
0.91	1	0	0	3	5	1
0.76	1	0	0	3	19	1
0.46	1	1	0	4	31	0
0.00	1	3	0	5	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	2	1	2
0.96	1	1	1	2	1	2
0.91	2	2	0	4	2	0
0.76	2	2	0	4	5	0
0.46	2	3	0	4	9	0
0.00	2	5	0	4	30	0

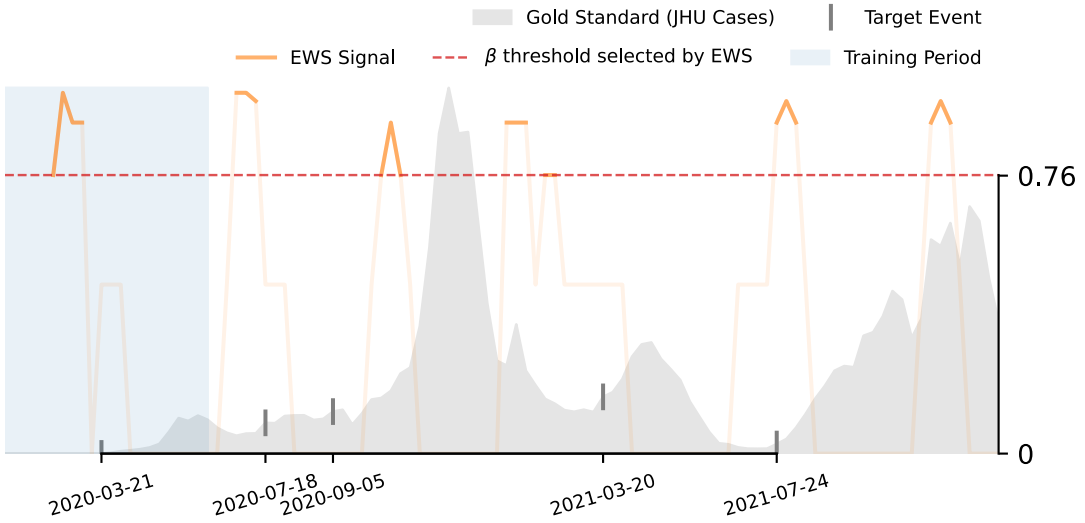
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	2	3	1	0	0	3
0.96	3	3	0	1	0	2
0.91	3	4	0	2	1	1
0.76	3	4	0	2	4	0
0.46	3	5	0	3	9	0
0.00	3	8	0	3	29	0

Minnesota

Proxies selected by the Multiple Sources method

Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) fever
(GT) Acute bronchitis
(GT) Asthma

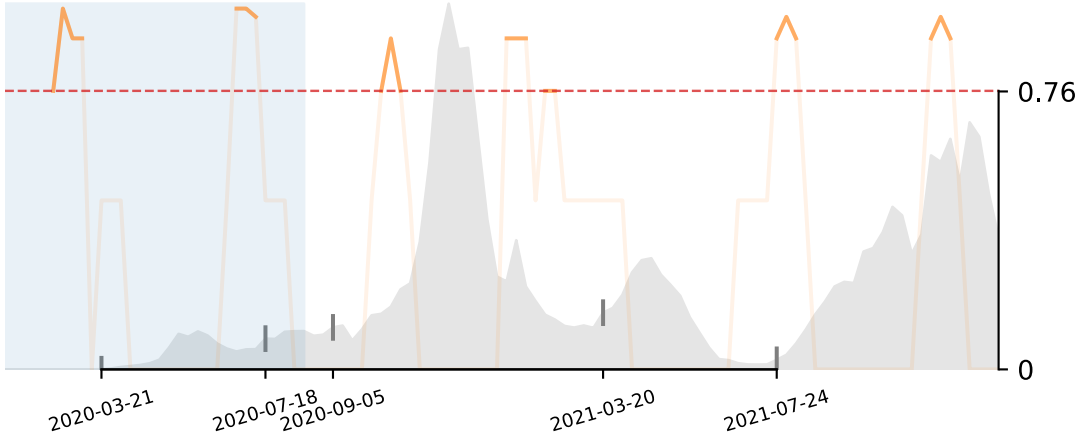


Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	0	3
0.96	1	0	0	1	2	2
0.91	1	0	0	2	9	2
0.76	1	0	0	3	11	1
0.46	1	1	0	4	19	0
0.00	1	3	0	4	55	0

Model 2

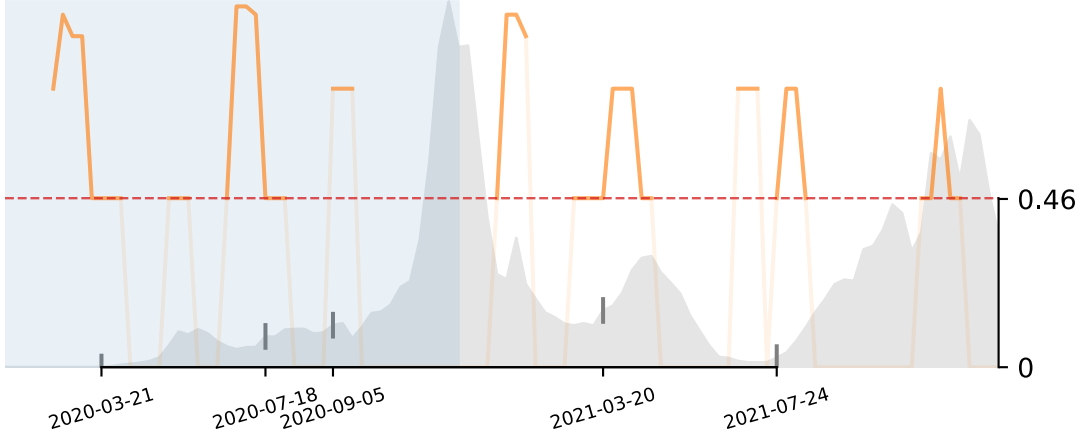
(JHU) cases
(GT) covid
(GT) covid-19
(GT) fever
(GT) Acute bronchitis
(GT) Asthma



β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	2	0	0	0	2	2
0.91	2	0	0	1	9	2
0.76	2	0	0	2	11	1
0.46	2	1	0	2	19	1
0.00	2	5	0	3	55	0

Model 3

(GT) Nasal congestion
(GT) Ageusia
(JHU) cases
(GT) Acute bronchitis
(GT) Asthma
(GT) Wheeze



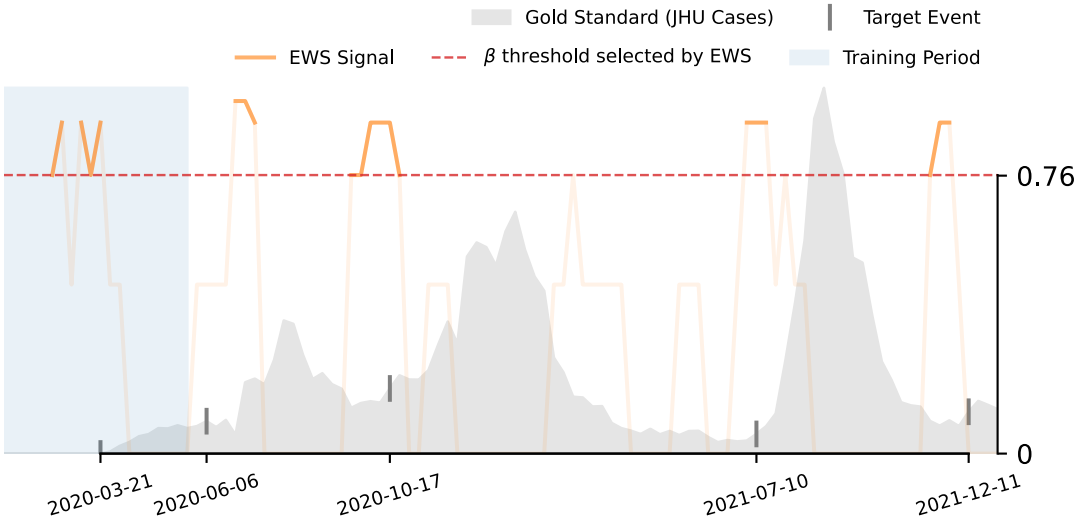
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	0	2	0	2	2
0.91	2	0	1	0	3	2
0.76	2	0	1	1	9	0
0.46	3	3	0	2	17	0
0.00	3	10	0	2	42	0

Mississippi

Proxies selected by the Multiple Sources method

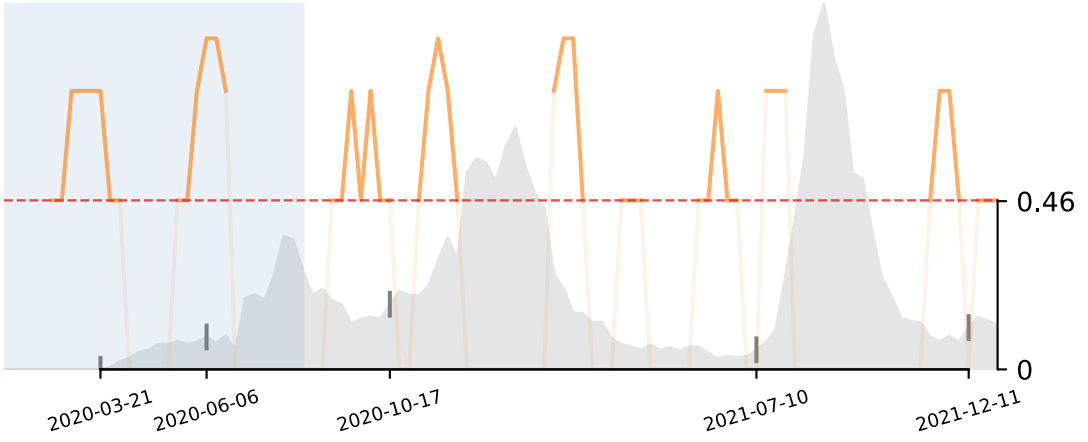
Model 1

(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Bronchitis
(GT) Burning Chest Pain



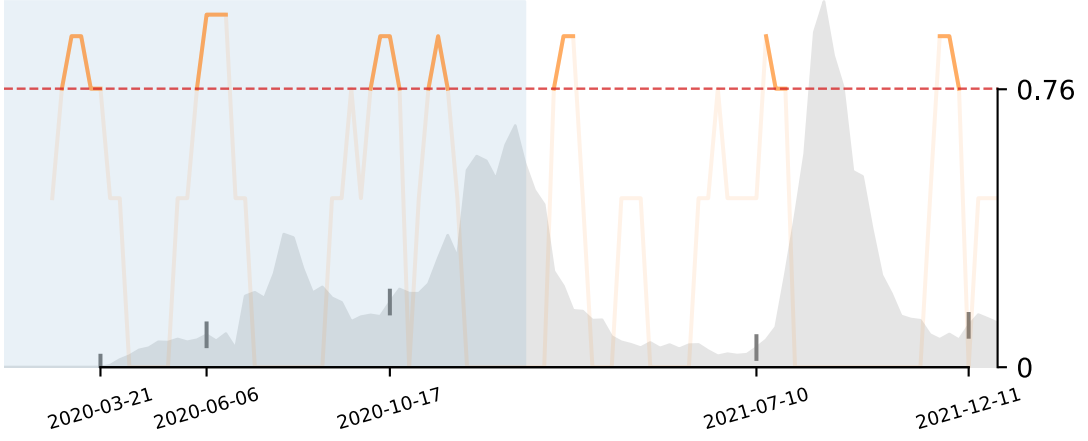
Model 2

(GT) covid symptoms
(GT) fever
(GT) Chest pain
(GT) Hyperventilation



Model 3

(GT) covid symptoms
(GT) Chest pain
(GT) Hyperventilation
(GT) fever
(GT) Anosmia
(GT) covid



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	2	4
0.91	0	0	1	3	4	1
0.76	1	0	0	3	7	1
0.46	1	1	0	4	24	0
0.00	1	3	0	4	61	0

β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	3
0.91	0	0	2	0	3	3
0.76	1	1	1	3	9	0
0.46	2	2	0	3	18	0
0.00	2	5	0	3	51	0

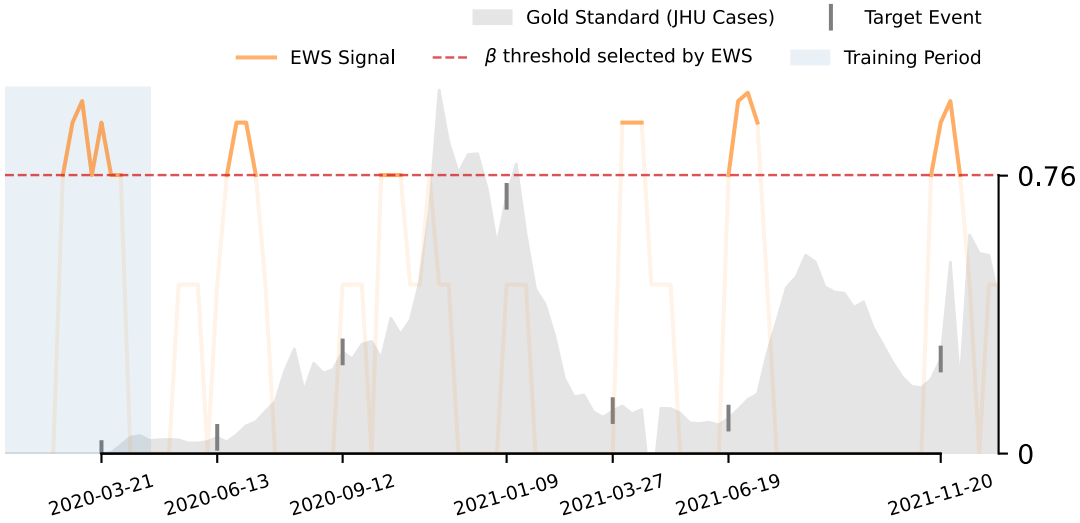
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	2	2	1	3	0
0.76	3	3	0	2	6	0
0.46	3	6	0	2	13	0
0.00	3	15	0	2	35	0

Missouri

Proxies selected by the Multiple Sources method

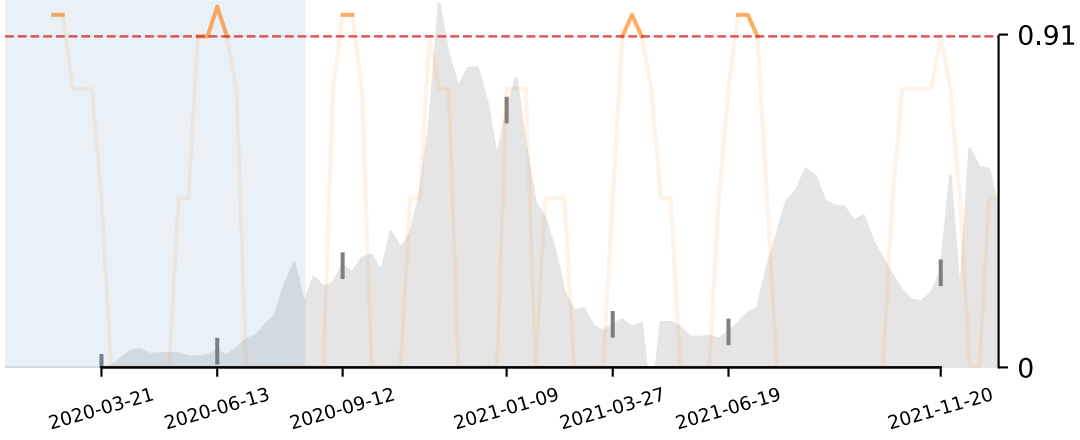
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) covid-19 who



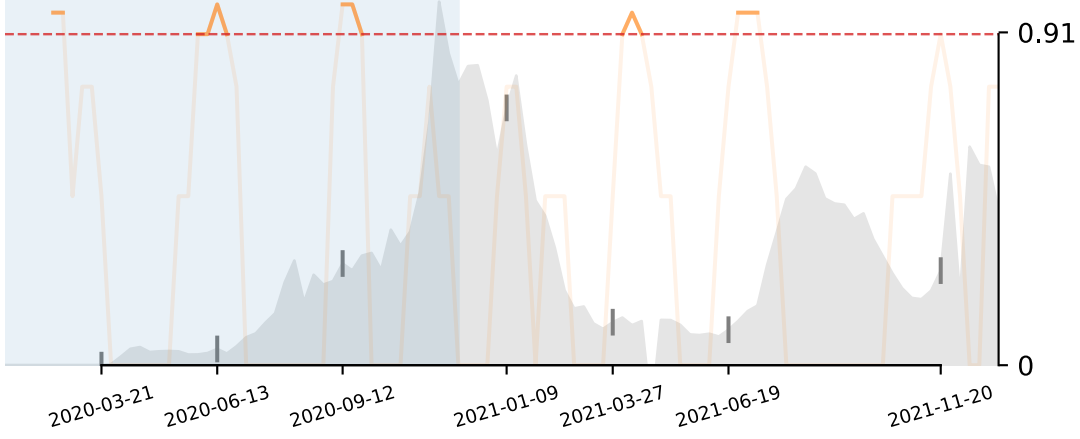
Model 2

(GT) chest pain
(GT) covid symptoms
(GT) Chest pain
(GT) Nasal congestion
(GT) Otitis
(GT) Sore throat



Model 3

(GT) covid symptoms
(GT) Nasal congestion
(GT) Sore throat
(GT) Throat irritation
(GT) Chest pain
(GT) chest pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	6
0.99	0	0	1	0	1	5
0.96	0	0	1	0	3	4
0.91	1	0	0	1	9	2
0.76	1	0	0	2	16	2
0.46	1	2	0	5	30	0
0.00	1	2	0	6	46	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	5
0.99	0	0	2	0	0	5
0.96	1	0	1	1	4	2
0.91	2	1	0	2	8	1
0.76	2	2	0	4	14	0
0.46	2	3	0	5	22	0
0.00	2	3	0	5	40	0

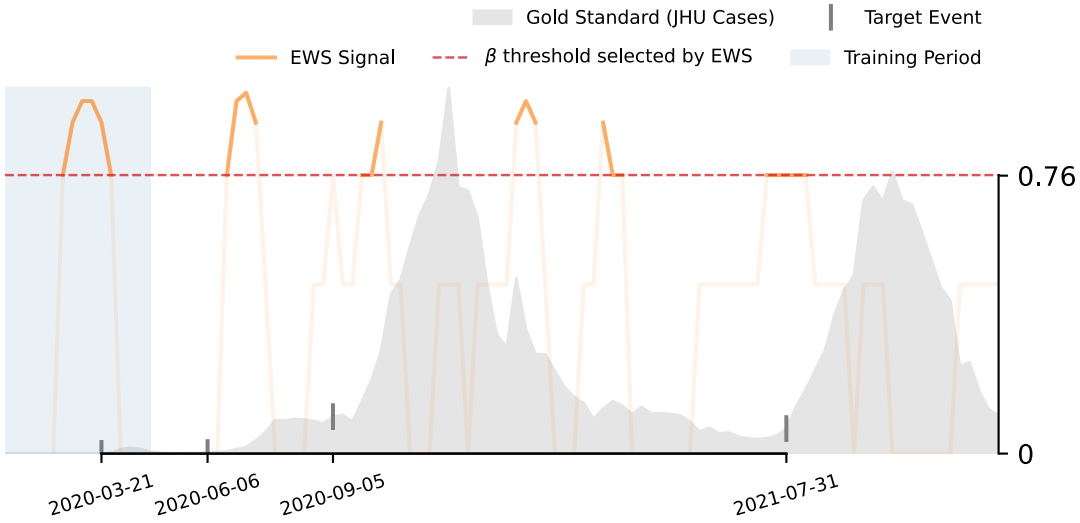
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	4
0.99	0	0	3	0	0	4
0.96	2	1	1	0	4	2
0.91	3	2	0	1	6	1
0.76	3	4	0	3	12	0
0.46	3	6	0	4	17	0
0.00	3	10	0	4	30	0

Montana

Proxies selected by the Multiple Sources method

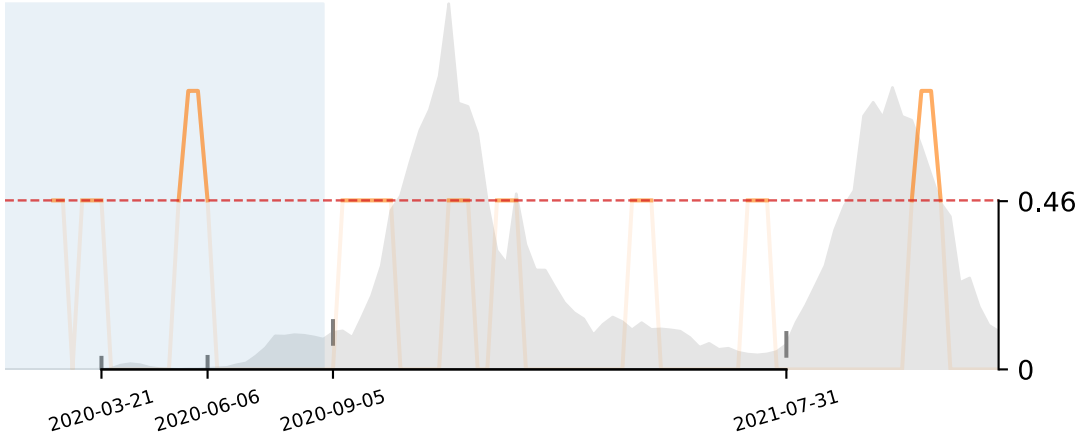
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



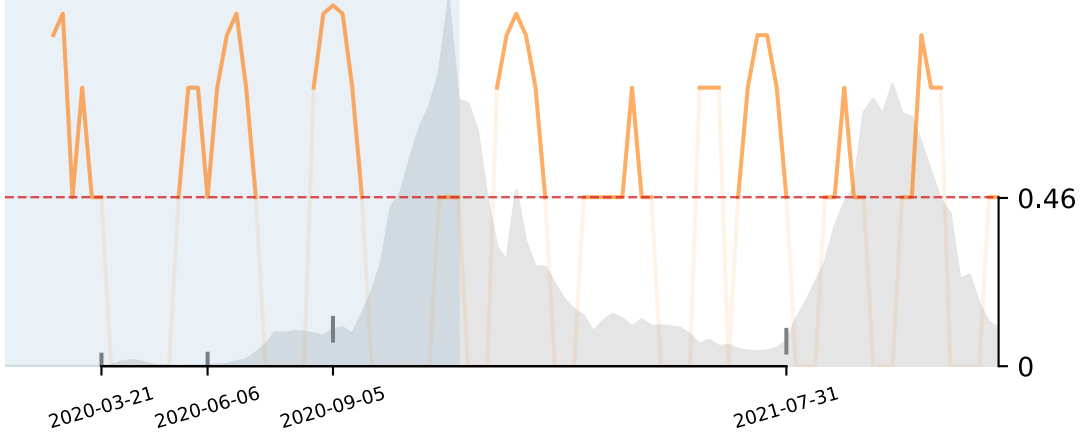
Model 2

(GT) Diarrhea
(GT) Phlegm



Model 3

(GT) Vomiting
(GT) covid
(GT) Nasal congestion
(GT) Phlegm
(GT) Shortness of breath
(GT) fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	1	3
0.96	0	0	1	0	3	3
0.91	1	0	0	0	8	3
0.76	1	0	0	2	15	0
0.46	1	1	0	2	45	0
0.00	1	1	0	3	68	0

	tp	fp	fn	tp	fp	fn
β						
0.76	0	0	2	0	2	2
0.46	1	0	1	1	19	0
0.00	2	1	0	2	62	0

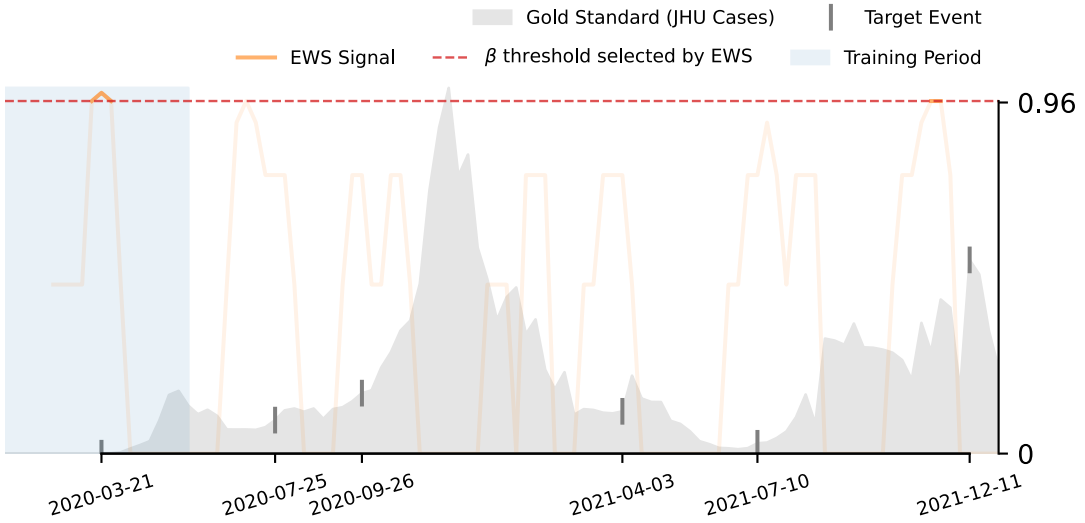
	tp	fp	fn	tp	fp	fn
β						
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	1	0	2	0	1	1
0.91	2	2	1	1	4	0
0.76	2	4	1	1	13	0
0.46	3	7	0	1	29	0
0.00	3	12	0	1	49	0

Nebraska

Proxies selected by the Multiple Sources method

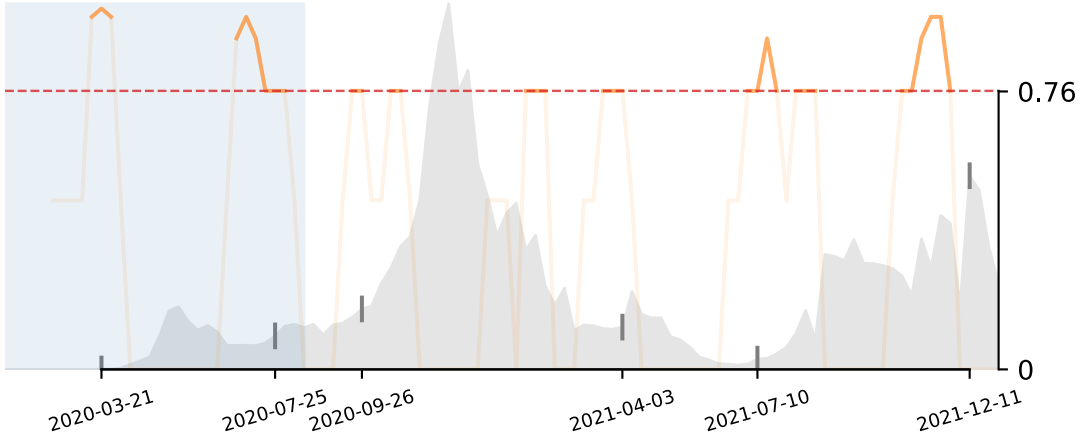
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) quarantine
(GT) fever



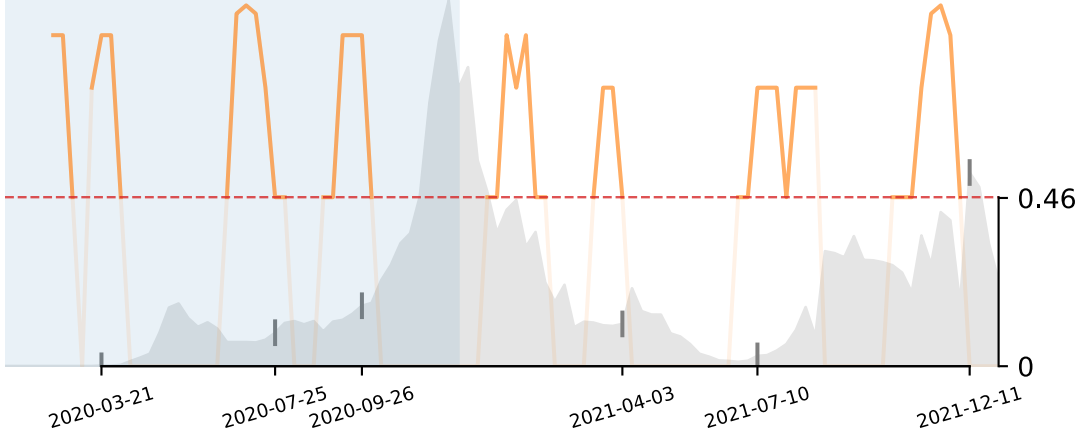
Model 2

(JHU) cases
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) quarantine
(GT) fever



Model 3

(GT) covid-19
(GT) fever
(GT) Asthma
(GT) Pneumonia
(JHU) cases
(GT) quarantine



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	1	0	0	2	0	3
0.91	1	1	0	2	1	2
0.76	1	1	0	5	12	0
0.46	1	1	0	5	22	0
0.00	1	3	0	5	49	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	1	0	1	1	0	3
0.91	2	1	0	1	1	2
0.76	2	1	0	4	11	0
0.46	2	2	0	4	20	0
0.00	2	6	0	4	45	0

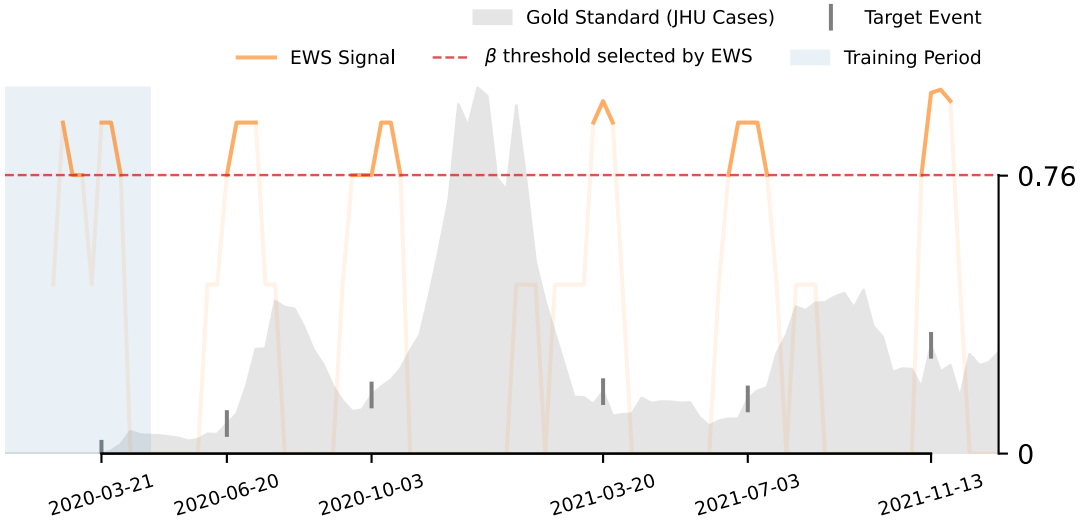
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	1	0	2
0.96	1	0	2	1	0	2
0.91	1	0	2	1	2	2
0.76	3	2	0	3	8	0
0.46	3	2	0	3	15	0
0.00	3	6	0	3	35	0

Nevada

Proxies selected by the Multiple Sources method

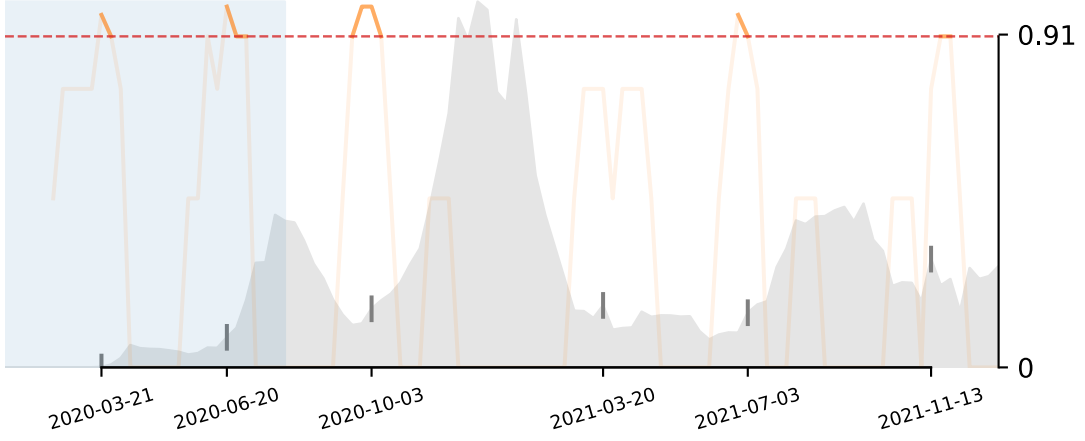
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) covid-19 who



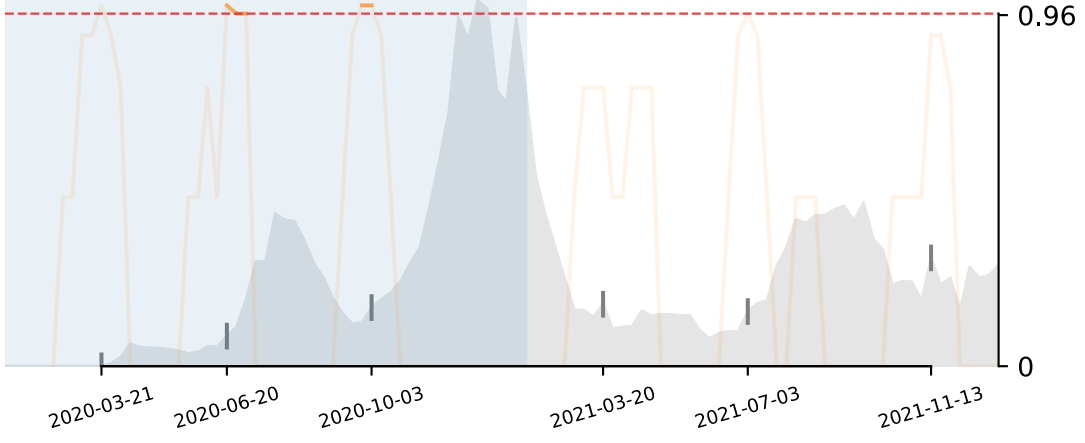
Model 2

(JHU) cases
(GT) covid-19
(GT) fever
(GT) Anosmia
(GT) Chest pain
(GT) Chills



Model 3

(JHU) cases
(GT) covid-19
(GT) fever
(GT) Anosmia
(GT) Chills
(GT) Phlegm



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	1	4
0.99	0	0	1	1	1	4
0.96	0	0	1	2	2	3
0.91	0	0	1	3	9	0
0.76	1	1	0	5	11	0
0.46	1	2	0	5	22	0
0.00	1	3	0	5	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	1	0	3
0.96	1	0	1	2	0	2
0.91	2	0	0	2	3	1
0.76	2	3	0	4	7	0
0.46	2	4	0	4	17	0
0.00	2	5	0	4	46	0

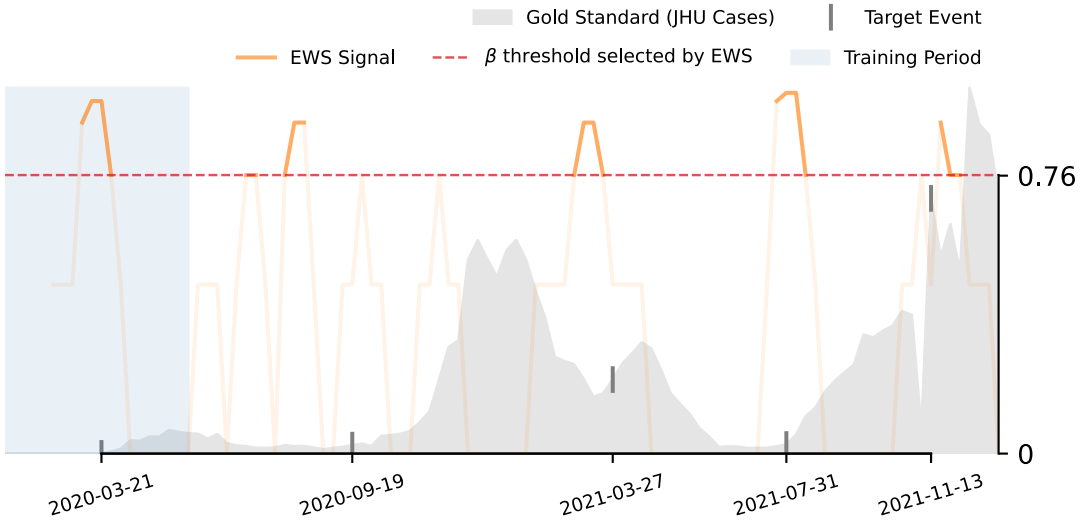
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	3	0	0	1	0	2
0.91	3	2	0	2	2	1
0.76	3	4	0	3	6	0
0.46	3	5	0	3	12	0
0.00	3	6	0	3	28	0

New Hampshire

Proxies selected by the Multiple Sources method

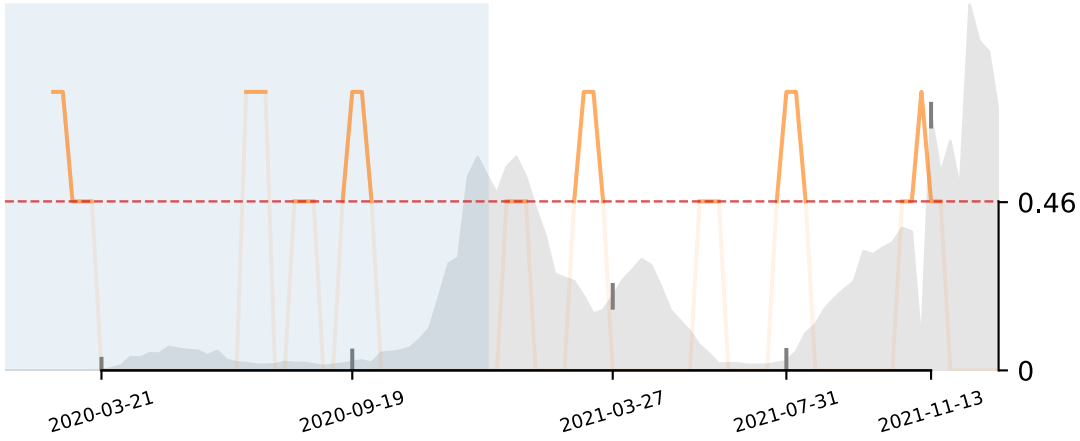
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis



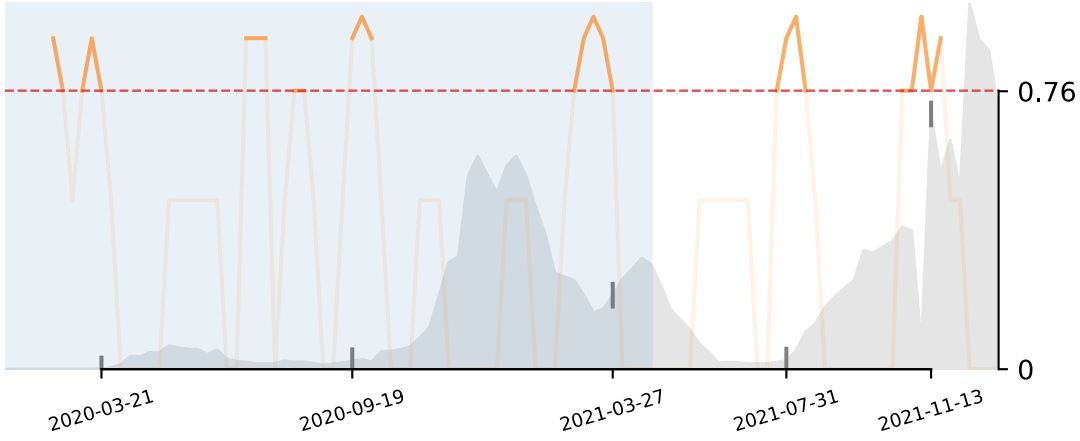
Model 2

(GT) Acute bronchitis
(GT) covid
(GT) Shortness of breath



Model 3

(GT) Acute bronchitis
(GT) covid
(GT) covid symptoms
(GT) quarantine
(GT) Shortness of breath
(GT) Fever



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	1	3
0.96	0	0	1	1	1	3
0.91	1	0	0	3	2	0
0.76	1	0	0	4	10	0
0.46	1	1	0	4	30	0
0.00	1	3	0	4	56	0

β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	0	0	3
0.76	0	0	2	3	1	0
0.46	2	5	0	3	9	0
0.00	2	8	0	3	32	0

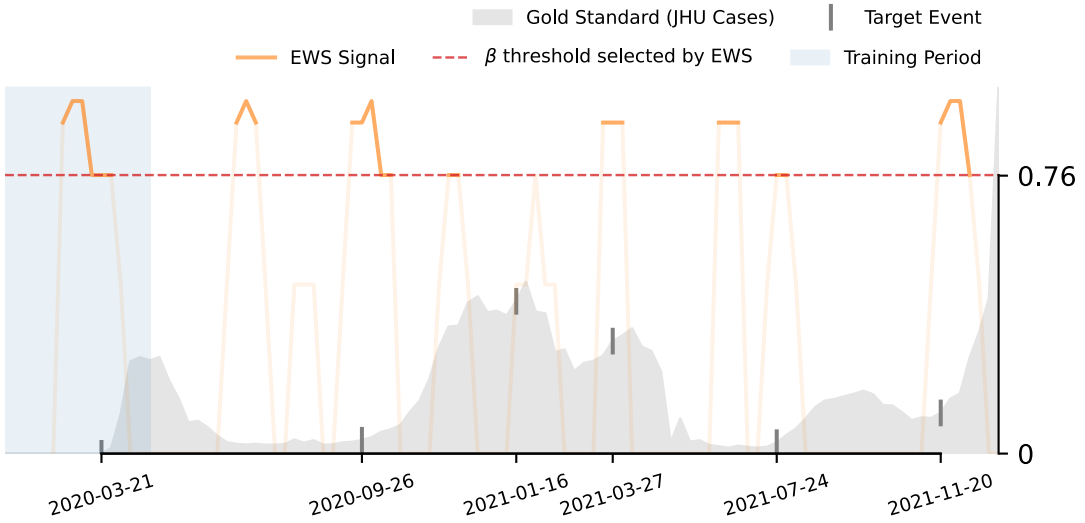
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	1	1	0
0.91	1	1	2	2	2	0
0.76	3	6	0	2	3	0
0.46	3	8	0	2	9	0
0.00	3	24	0	2	22	0

New Jersey

Proxies selected by the Multiple Sources method

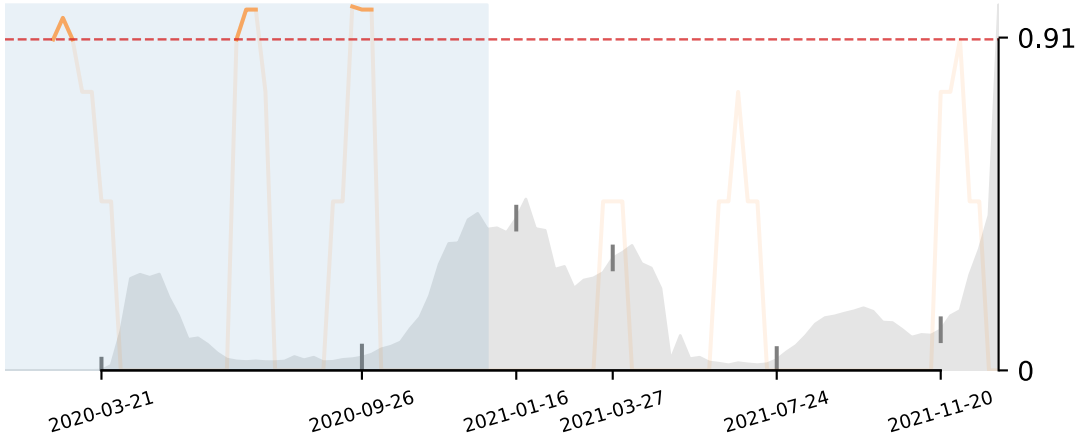
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) chest tightness
(GT) fever



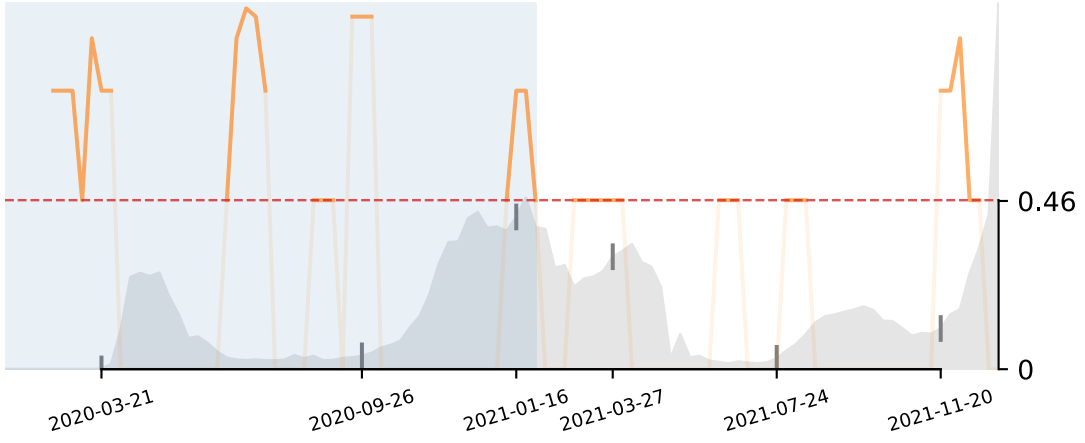
Model 2

(GT) chest tightness
(GT) covid symptoms
(GT) Ageusia
(GT) Anosmia
(GT) Asthma
(GT) Burning Chest Pain



Model 3

(GT) chest tightness
(GT) covid symptoms
(GT) nose bleed
(GT) Acute bronchitis
(GT) Ageusia
(GT) Anosmia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	0	0	1	0	4	3
0.91	1	0	0	4	7	1
0.76	1	0	0	5	13	0
0.46	1	1	0	5	21	0
0.00	1	2	0	5	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	1	0	1	0	0	4
0.96	1	3	1	0	0	4
0.91	2	3	0	0	1	3
0.76	2	5	0	2	2	2
0.46	2	6	0	3	5	1
0.00	2	7	0	4	29	0

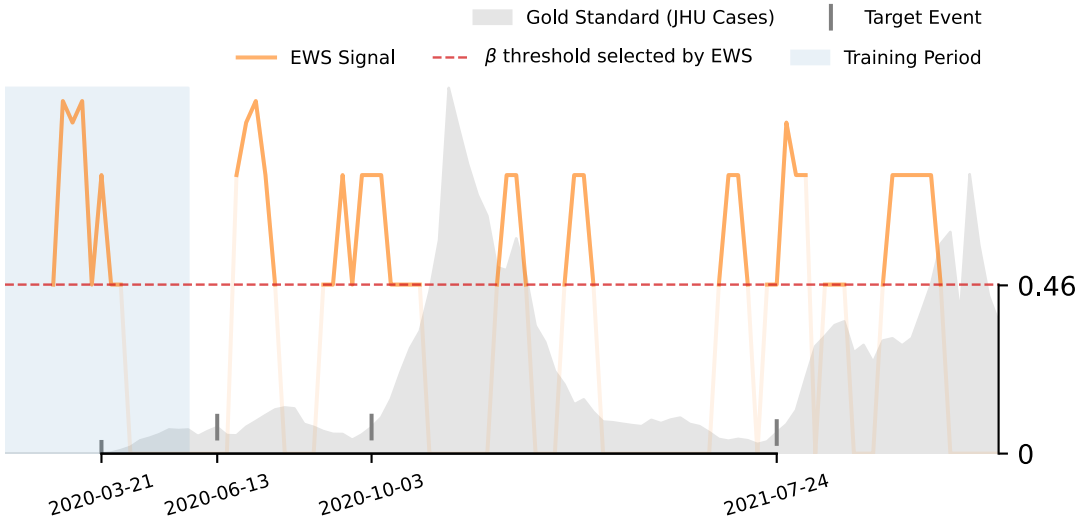
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	0	1	3	0	0	3
0.91	1	3	2	0	1	2
0.76	2	4	1	1	2	2
0.46	3	8	0	3	8	0
0.00	3	11	0	3	27	0

New Mexico

Proxies selected by the Multiple Sources method

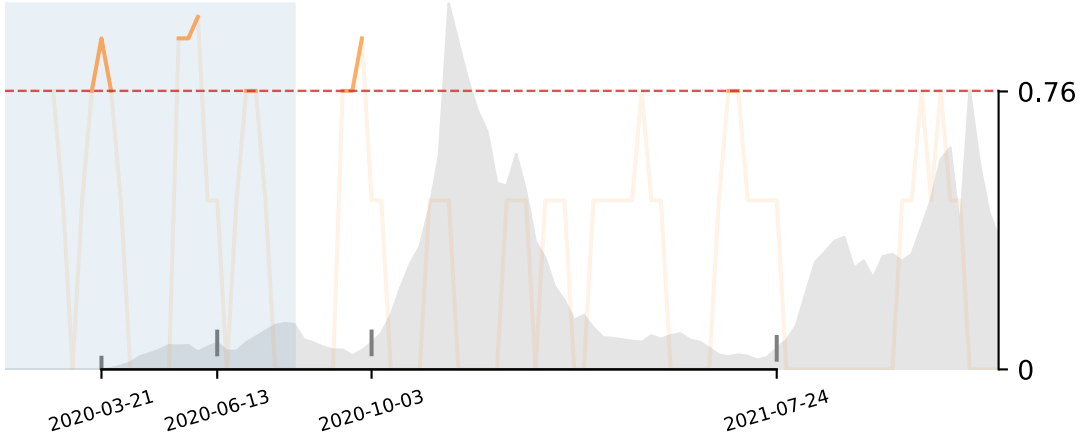
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) quarantine
(GT) sars-cov-2
(GT) Acute bronchitis



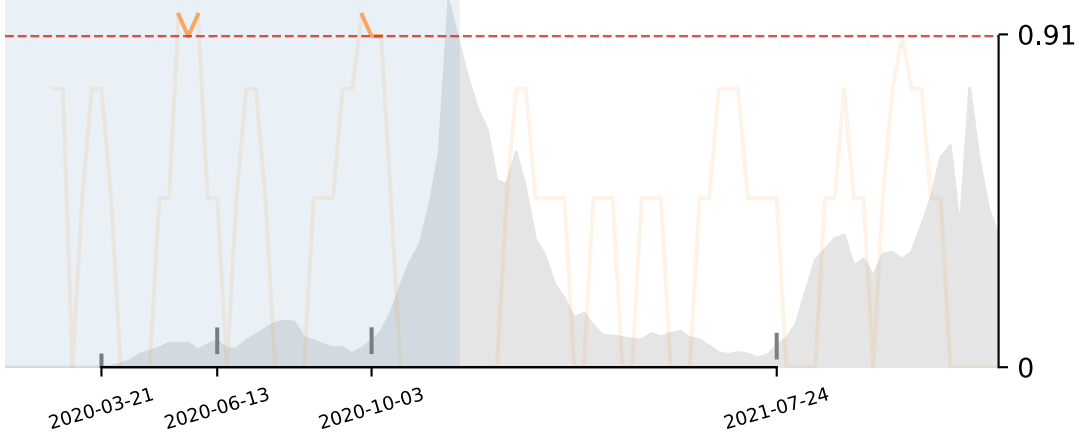
Model 2

(GT) Otitis
(GT) covid symptoms
(GT) Chest pain
(GT) Fever



Model 3

(GT) Otitis
(GT) covid symptoms
(GT) Fever
(GT) chest pain
(GT) Asphyxia
(GT) Vomiting



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	1	3
0.91	1	0	0	0	3	2
0.76	1	0	0	2	17	0
0.46	1	0	0	2	31	0
0.00	1	3	0	3	67	0

β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	2
0.91	1	0	1	1	0	1
0.76	2	0	0	2	3	0
0.46	2	4	0	2	25	0
0.00	2	7	0	2	59	0

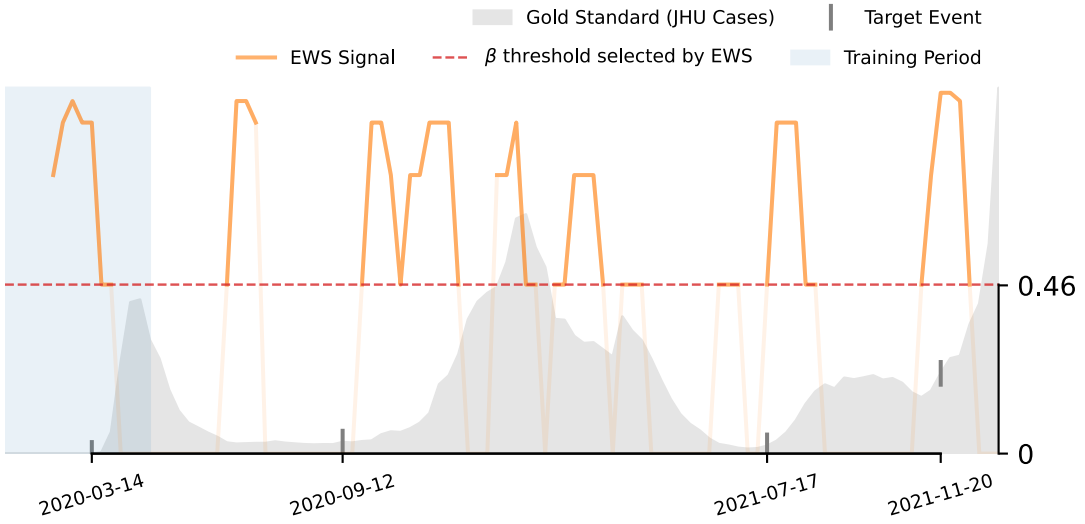
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	2	0	1	0	1	1
0.76	2	1	1	1	7	0
0.46	3	4	0	1	27	0
0.00	3	12	0	1	49	0

New York

Proxies selected by the Multiple Sources method

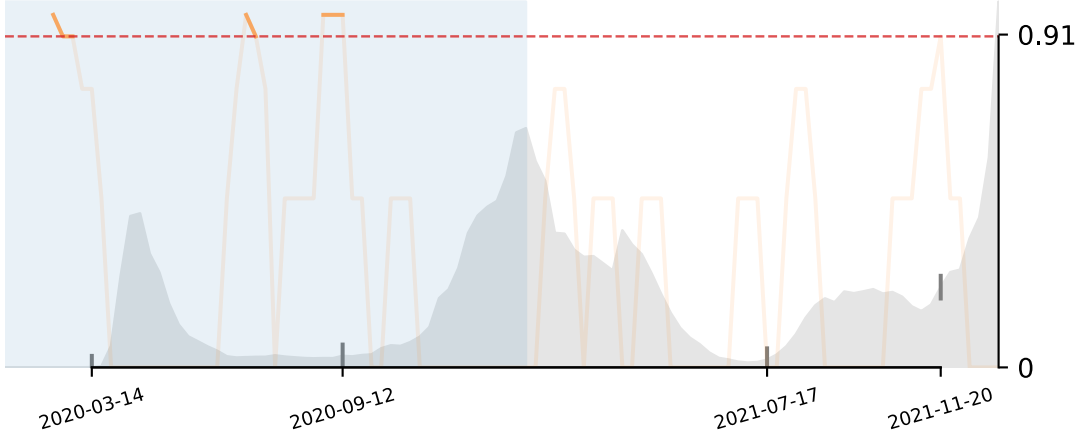
Model 1

(GT) covid
(GT) how long does covid last
(GT) loss smell
(GT) covid-19
(GT) loss taste
(GT) chest pain



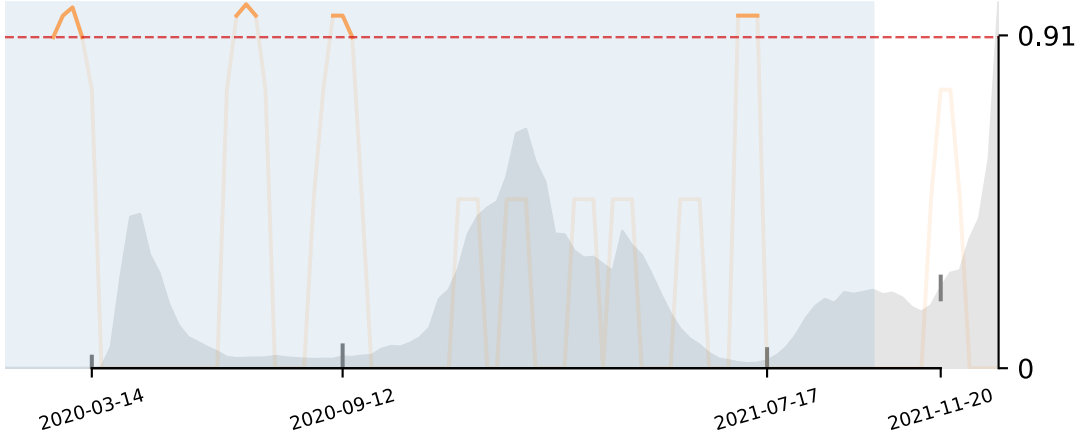
Model 2

(GT) nose bleed
(GT) sars-cov-2
(GT) Anosmia
(GT) Asthma
(GT) Burning Chest Pain
(GT) Pneumonia



Model 3

(GT) Asthma
(GT) covid symptoms
(GT) covid-19 who
(GT) Anosmia
(GT) Bronchitis
(GT) Burning Chest Pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	1	1	2
0.96	0	0	1	1	4	2
0.91	1	0	0	1	14	1
0.76	1	0	0	1	22	1
0.46	1	0	0	2	37	0
0.00	1	2	0	3	67	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	0	0	2	0	0	2
0.91	2	1	0	1	0	1
0.76	2	2	0	1	4	1
0.46	2	4	0	2	16	0
0.00	2	13	0	2	35	0

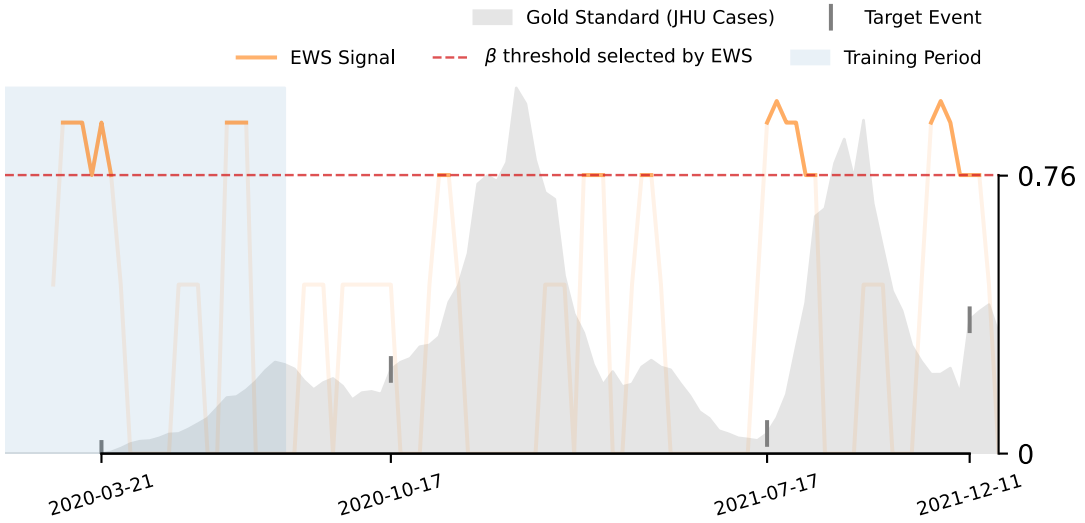
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	1	3	0	0	1
0.96	1	1	2	0	0	1
0.91	3	3	0	0	0	1
0.76	3	4	0	1	1	0
0.46	3	6	0	1	2	0
0.00	3	22	0	1	6	0

North Carolina

Proxies selected by the Multiple Sources method

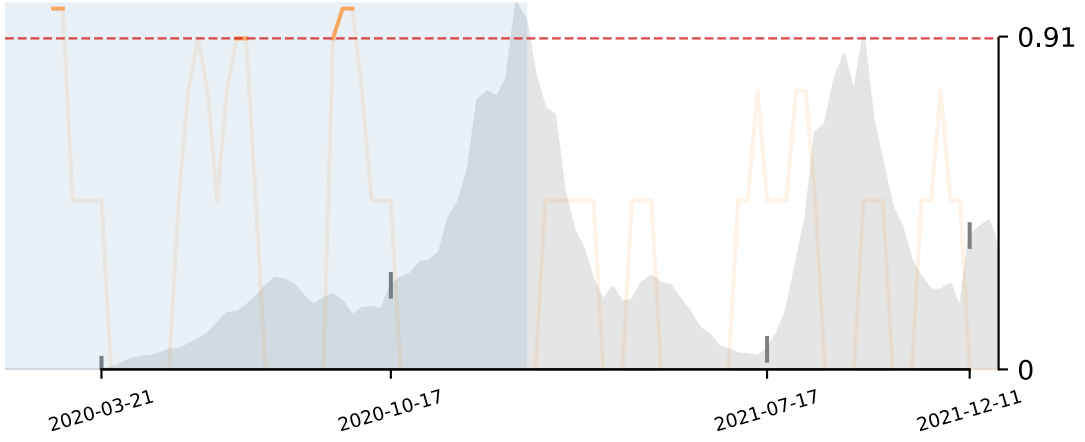
Model 1

(JHU) cases
(GT) sars-cov-2
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms



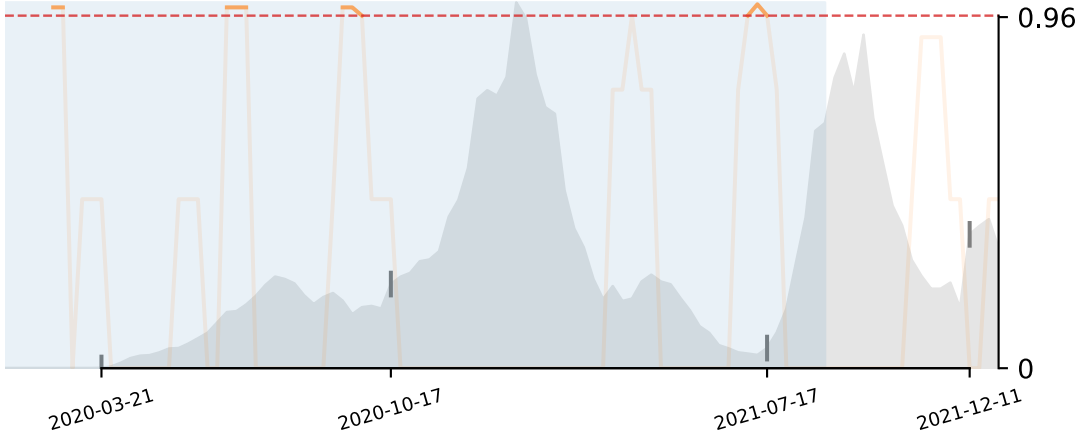
Model 2

(GT) chest pain
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Ageusia
(GT) Anosmia
(GT) Bronchitis



Model 3

(GT) Bronchitis
(GT) Throat irritation
(GT) covid symptoms
(GT) Cough
(GT) Nasal congestion
(GT) Phlegm



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	1	1
0.91	0	0	1	2	3	1
0.76	1	3	0	2	13	1
0.46	1	4	0	3	27	0
0.00	1	9	0	3	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	2	2	0	0	0	2
0.91	2	2	0	0	0	2
0.76	2	6	0	2	2	0
0.46	2	9	0	2	17	0
0.00	2	12	0	2	35	0

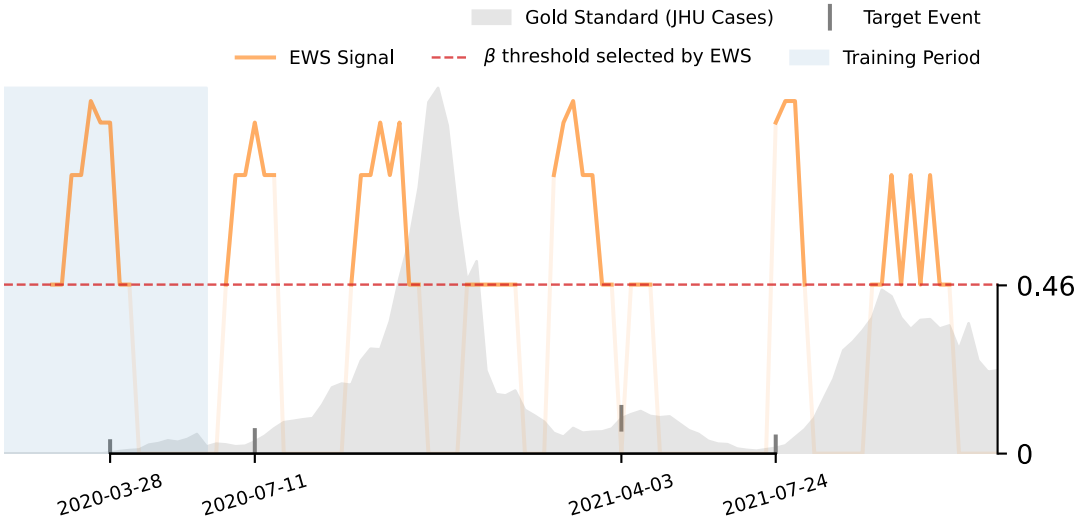
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	1	0	2	0	0	1
0.96	3	5	0	0	0	1
0.91	3	6	0	1	0	0
0.76	3	6	0	1	0	0
0.46	3	11	0	1	2	0
0.00	3	15	0	1	11	0

North Dakota

Proxies selected by the Multiple Sources method

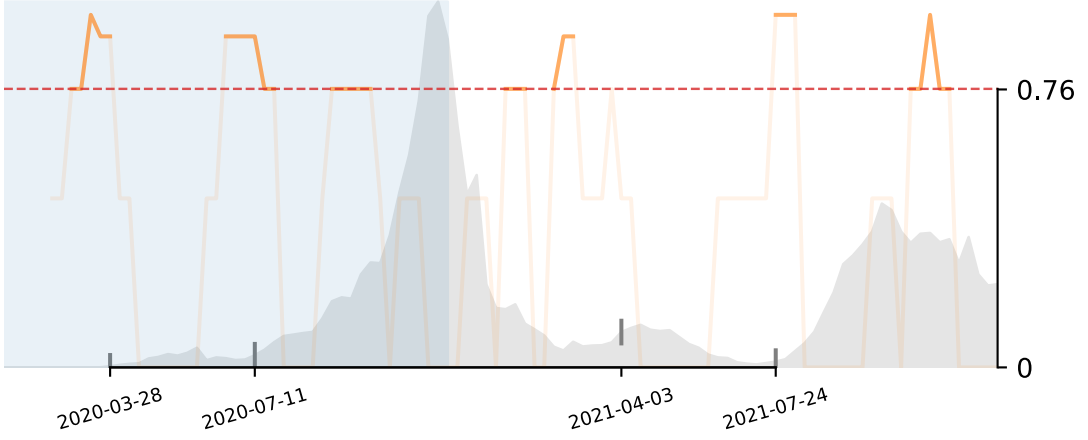
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) quarantine
(GT) Acute bronchitis
(GT) Chills



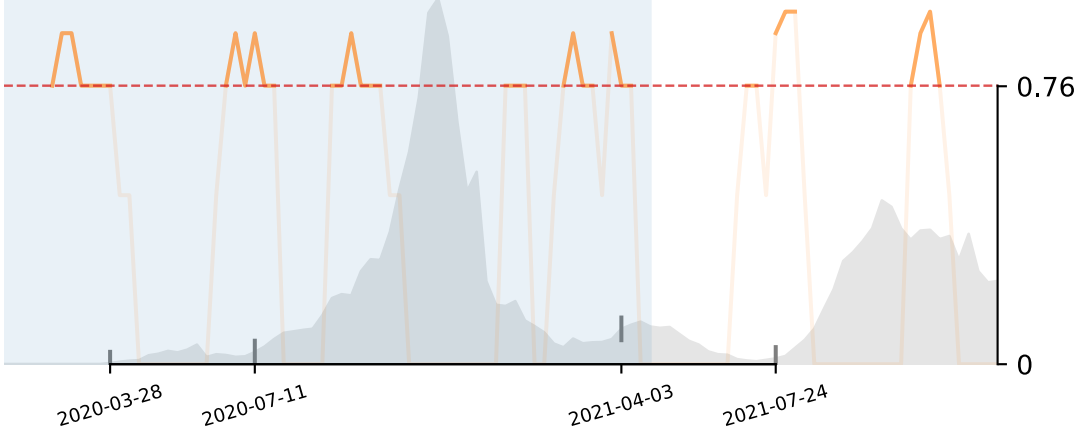
Model 2

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) Cough



Model 3

(JHU) cases
(GT) quarantine
(GT) Cough
(GT) Nasal congestion
(GT) Acute bronchitis
(GT) covid



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	1	2	1
0.91	1	0	0	3	4	0
0.76	1	0	0	3	13	0
0.46	1	0	0	3	32	0
0.00	1	4	0	3	63	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	0	0	2	1	3	1
0.91	1	0	1	2	3	0
0.76	2	0	0	2	11	0
0.46	2	7	0	2	18	0
0.00	2	17	0	2	43	0

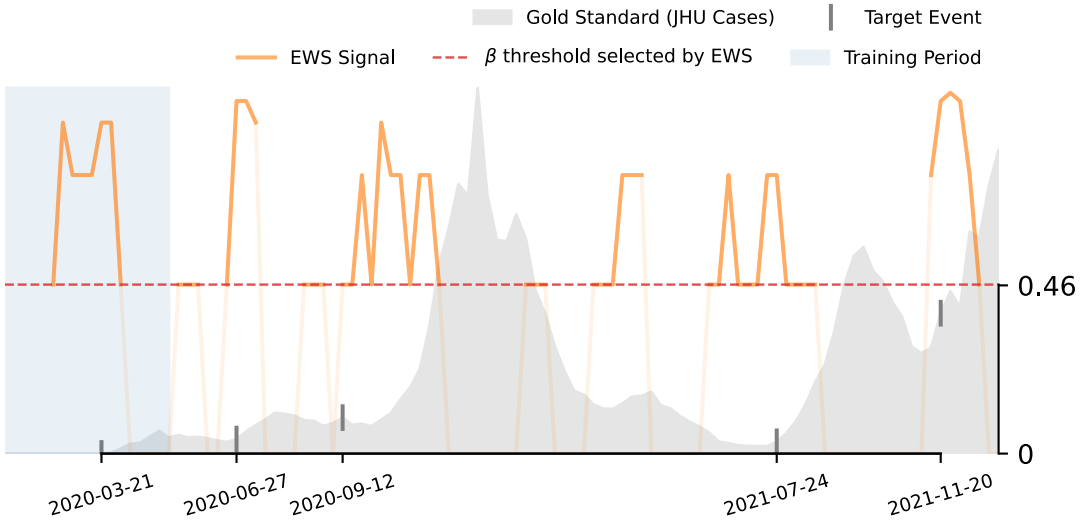
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	3	0
0.91	0	0	3	1	4	0
0.76	3	3	0	1	6	0
0.46	3	16	0	1	8	0
0.00	3	21	0	1	29	0

Ohio

Proxies selected by the Multiple Sources method

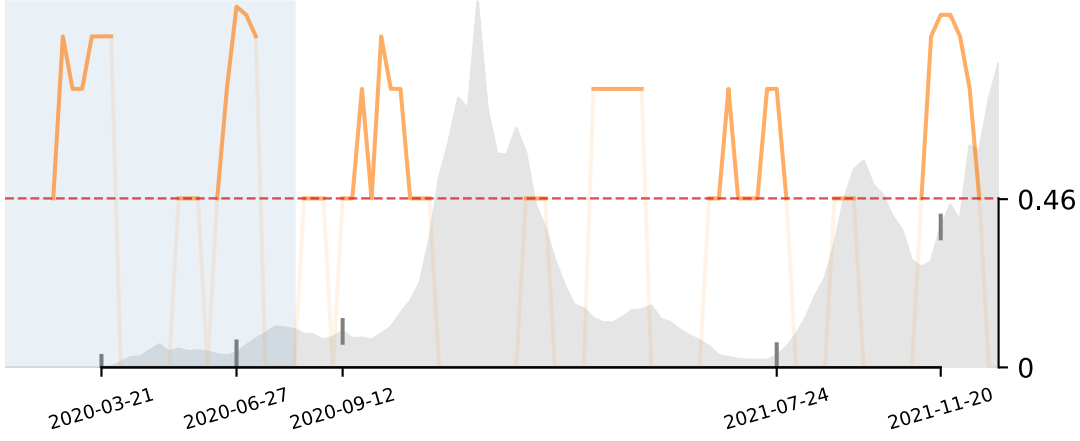
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness



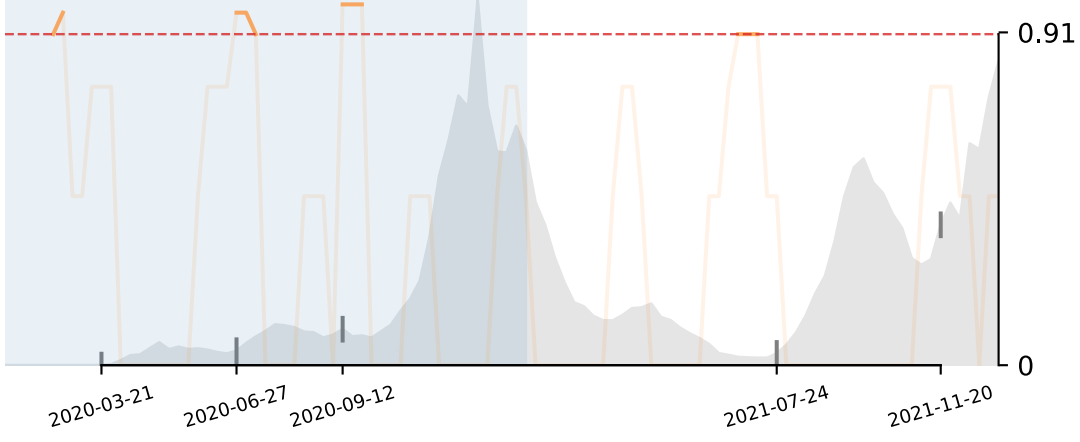
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) chest tightness
(GT) covid-19 who



Model 3

(GT) covid symptoms
(GT) Burning Chest Pain
(GT) Nasal congestion
(GT) chest tightness
(GT) Bronchitis
(GT) Throat irritation



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	1	3
0.96	0	0	1	2	3	2
0.91	0	0	1	2	5	2
0.76	1	1	0	3	14	0
0.46	1	1	0	4	30	0
0.00	1	3	0	4	58	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	0	1	1	1	2
0.91	1	1	1	1	3	2
0.76	2	3	0	2	13	0
0.46	2	3	0	3	27	0
0.00	2	6	0	3	54	0

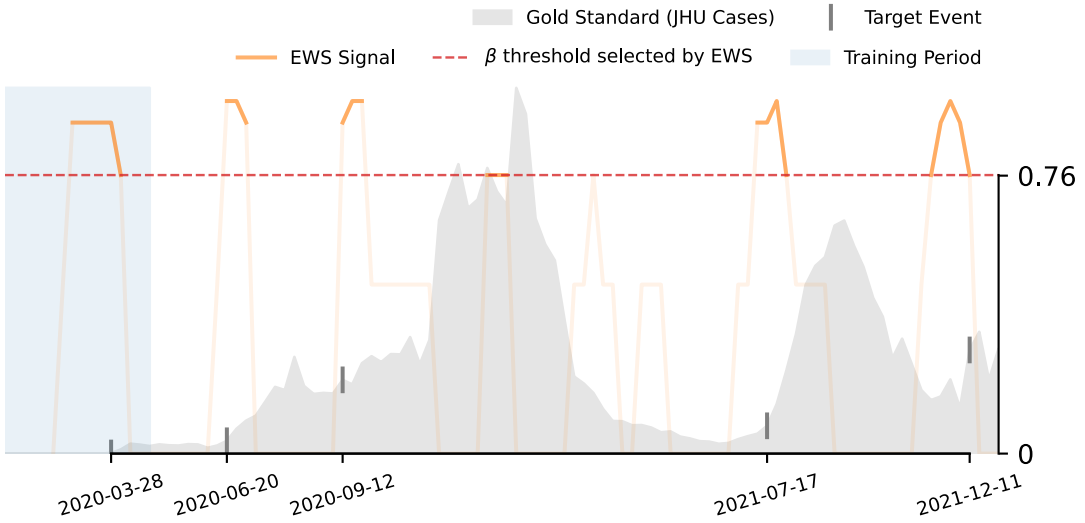
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	1	2	2	0	0	2
0.91	3	3	0	1	0	1
0.76	3	5	0	2	3	0
0.46	3	8	0	2	10	0
0.00	3	13	0	2	35	0

Oklahoma

Proxies selected by the Multiple Sources method

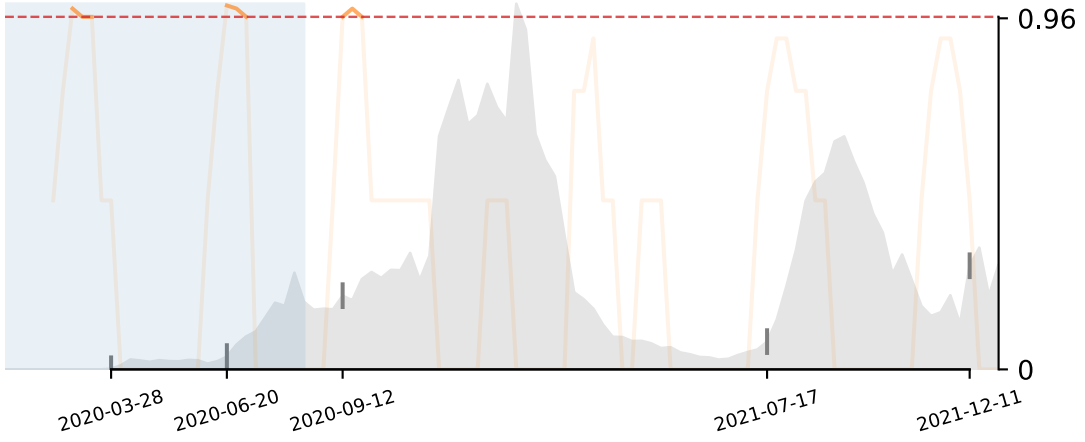
Model 1

(JHU) cases
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) covid symptoms



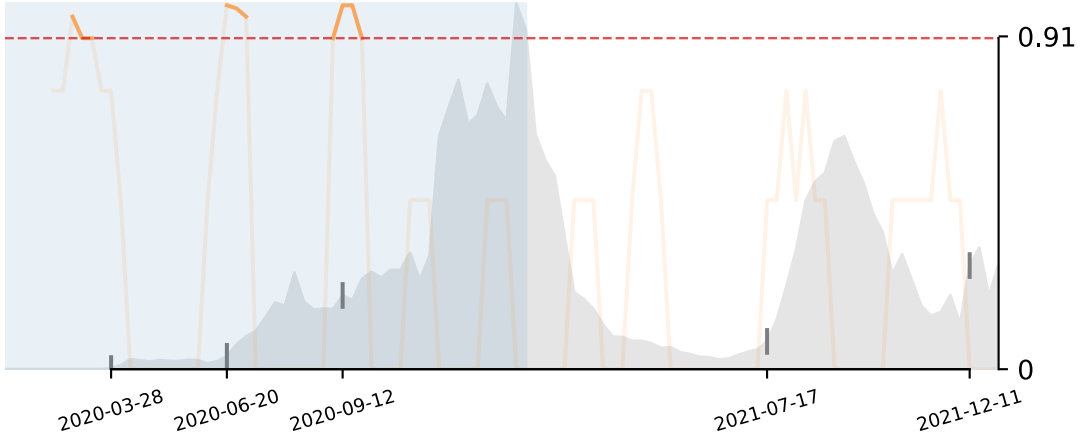
Model 2

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) Acute bronchitis
(GT) Ageusia



Model 3

(GT) Acute bronchitis
(GT) Ageusia
(GT) Anosmia
(GT) chest pain
(GT) covid symptoms
(GT) Chills



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	2	4	0
0.91	0	0	1	4	5	0
0.76	1	0	0	4	10	0
0.46	1	1	0	4	28	0
0.00	1	2	0	4	60	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	0	1	0	1	2
0.96	2	1	0	1	2	2
0.91	2	2	0	2	5	0
0.76	2	2	0	3	9	0
0.46	2	3	0	3	26	0
0.00	2	4	0	3	54	0

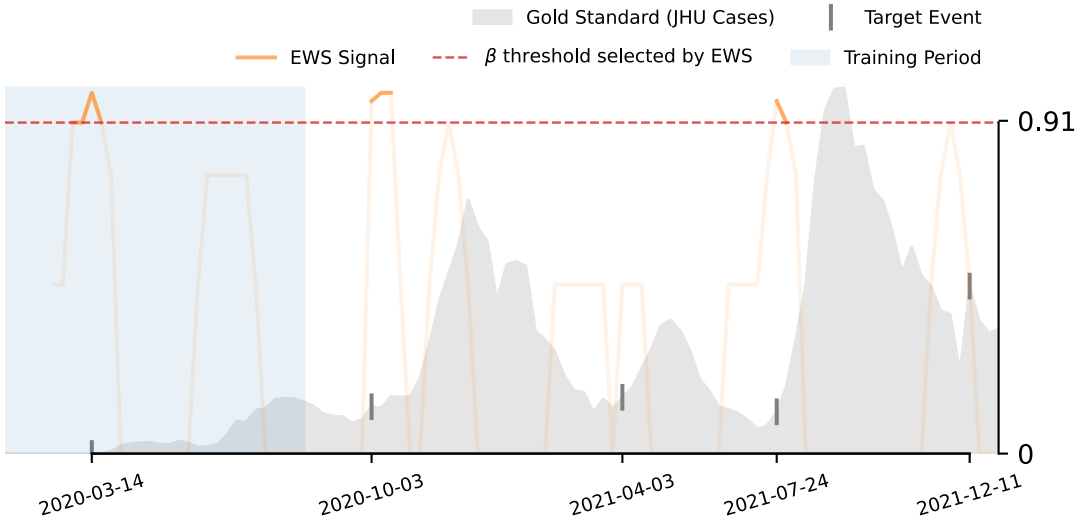
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	2	1	1	0	0	2
0.96	2	2	1	0	0	2
0.91	3	3	0	0	0	2
0.76	3	4	0	1	4	0
0.46	3	6	0	2	15	0
0.00	3	13	0	2	35	0

Oregon

Proxies selected by the Multiple Sources method

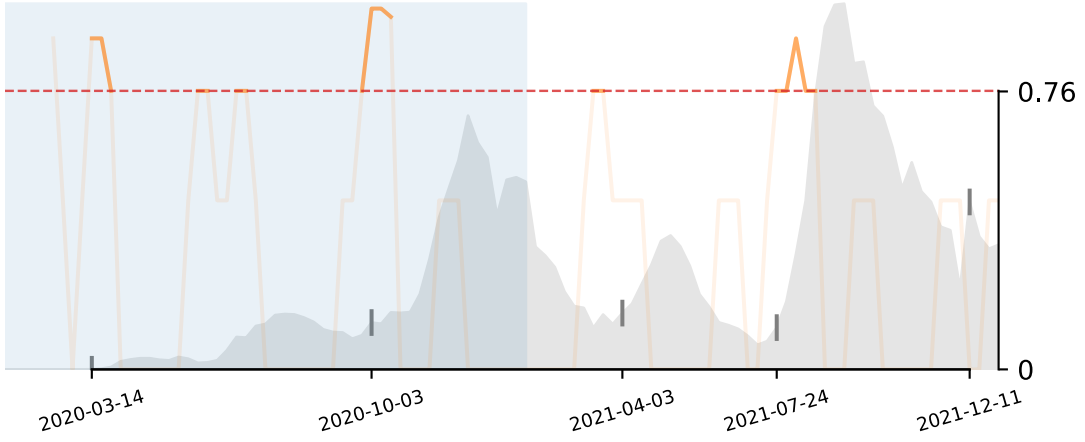
Model 1

(JHU) cases
(GT) covid-19 who
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms



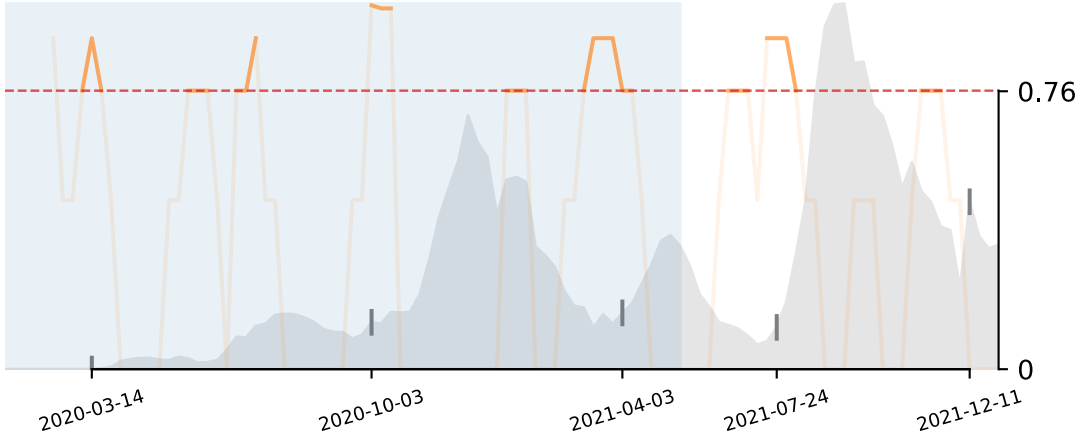
Model 2

(JHU) cases
(GT) covid symptoms
(GT) quarantine
(GT) covid-19 who
(GT) fever
(GT) Anosmia



Model 3

(JHU) cases
(GT) covid symptoms
(GT) fever
(GT) Cough
(GT) Fever
(GT) Hyperventilation



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	2	3
0.96	1	0	0	2	2	2
0.91	1	0	0	3	4	1
0.76	1	1	0	3	7	1
0.46	1	7	0	4	13	0
0.00	1	9	0	4	44	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	0	3
0.96	1	1	1	0	0	3
0.91	1	2	1	0	1	2
0.76	2	3	0	2	4	1
0.46	2	8	0	3	11	0
0.00	2	15	0	3	28	0

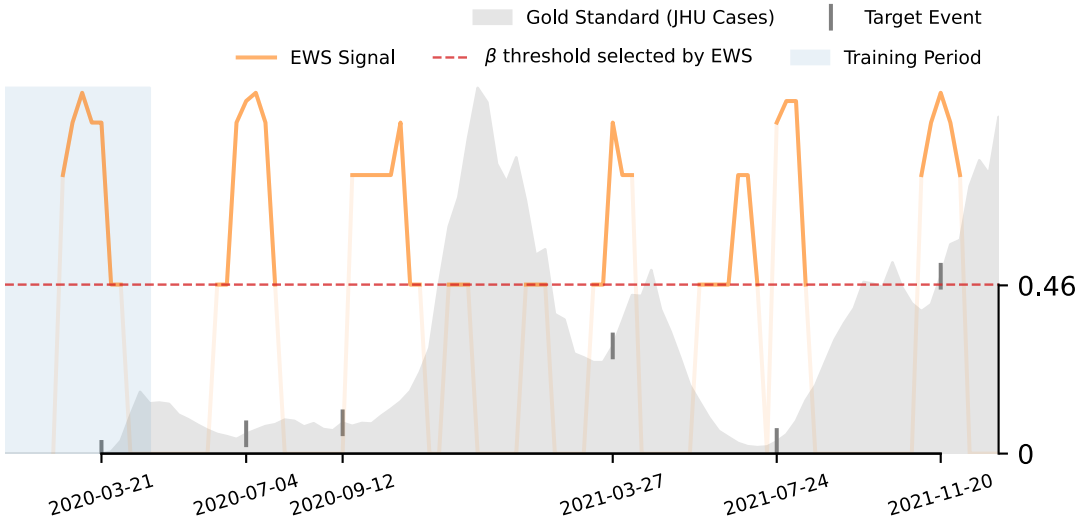
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	1	2	2	0	0	2
0.91	1	2	2	1	1	1
0.76	3	3	0	2	2	0
0.46	3	13	0	2	7	0
0.00	3	22	0	2	19	0

Pennsylvania

Proxies selected by the Multiple Sources method

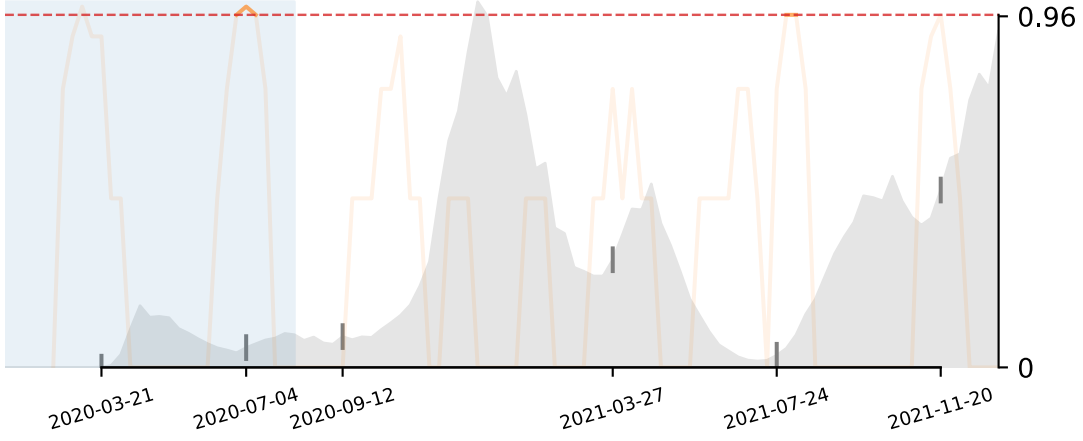
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) loss taste
(GT) chest pain
(GT) covid symptoms



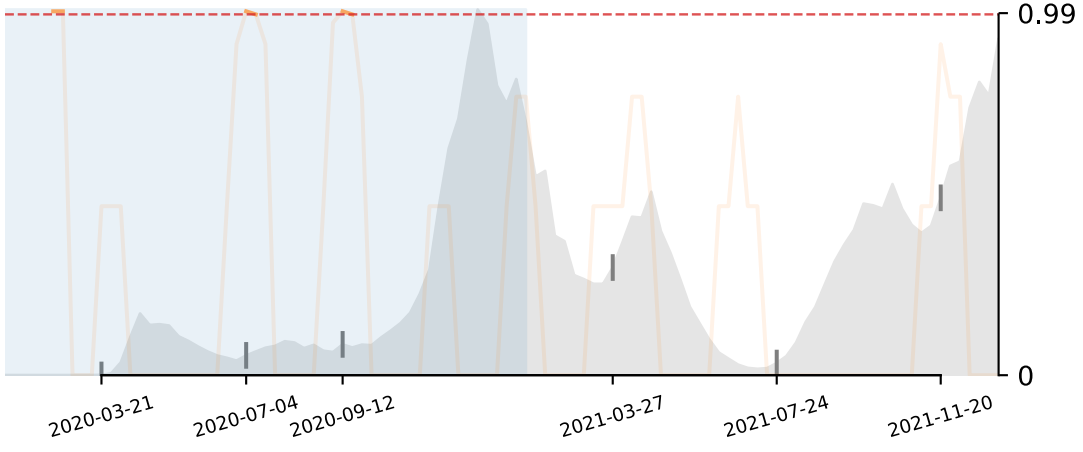
Model 2

(GT) covid
(GT) covid-19
(GT) loss taste
(GT) chest pain
(GT) covid symptoms
(GT) covid-19 who



Model 3

(GT) Anosmia
(GT) Pneumonia
(GT) Viral pneumonia
(GT) Asthma
(GT) Chest pain
(GT) Wheeze



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	1	1	3
0.96	1	0	0	2	3	2
0.91	1	0	0	4	6	1
0.76	1	0	0	4	14	0
0.46	1	0	0	4	26	0
0.00	1	2	0	5	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	0	0	2	0	0	4
0.96	2	0	0	1	2	2
0.91	2	1	0	1	3	2
0.76	2	1	0	3	8	1
0.46	2	2	0	3	25	0
0.00	2	4	0	4	47	0

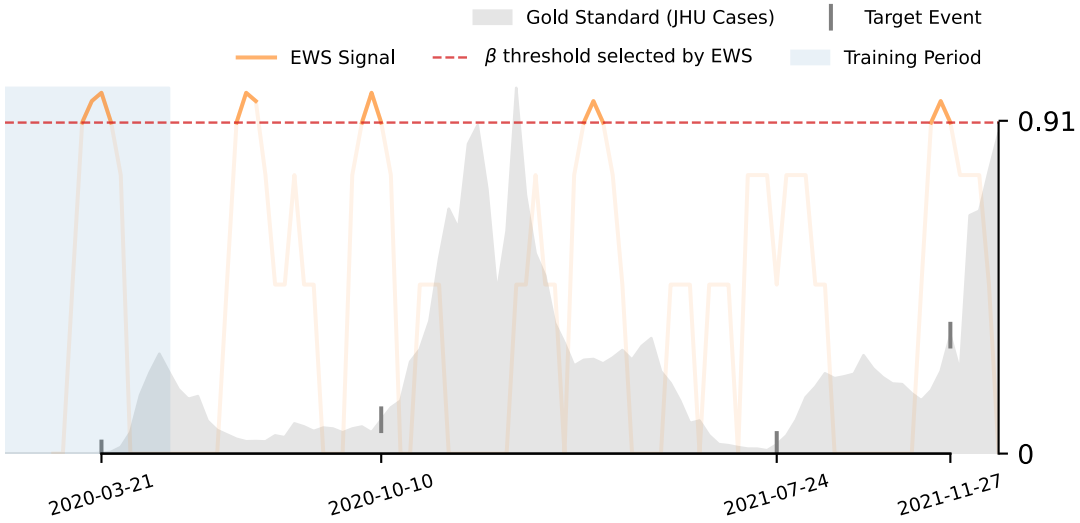
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	3	1	0	0	0	3
0.96	3	3	0	0	0	3
0.91	3	3	0	1	0	2
0.76	3	4	0	2	4	0
0.46	3	7	0	3	7	0
0.00	3	13	0	3	28	0

Rhode Island

Proxies selected by the Multiple Sources method

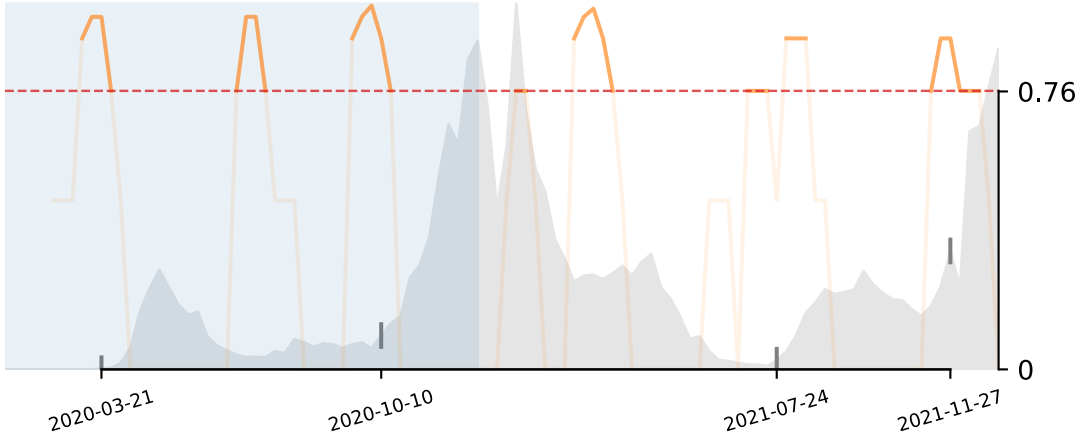
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine



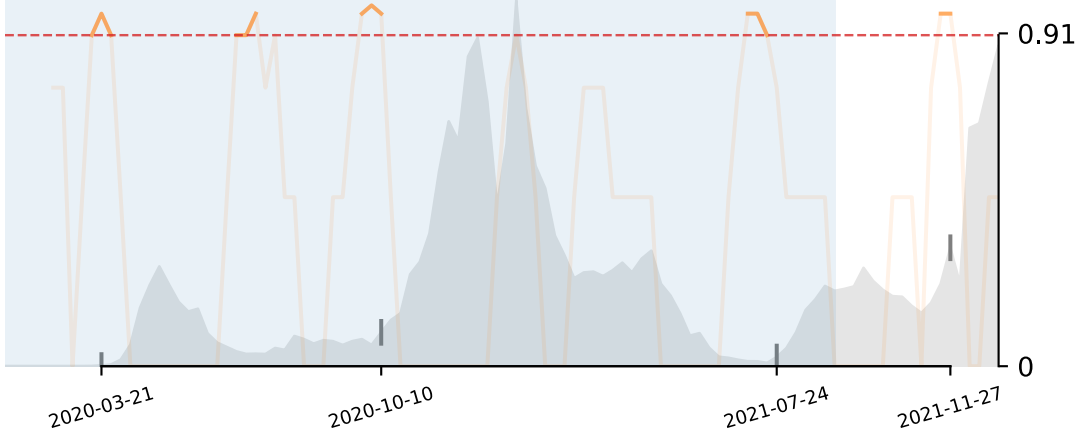
Model 2

(GT) Acute bronchitis
(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine



Model 3

(GT) Throat irritation
(JHU) cases
(GT) covid
(GT) Asthma
(GT) Sore throat
(GT) covid symptoms



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	1	1	2
0.96	1	0	0	2	3	1
0.91	1	0	0	2	6	1
0.76	1	1	0	3	18	0
0.46	1	2	0	3	38	0
0.00	1	2	0	3	65	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	1	0	1	0	1	2
0.96	1	0	1	0	2	2
0.91	2	2	0	1	7	0
0.76	2	2	0	2	13	0
0.46	2	6	0	2	20	0
0.00	2	11	0	2	40	0

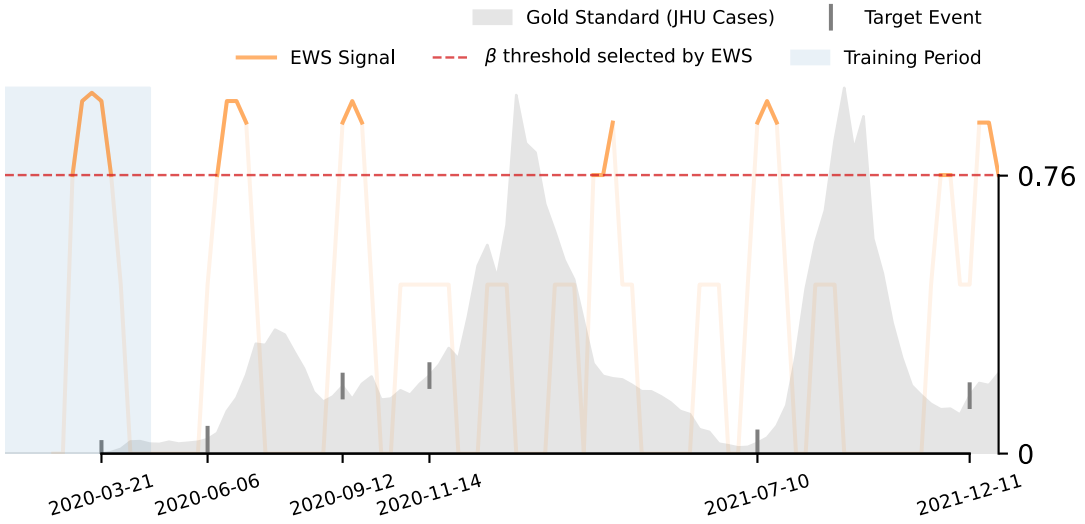
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	1	0	2	1	0	0
0.91	3	1	0	1	0	0
0.76	3	6	0	1	1	0
0.46	3	13	0	1	3	0
0.00	3	33	0	1	10	0

South Carolina

Proxies selected by the Multiple Sources method

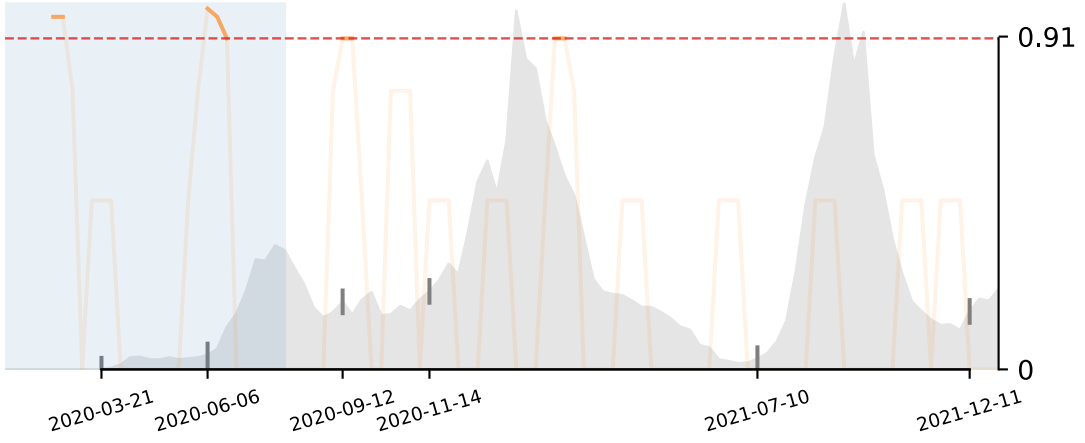
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine



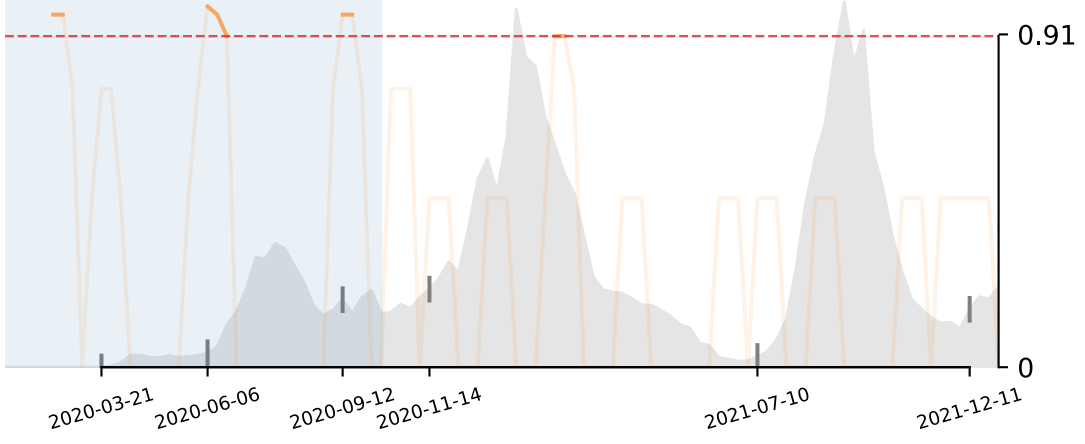
Model 2

(GT) chest pain
(GT) Ageusia
(GT) Anosmia
(GT) Chest pain
(GT) Otitis



Model 3

(GT) chest pain
(GT) Anosmia
(GT) Chest pain
(JHU) cases
(GT) Ageusia
(GT) Otitis



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	0	5
0.96	1	0	0	0	4	2
0.91	1	0	0	2	10	1
0.76	1	0	0	3	14	1
0.46	1	1	0	5	29	0
0.00	1	2	0	5	54	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	4
0.96	1	0	1	0	0	4
0.91	2	2	0	1	3	3
0.76	2	3	0	2	4	2
0.46	2	3	0	4	18	0
0.00	2	4	0	4	47	0

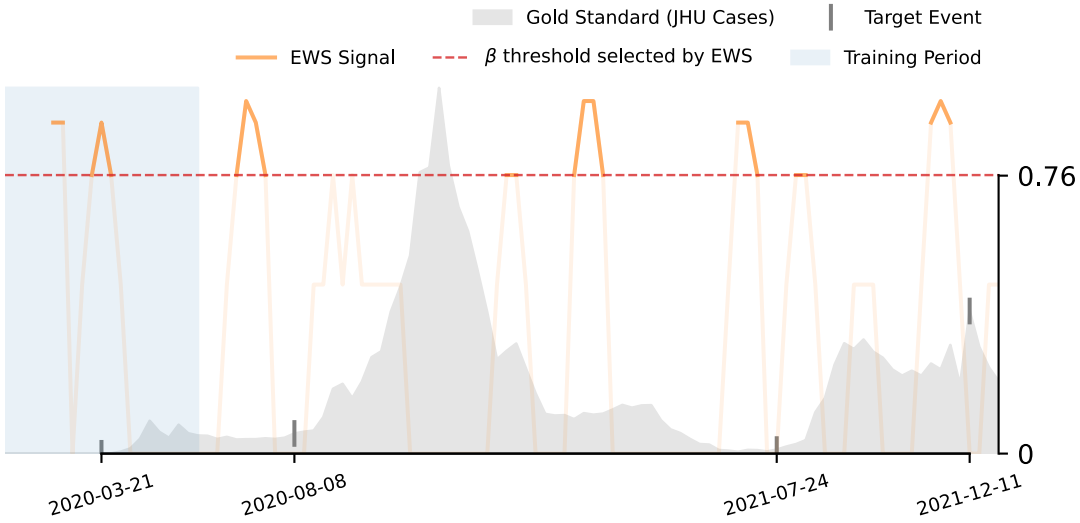
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	1	0	2	0	0	3
0.91	3	3	0	0	2	3
0.76	3	4	0	1	3	2
0.46	3	6	0	3	20	0
0.00	3	7	0	3	45	0

South Dakota

Proxies selected by the Multiple Sources method

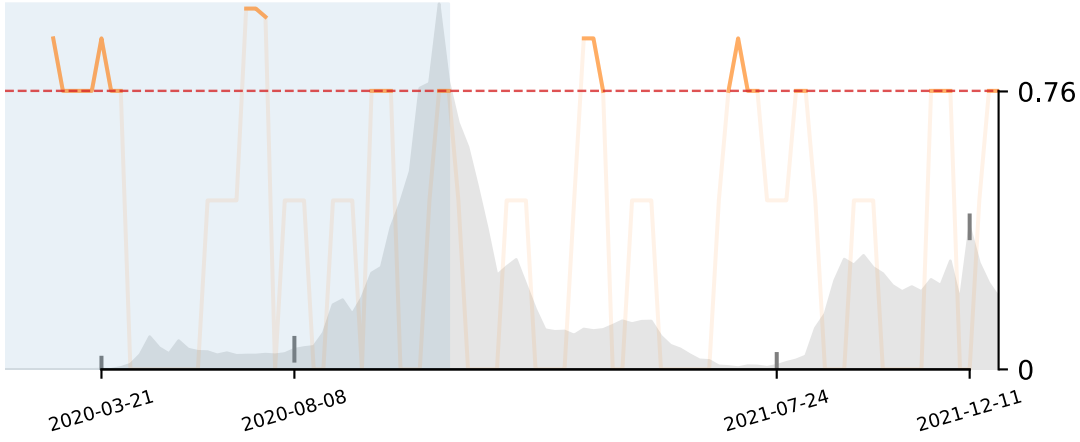
Model 1

(GT) covid
(GT) covid symptoms
(GT) quarantine
(GT) Acute bronchitis
(GT) Asthma
(GT) Bronchitis



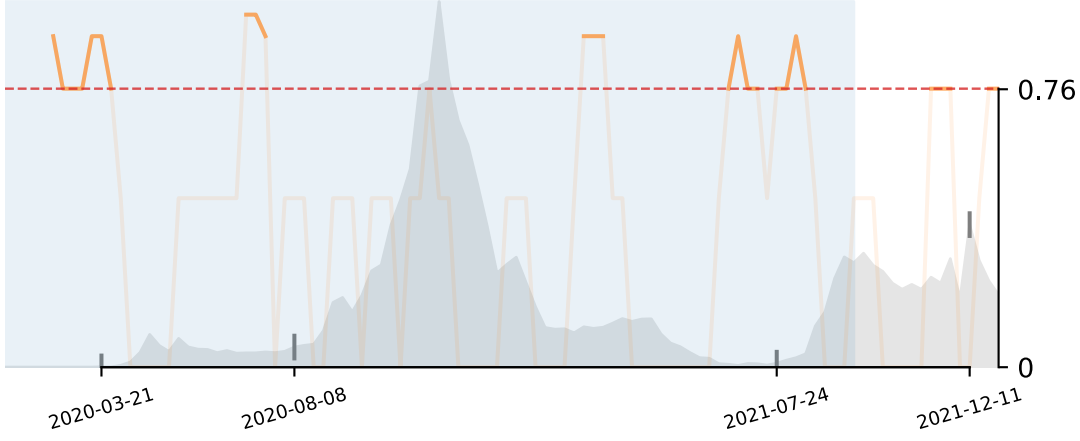
Model 2

(GT) covid
(GT) covid symptoms
(GT) Bronchitis
(GT) Cardiac arrest
(GT) Wheeze
Twitter (state level signal)



Model 3

(GT) Bronchitis
(GT) covid
(GT) Cardiac arrest
Twitter (state level signal)
(GT) covid symptoms
(GT) covid-19



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	2	2	1
0.91	0	0	1	3	2	0
0.76	1	1	0	3	10	0
0.46	1	2	0	3	28	0
0.00	1	3	0	3	62	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	1	1	1	0	0	2
0.91	1	1	1	1	2	1
0.76	2	2	0	2	7	0
0.46	2	9	0	2	21	0
0.00	2	18	0	2	43	0

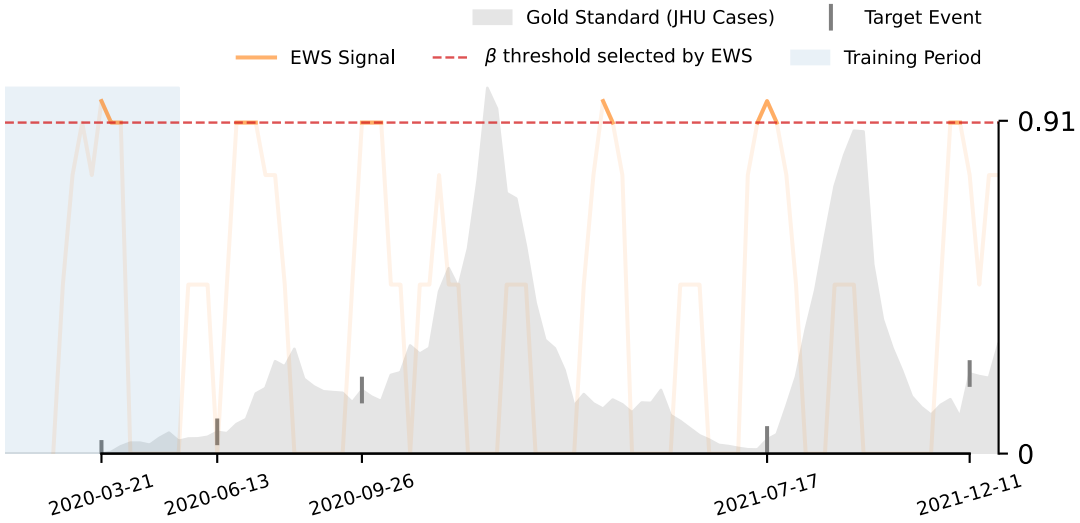
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	1	1	2	0	0	1
0.76	3	6	0	1	2	0
0.46	3	11	0	1	5	0
0.00	3	39	0	1	8	0

Tennessee

Proxies selected by the Multiple Sources method

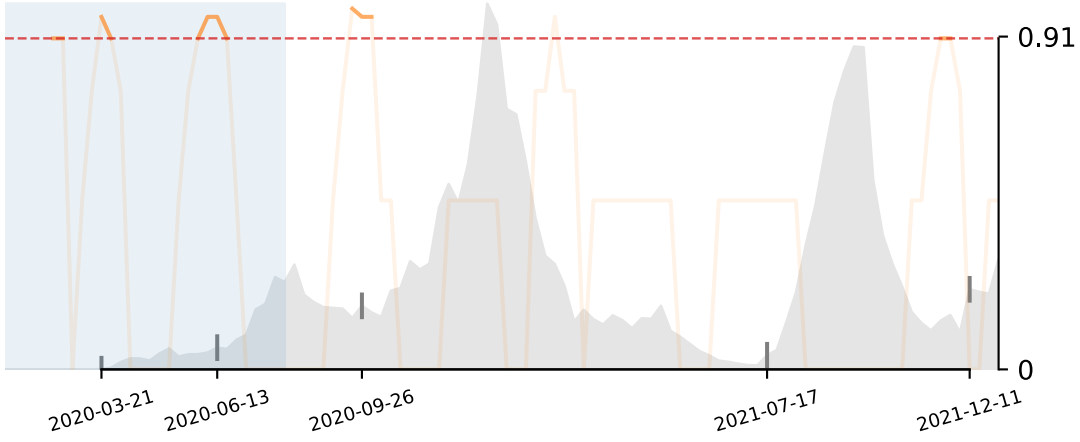
Model 1

(JHU) cases
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest tightness
(GT) covid-19 who



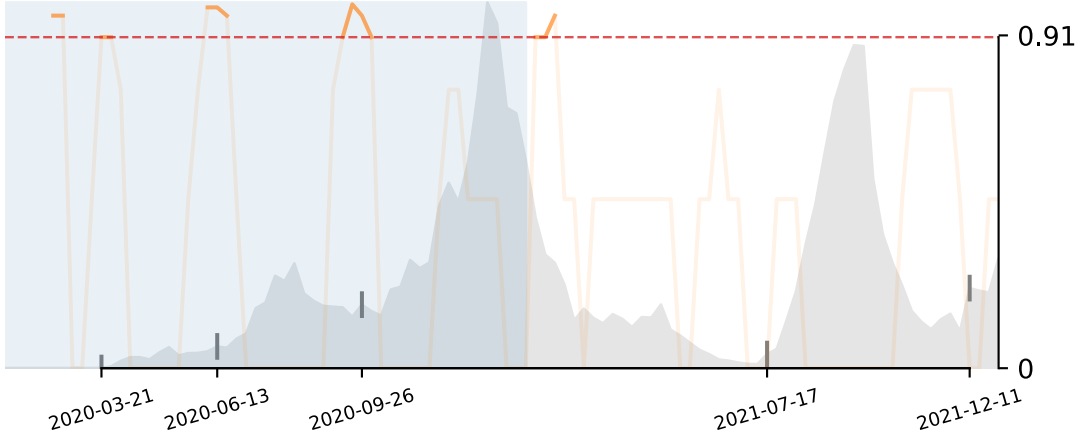
Model 2

(GT) covid symptoms
(GT) fever
(GT) Ageusia
(GT) Anosmia
(GT) Chest pain
(GT) Diarrhea



Model 3

(GT) Ageusia
(GT) Anosmia
(GT) Chest pain
(GT) fever
(GT) Diarrhea
(GT) Shortness of breath



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	1	1	3
0.91	1	0	0	3	8	0
0.76	1	2	0	3	16	0
0.46	1	2	0	4	36	0
0.00	1	2	0	4	60	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	1	0	2
0.96	0	0	2	1	2	2
0.91	2	0	0	2	2	1
0.76	2	3	0	2	6	1
0.46	2	4	0	3	28	0
0.00	2	5	0	3	53	0

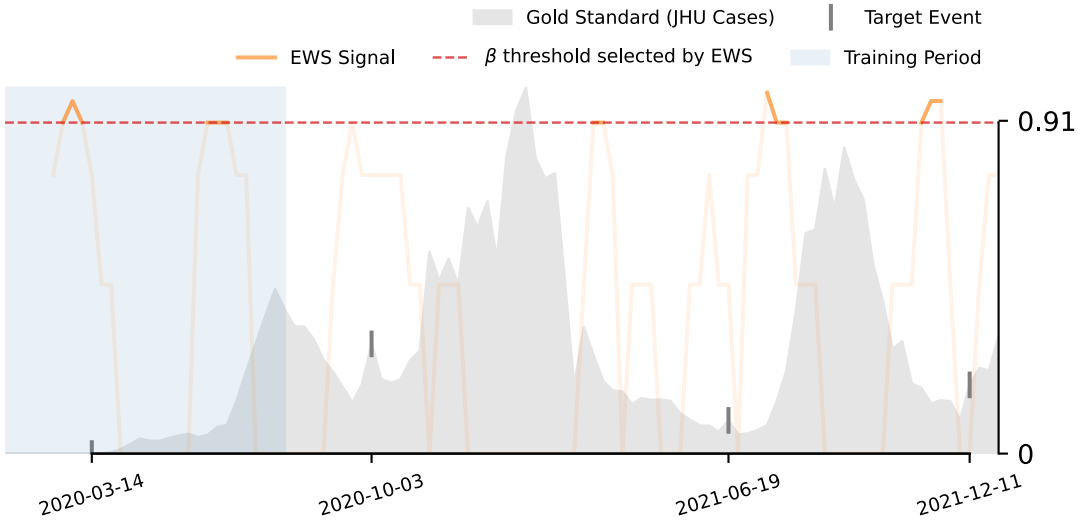
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	1	0	2	0	0	2
0.96	2	0	1	0	1	2
0.91	3	2	0	0	3	2
0.76	3	4	0	2	3	0
0.46	3	7	0	2	21	0
0.00	3	13	0	2	35	0

Texas

Proxies selected by the Multiple Sources method

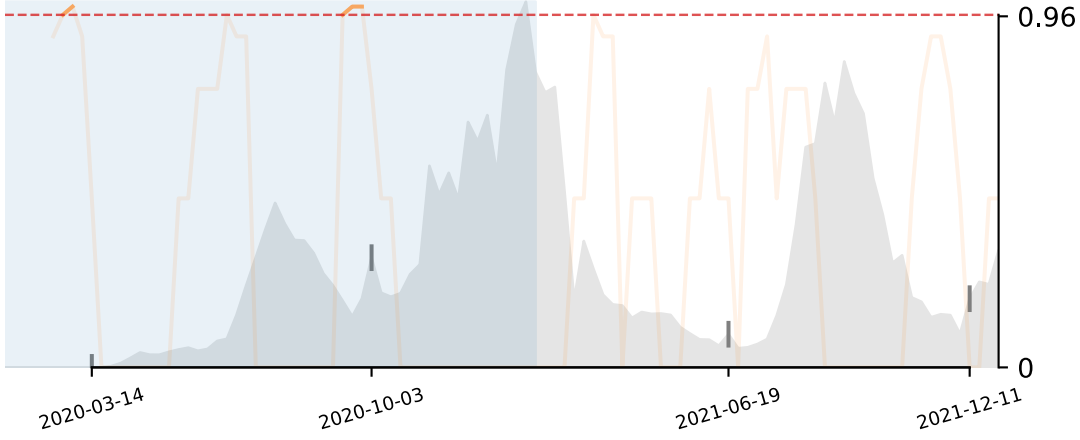
Model 1

(GT) side effects of vaccine
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) loss taste
(GT) chest pain



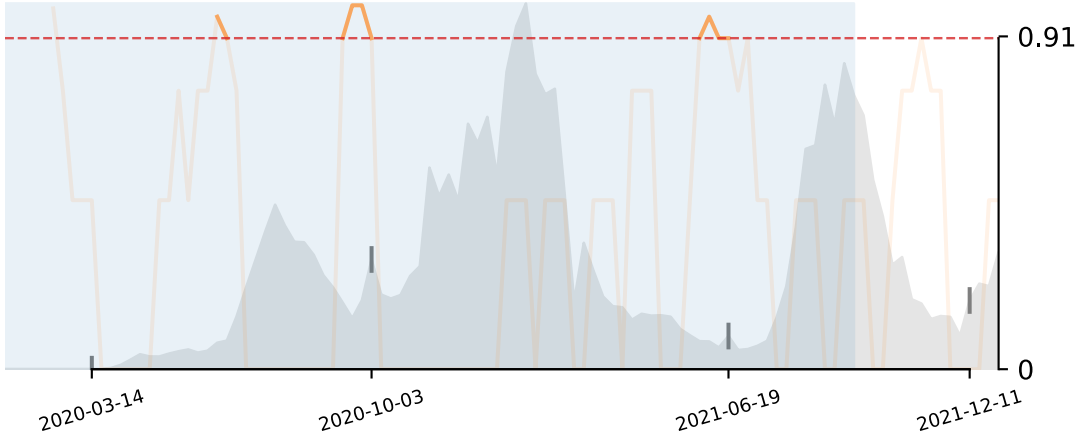
Model 2

(GT) covid
(GT) loss taste
(GT) chest pain
(GT) covid symptoms
(GT) fever
(GT) Acute bronchitis



Model 3

(GT) loss taste
(GT) Fever
(GT) Shortness of breath
(GT) Vomiting
(GT) chest pain
(GT) Sore throat



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	1	3
0.96	0	0	1	1	1	2
0.91	1	0	0	2	5	1
0.76	1	3	0	3	13	0
0.46	1	6	0	3	28	0
0.00	1	8	0	3	53	0

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	2
0.99	0	0	2	0	0	2
0.96	2	0	0	0	1	2
0.91	2	1	0	1	4	1
0.76	2	3	0	2	9	0
0.46	2	6	0	2	18	0
0.00	2	10	0	2	34	0

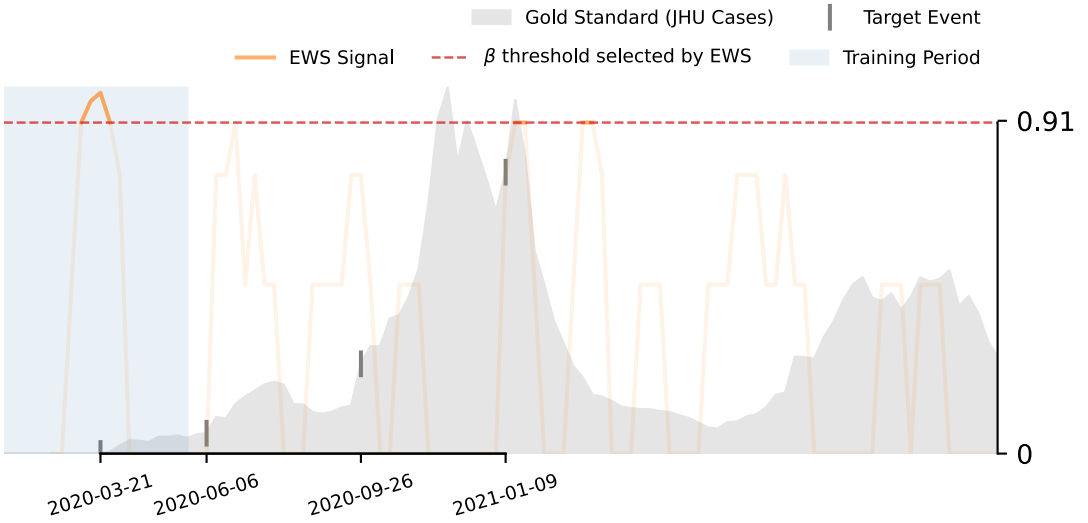
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	1	0	2	0	0	1
0.96	2	0	1	0	0	1
0.91	3	1	0	1	0	0
0.76	3	3	0	1	1	0
0.46	3	11	0	1	5	0
0.00	3	30	0	1	8	0

Utah

Proxies selected by the Multiple Sources method

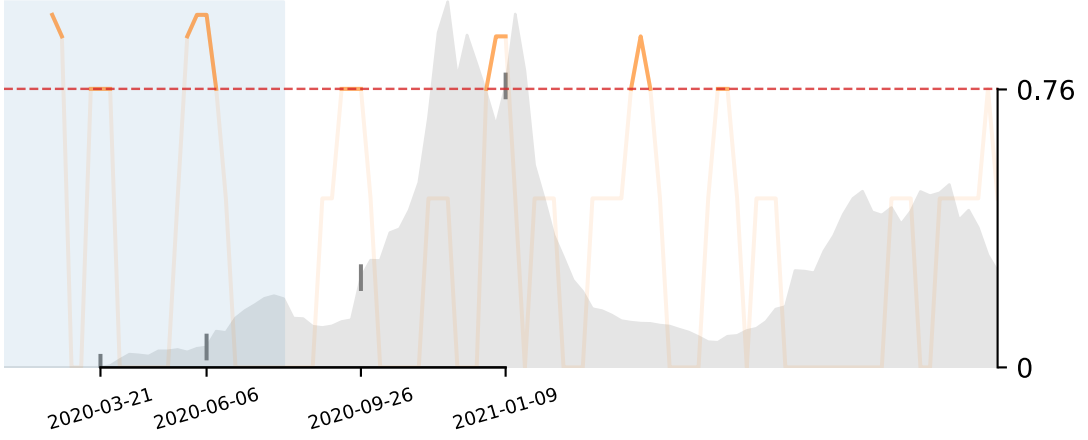
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid-19 who
(GT) Acute bronchitis



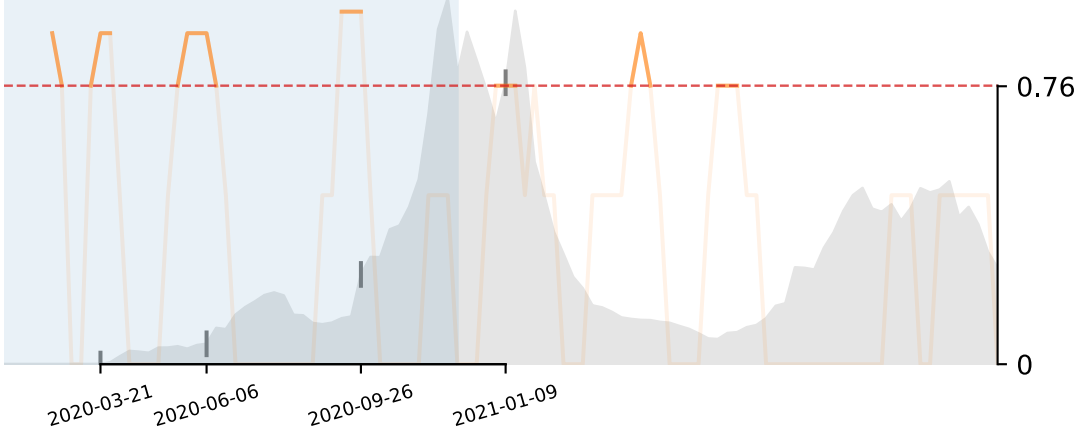
Model 2

(GT) covid symptoms
(GT) fever
(GT) Chest pain
(GT) Throat irritation
(GT) Chills



Model 3

(GT) fever
(GT) Chest pain
(GT) Chills
(JHU) cases
(GT) covid symptoms
(GT) Ageusia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	1	0	0	0	0	3
0.91	1	0	0	0	5	2
0.76	1	1	0	2	13	0
0.46	1	2	0	2	38	0
0.00	1	2	0	3	68	0

β	tp	fp	fn	tp	fp	fn
0.99	0	0	2	0	0	2
0.96	0	0	2	0	0	2
0.91	1	1	1	1	1	1
0.76	2	1	0	2	6	0
0.46	2	3	0	2	32	0
0.00	2	4	0	2	60	0

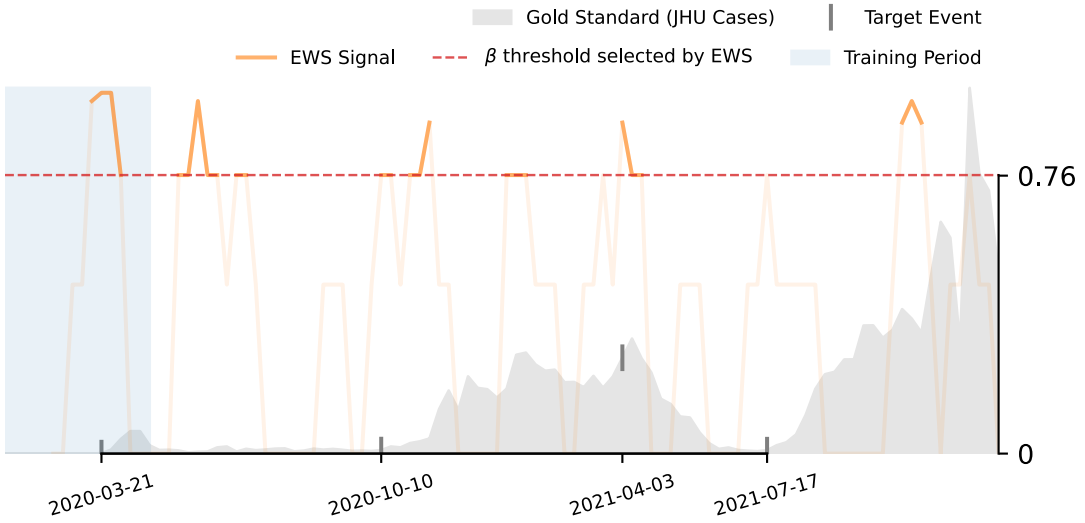
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	1	0	2	0	1	1
0.76	3	2	0	1	8	0
0.46	3	3	0	1	28	0
0.00	3	9	0	1	51	0

Vermont

Proxies selected by the Multiple Sources method

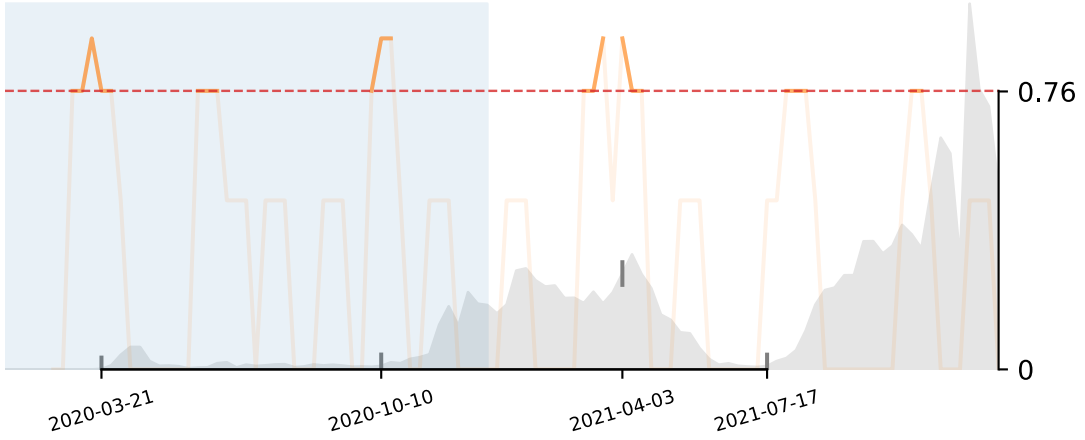
Model 1

(GT) covid
(GT) covid-19
(GT) chest pain
(GT) covid symptoms
(GT) quarantine
(GT) fever



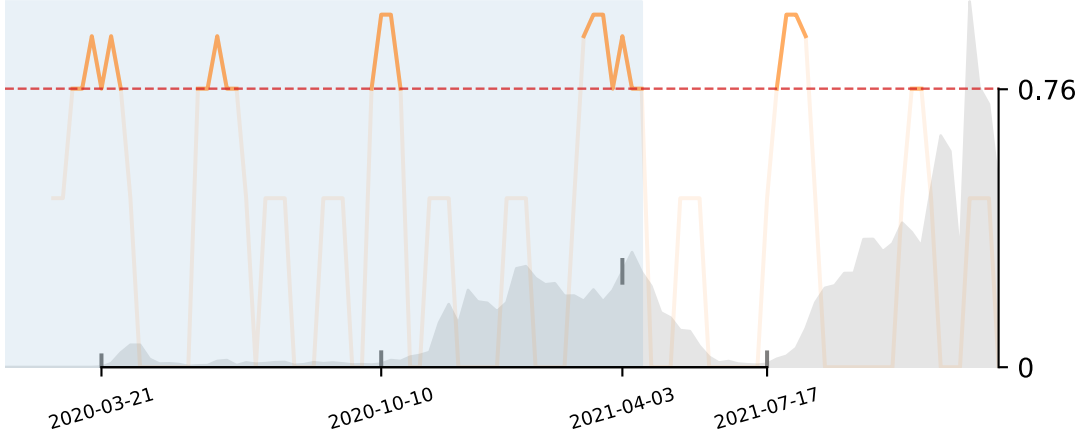
Model 2

(GT) covid-19
(GT) fever
Twitter (state level signal)
(GT) covid



Model 3

(GT) covid-19
Twitter (state level signal)
(GT) covid
(GT) fever
(GT) Acute bronchitis
(JHU) cases



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	1	1	0	0	2	3
0.91	1	1	0	1	5	2
0.76	1	1	0	3	20	0
0.46	1	2	0	3	42	0
0.00	1	2	0	3	67	0

β	tp	fp	fn	tp	fp	fn
0.96	0	0	2	0	0	2
0.91	0	0	2	1	0	1
0.76	2	1	0	1	7	0
0.46	2	5	0	2	20	0
0.00	2	18	0	2	39	0

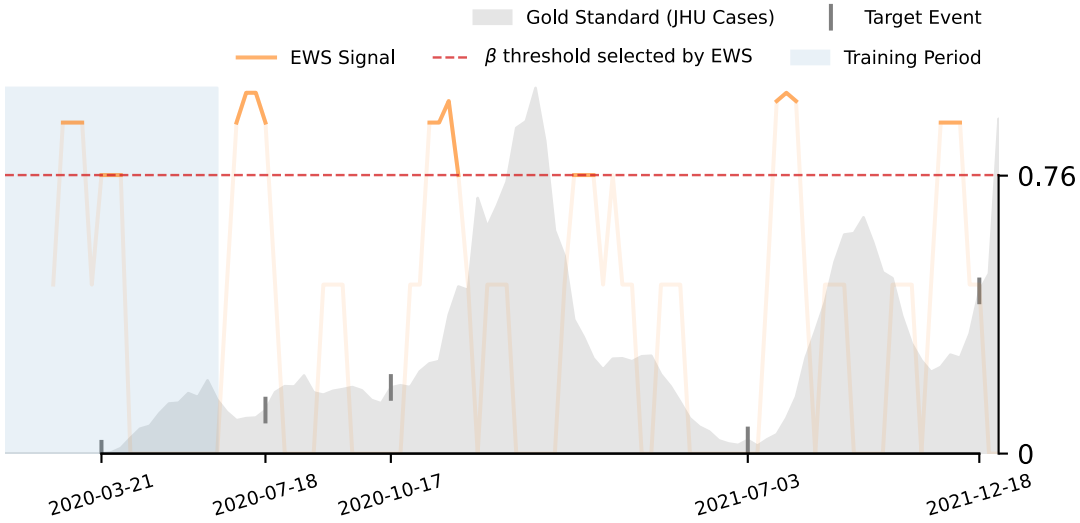
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	1
0.99	0	0	3	0	0	1
0.96	0	0	3	0	2	0
0.91	2	1	1	0	3	0
0.76	3	3	0	0	6	0
0.46	3	11	0	1	15	0
0.00	3	26	0	1	30	0

Virginia

Proxies selected by the Multiple Sources method

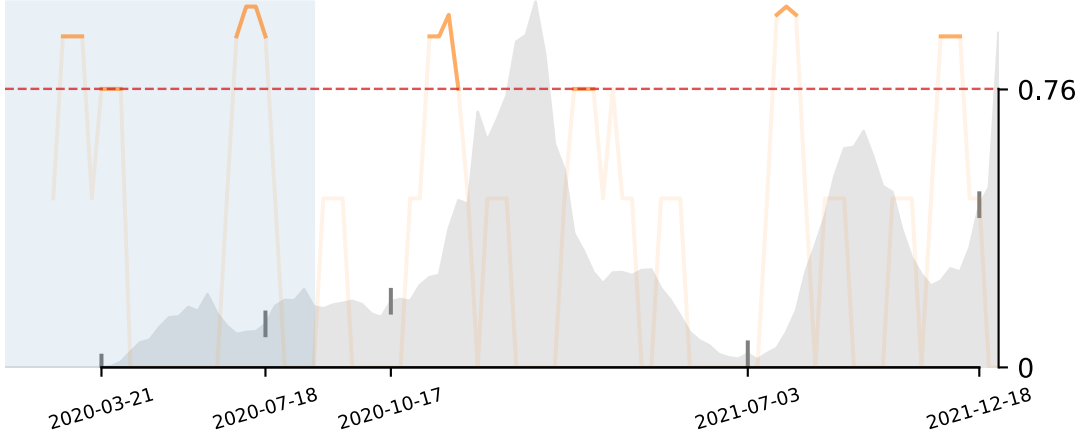
Model 1

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) nose bleed
(GT) Acute bronchitis



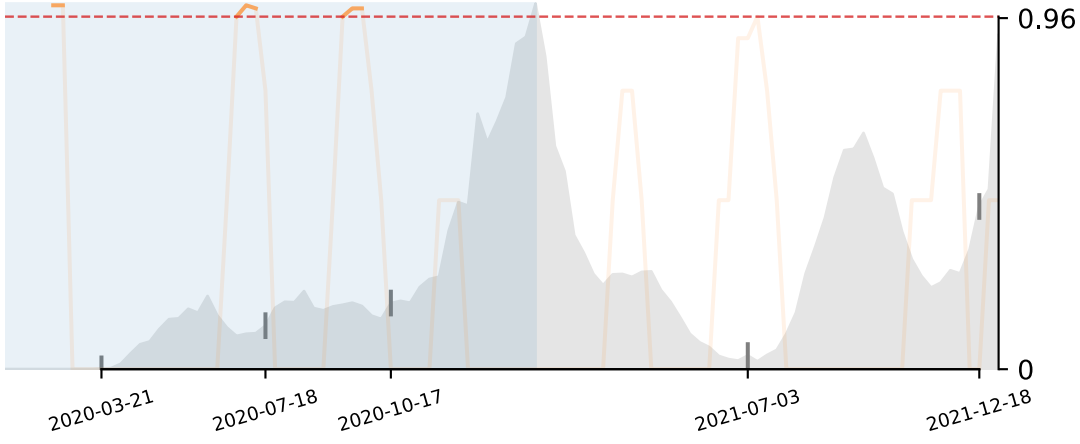
Model 2

(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain
(GT) nose bleed
(GT) Acute bronchitis



Model 3

(GT) Anosmia
(GT) Asthma
(GT) Bronchitis
(GT) Cough
(GT) Throat irritation
(GT) Chest pain



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	1	1	3
0.96	0	0	1	1	4	3
0.91	0	0	1	2	6	2
0.76	1	0	0	2	11	2
0.46	1	2	0	3	34	0
0.00	1	3	0	4	55	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	0	0	2	0	1	3
0.96	1	0	1	0	4	3
0.91	1	0	1	1	6	2
0.76	2	0	0	1	11	2
0.46	2	2	0	2	33	0
0.00	2	4	0	3	50	0

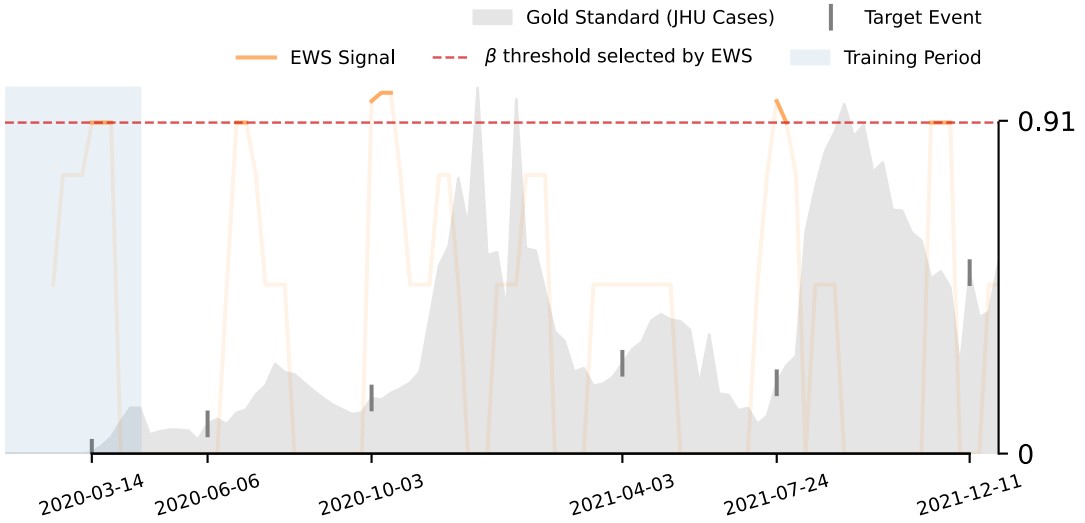
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	2	1	1	0	0	2
0.96	3	1	0	0	1	1
0.91	3	2	0	1	1	1
0.76	3	2	0	2	4	0
0.46	3	2	0	2	10	0
0.00	3	6	0	2	34	0

Washington

Proxies selected by the Multiple Sources method

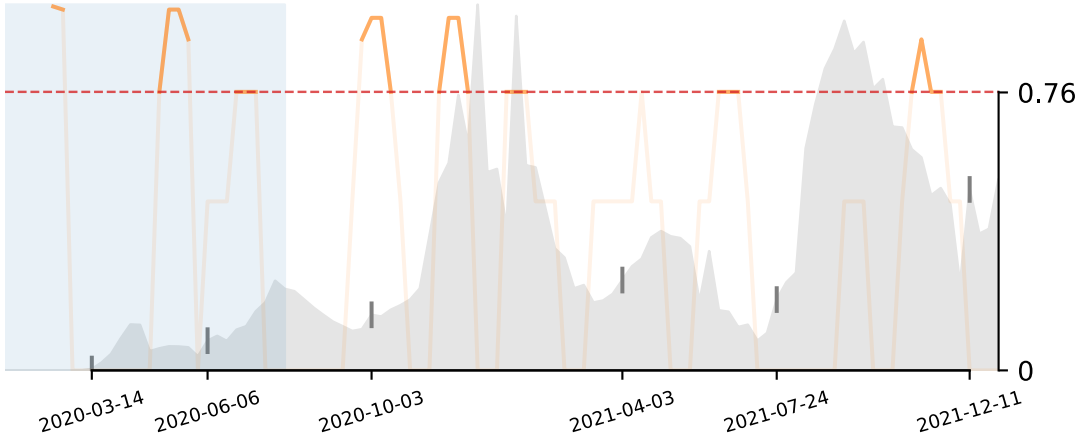
Model 1

(JHU) cases
(JHU) deaths
(GT) covid
(GT) how long does covid last
(GT) covid-19
(GT) chest pain



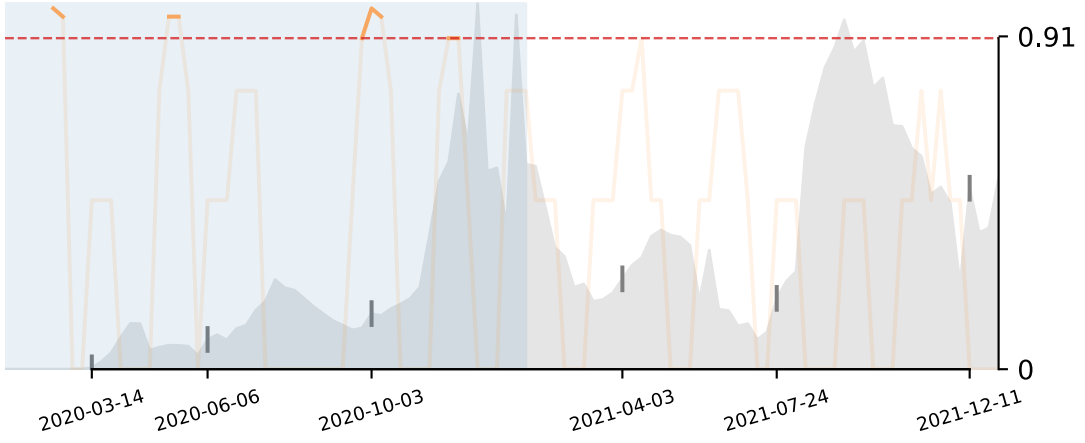
Model 2

(GT) Anxiety
(GT) Chest pain
(GT) Diarrhea
(GT) Vomiting
(GT) Fever
(GT) Otitis



Model 3

(GT) Chest pain
(GT) Vomiting
(GT) Fever
(GT) Otitis
(JHU) cases
(GT) Anxiety



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	5
0.99	0	0	1	0	2	4
0.96	0	0	1	2	2	3
0.91	0	0	1	3	5	2
0.76	1	2	0	3	13	2
0.46	1	2	0	4	34	0
0.00	1	2	0	5	54	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	4
0.99	1	0	1	0	0	4
0.96	2	0	0	1	3	3
0.91	2	0	0	2	3	2
0.76	2	0	0	3	10	0
0.46	2	4	0	4	23	0
0.00	2	6	0	4	46	0

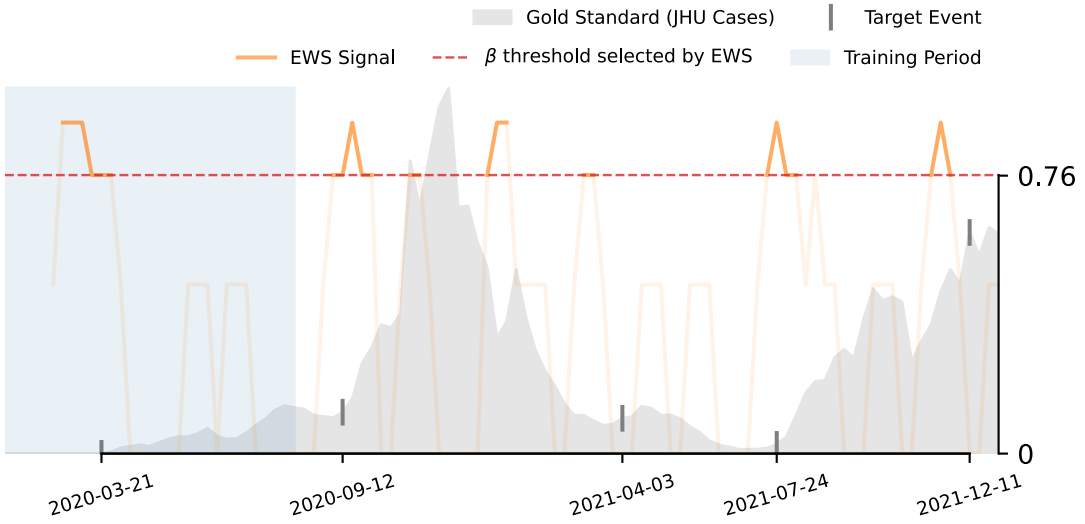
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	3
0.99	0	0	3	0	0	3
0.96	2	0	1	0	0	3
0.91	3	1	0	0	1	2
0.76	3	3	0	3	2	0
0.46	3	12	0	3	15	0
0.00	3	17	0	3	28	0

Wisconsin

Proxies selected by the Multiple Sources method

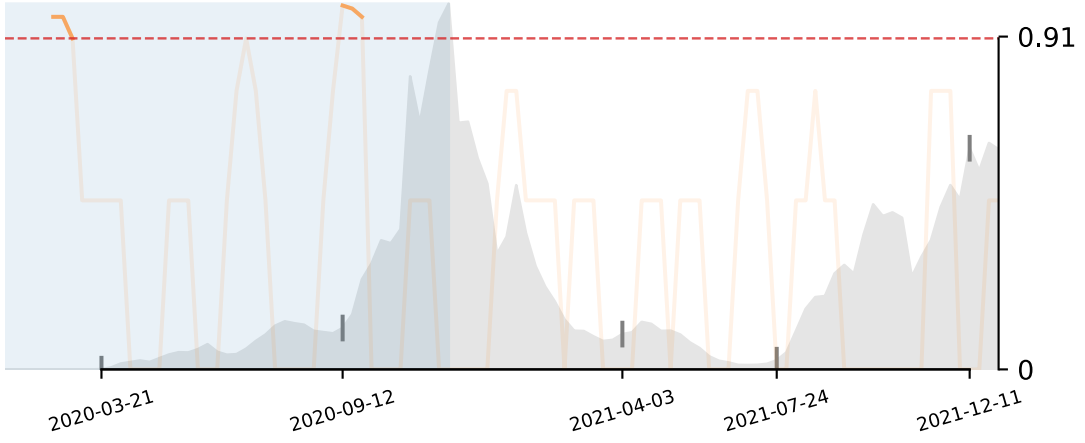
Model 1

(GT) how long does covid last
(GT) chest pain
(GT) chest tightness
(GT) covid-19 who
(GT) covid
(GT) covid-19



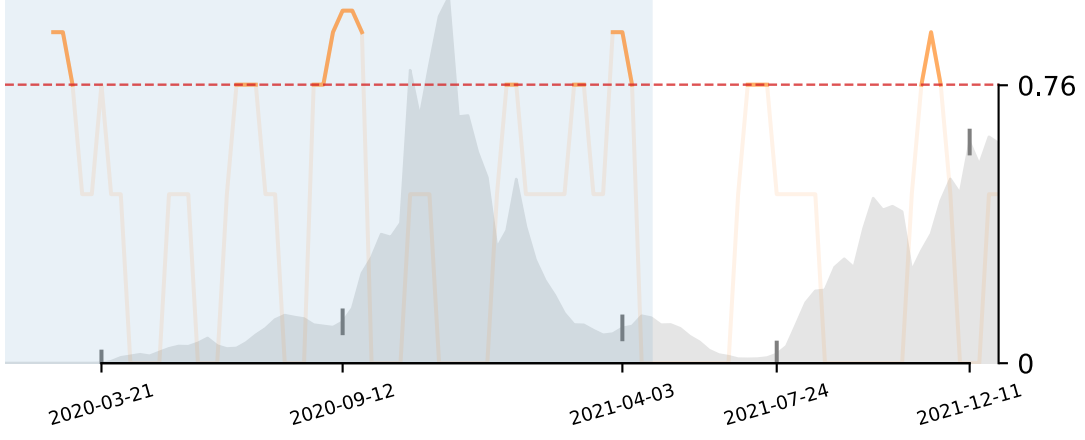
Model 2

(GT) chest pain
(GT) how long does covid last
(GT) quarantine
(GT) Ageusia
(GT) Anosmia
(GT) Bronchitis



Model 3

(GT) how long does covid last
(GT) Hyperventilation
(GT) Cough
(GT) Nasal congestion
(GT) side effects of vaccine
(GT) Ageusia



Performance as a function of β

	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	4
0.99	0	0	1	0	0	4
0.96	0	0	1	0	0	4
0.91	0	0	1	2	3	1
0.76	1	0	0	4	11	0
0.46	1	1	0	4	31	0
0.00	1	9	0	4	47	0

β	tp	fp	fn	tp	fp	fn
1.00	0	0	2	0	0	3
0.99	1	0	1	0	0	3
0.96	1	1	1	0	0	3
0.91	2	3	0	0	0	3
0.76	2	4	0	2	3	1
0.46	2	6	0	3	20	0
0.00	2	16	0	3	36	0

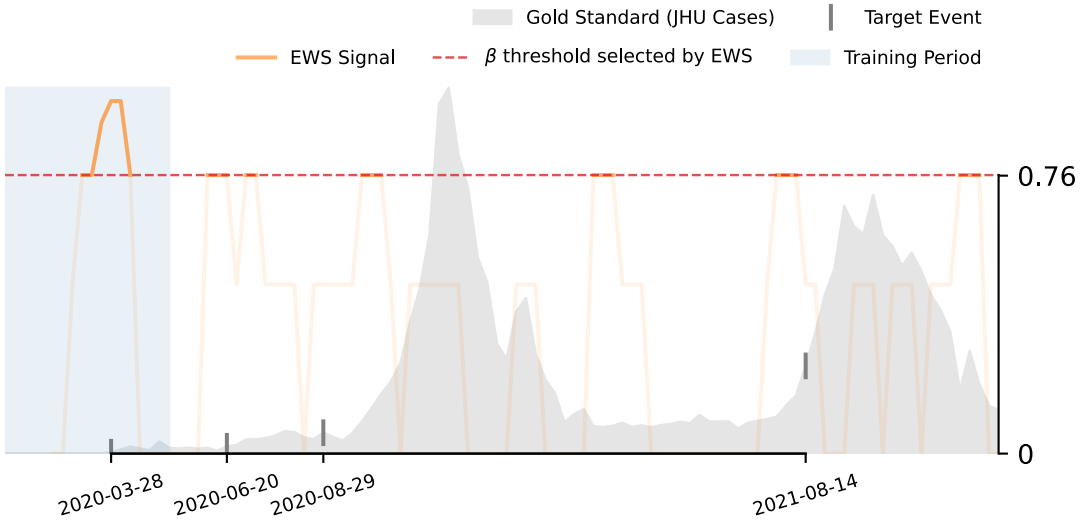
β	tp	fp	fn	tp	fp	fn
1.00	0	0	3	0	0	2
0.99	0	0	3	0	0	2
0.96	0	0	3	0	0	2
0.91	1	1	2	1	0	1
0.76	3	3	0	2	0	0
0.46	3	10	0	2	6	0
0.00	3	27	0	2	22	0

Wyoming

Proxies selected by the Multiple Sources method

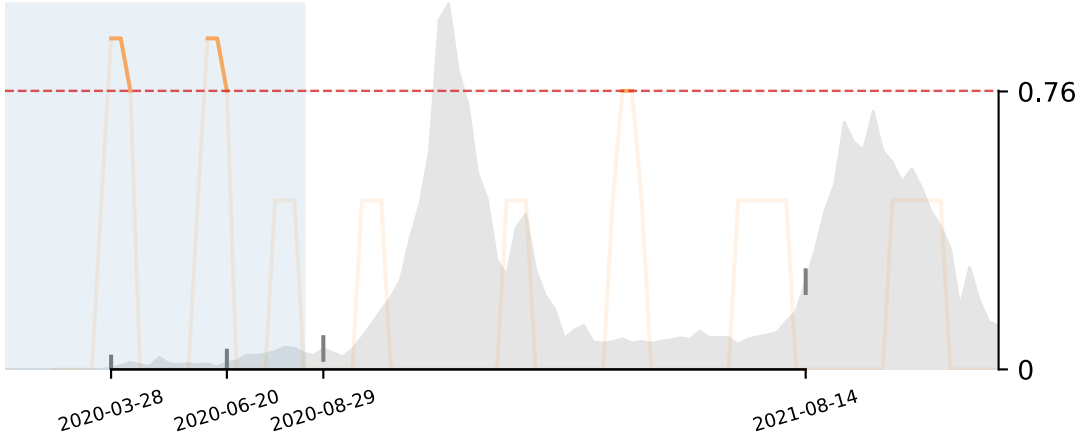
Model 1

(JHU) cases
(GT) covid
(GT) covid-19
(GT) covid symptoms
(GT) quarantine
(GT) fever



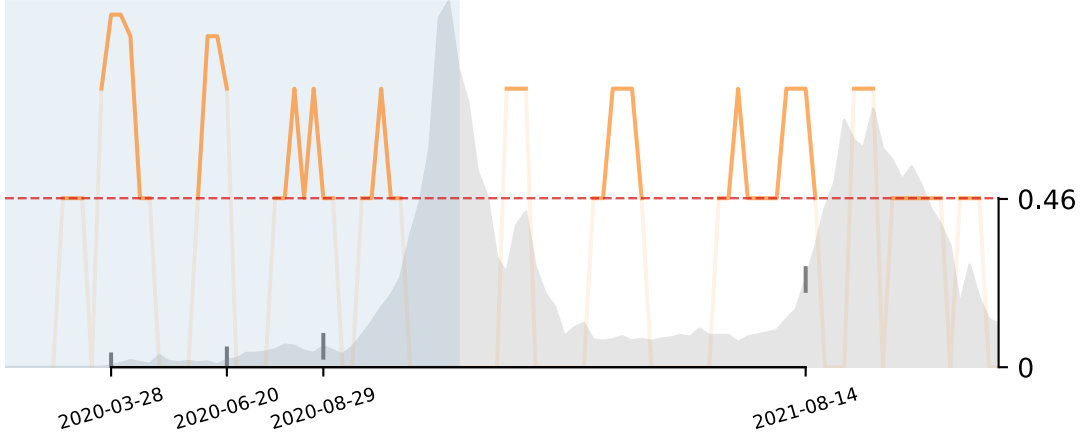
Model 2

(JHU) cases
(GT) Nasal congestion
(GT) fever



Model 3

(GT) fever
(GT) covid symptoms
(GT) Nasal congestion
(JHU) cases
(GT) Cardiac arrest



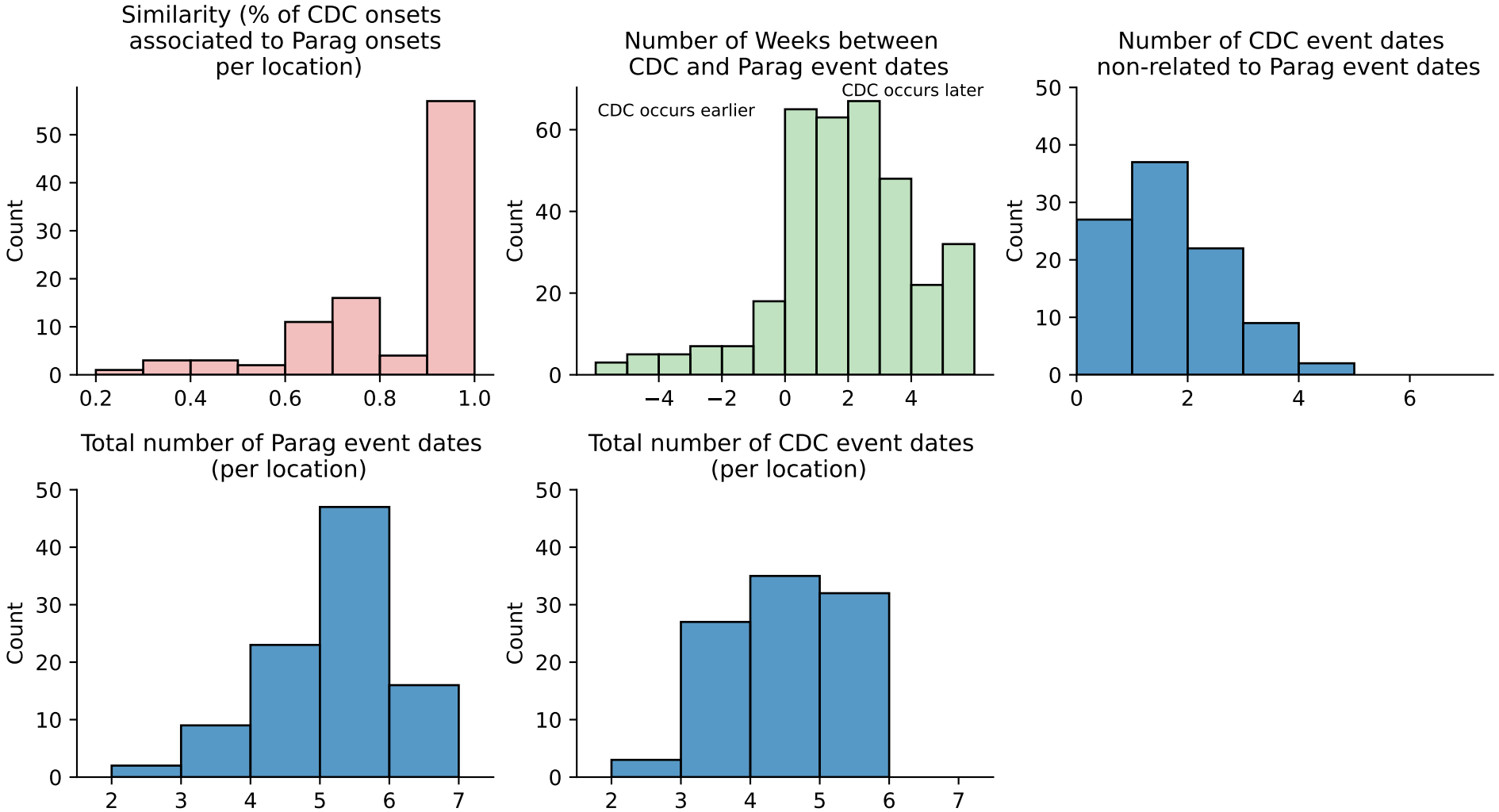
Performance as a function of β

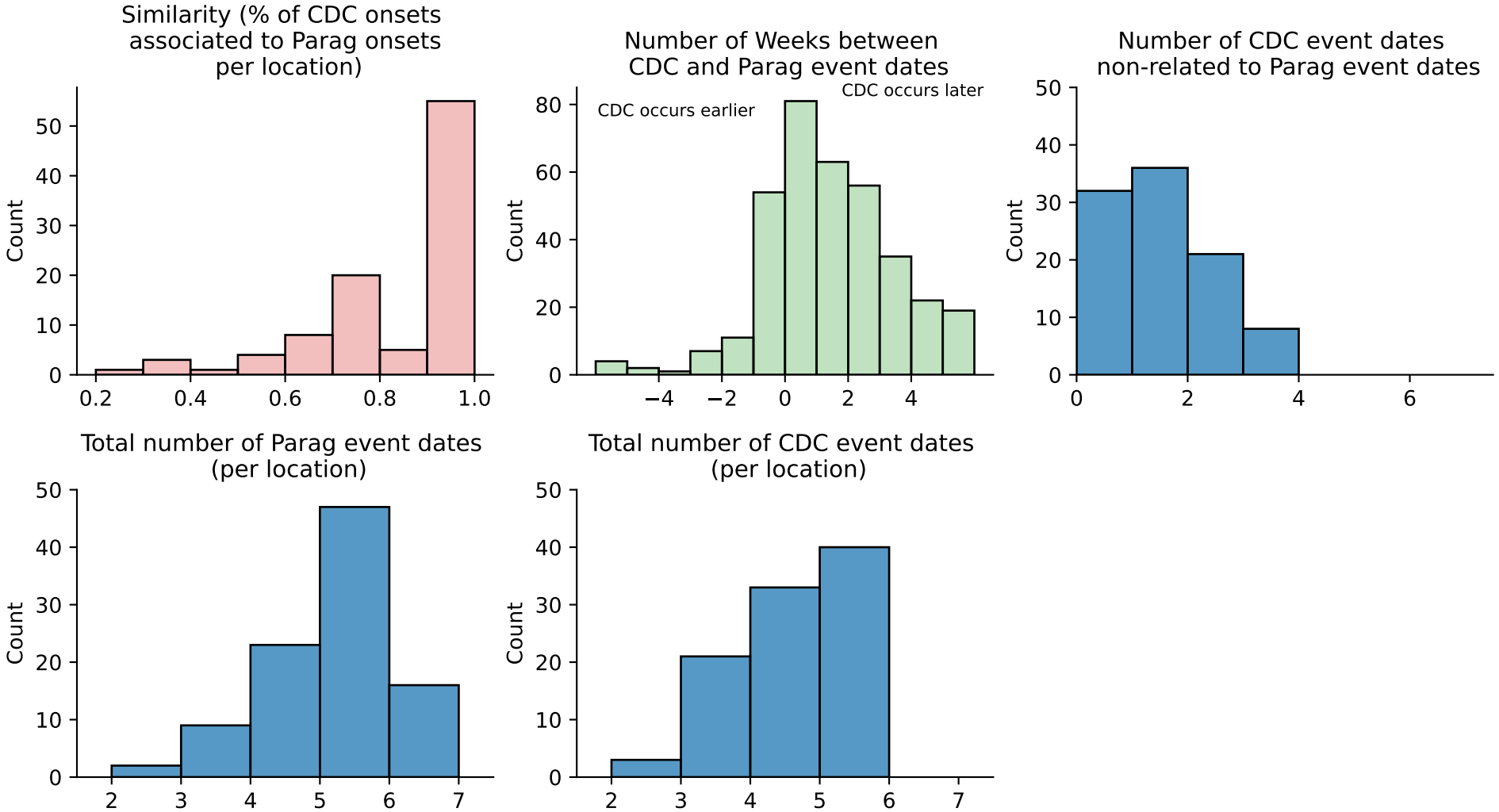
	Training			Out of sample		
β	tp	fp	fn	tp	fp	fn
1.00	0	0	1	0	0	3
0.99	0	0	1	0	0	3
0.96	0	0	1	0	0	3
0.91	1	1	0	0	0	3
0.76	1	1	0	2	11	1
0.46	1	2	0	3	38	0
0.00	1	2	0	3	66	0

β	tp	fp	fn	tp	fp	fn
0.91	0	0	2	0	0	2
0.76	2	1	0	0	2	2
0.46	2	2	0	1	17	1
0.00	2	5	0	2	63	0

β	tp	fp	fn	tp	fp	fn
0.99	0	0	3	0	0	1
0.96	0	0	3	0	0	1
0.91	1	1	2	0	0	1
0.76	2	2	1	1	10	0
0.46	3	3	0	1	25	0
0.00	3	12	0	1	49	0

Figures S188-S189.
Comparative analysis between the outbreak onset dates as created by using Parag’s method against the CDC's daily transmission levels. (A) represents a histogram on the number of 'associated events' between both sources (associated events occur in time within a time difference of at most 6 weeks). (B) Represents the timing (in weeks) between associated events over all counties. (C) The number of non-associated onsets within the CDC's data. Panels (D) and (E) show a count of the number of events expected to see within a county.

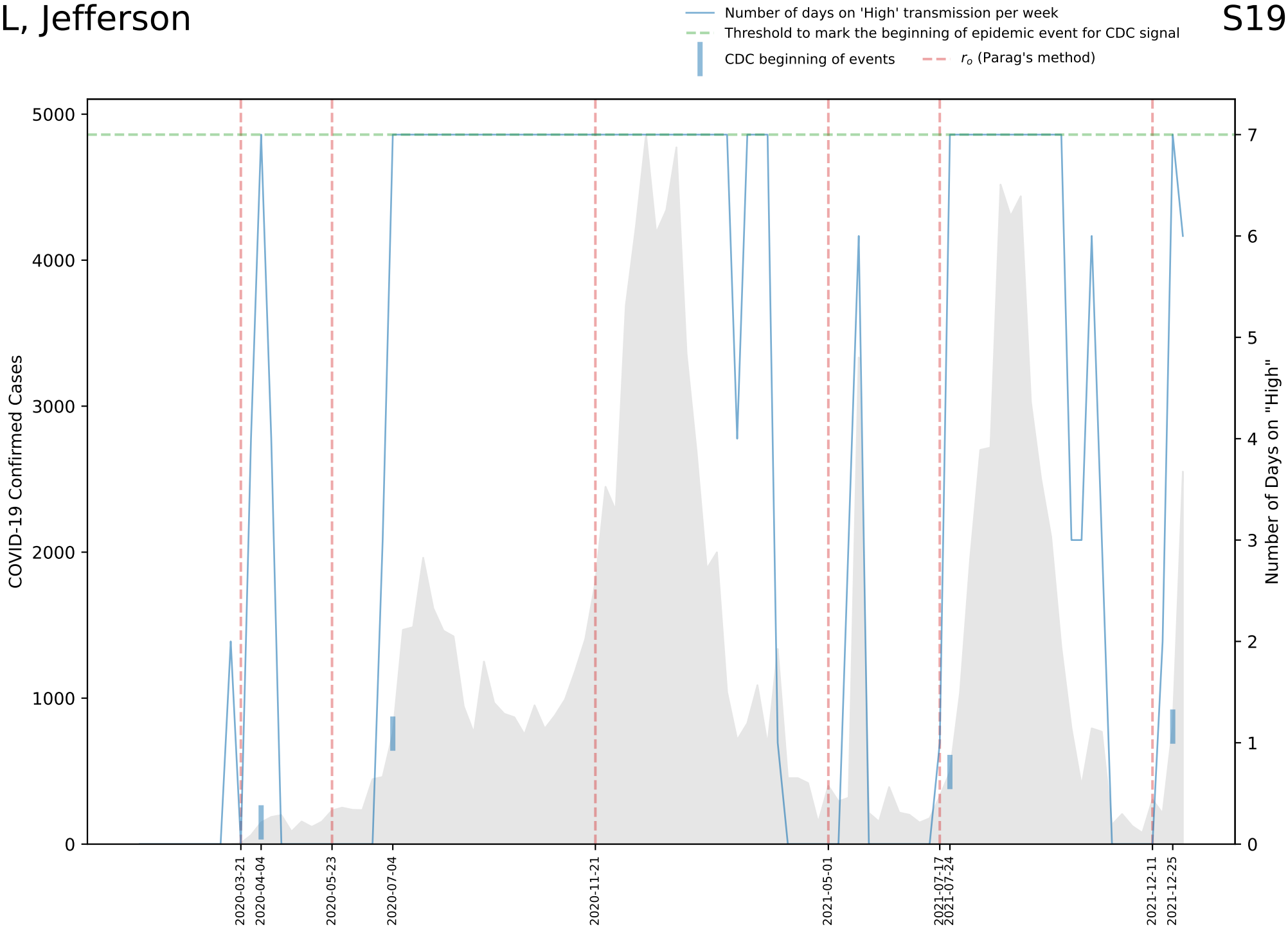

Similarity (% of CDC onsets associated to Parag onsets per location)
Count
0
10
20
30
40
50
0.2
0.4
0.6
0.8
1.0
Number of Weeks between CDC and Parag event dates
CDC occurs earlier
CDC occurs later
Count
0
20
40
60
−4
−2
0
2
4
Number of CDC event dates non-related to Parag event dates
Count
0
10
20
30
40
50
0
2
4
6
Total number of Parag event dates (per location)
Count
0
10
20
30
40
50
2
3
4
5
6
7
Total number of CDC event dates (per location)
Count
0
10
20
30
40
50
2
3
4
5
6
7


Similarity (% of CDC onsets associated to Parag onsets per location)
Count
0
10
20
30
40
50
0.2
0.4
0.6
0.8
1.0
Number of Weeks between CDC and Parag event dates
CDC occurs earlier
CDC occurs later
Count
0
20
40
60
80
−4
−2
0
2
4
Number of CDC event dates non-related to Parag event dates
Count
0
10
20
30
40
50
0
2
4
6
Total number of Parag event dates (per location)
Count
0
10
20
30
40
50
2
3
4
5
6
7
Total number of CDC event dates (per location)
Count
0
10
20
30
40
50
2
3
4
5
6
7

Figures S190-S286.
Visual comparison (per county) of the probability of resurgence (timeseries in green, onsets as vertical dotted red lines),against the onsets generated using CDC's COVID-19 transmission-level data (timeseries in blue, onsets as vertical blue tick marks).

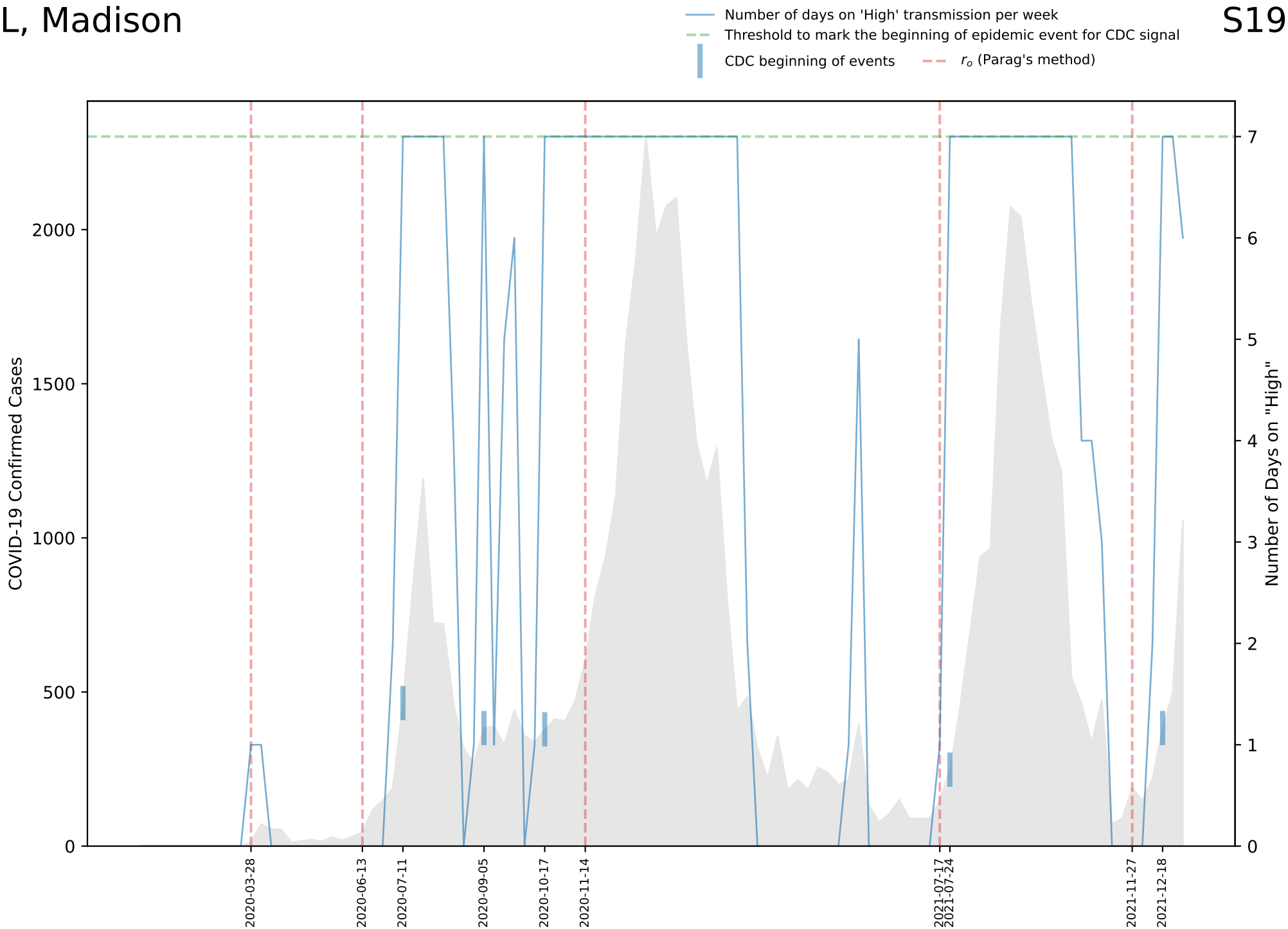
AL, Jefferson

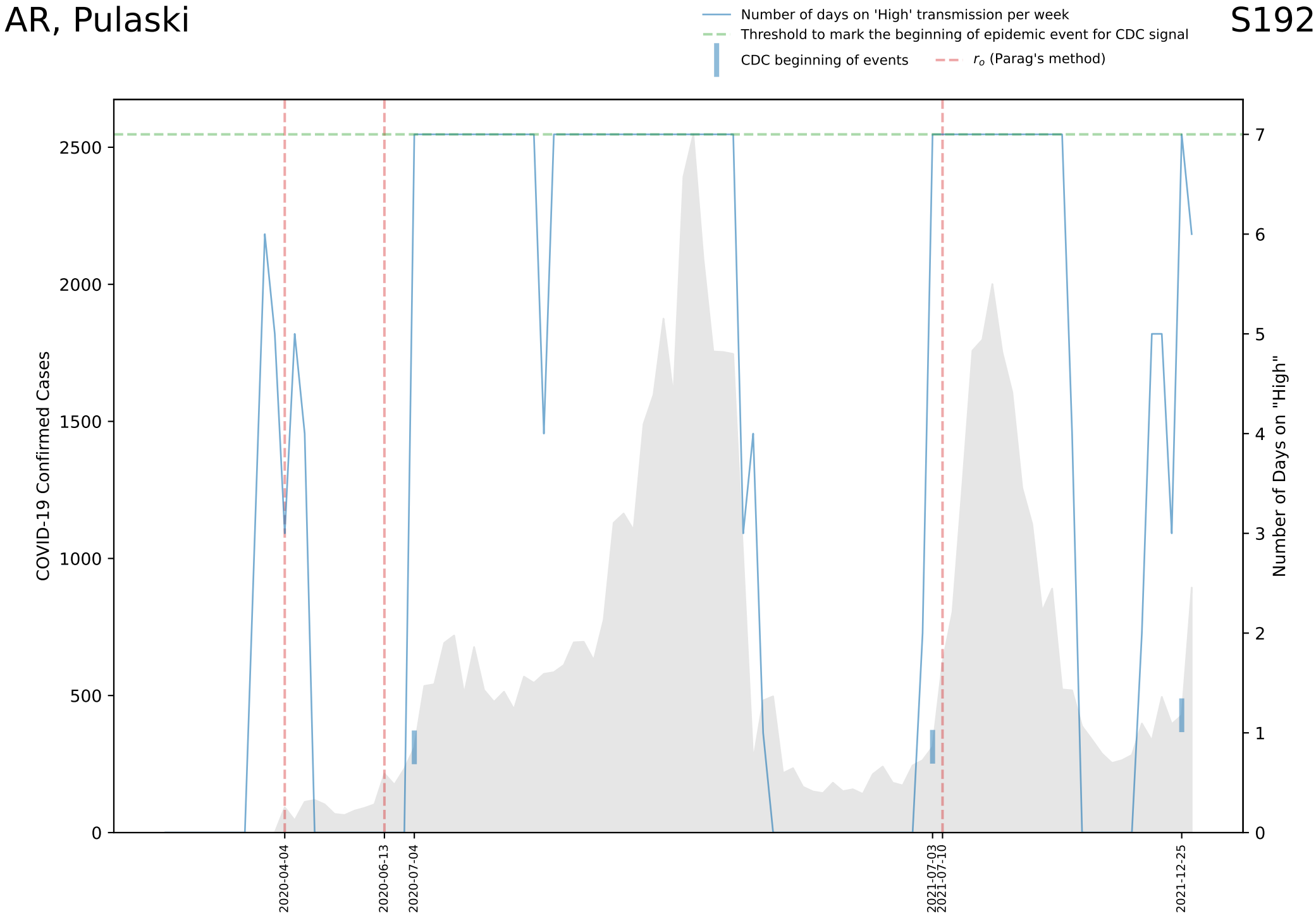
S190



AL, Madison

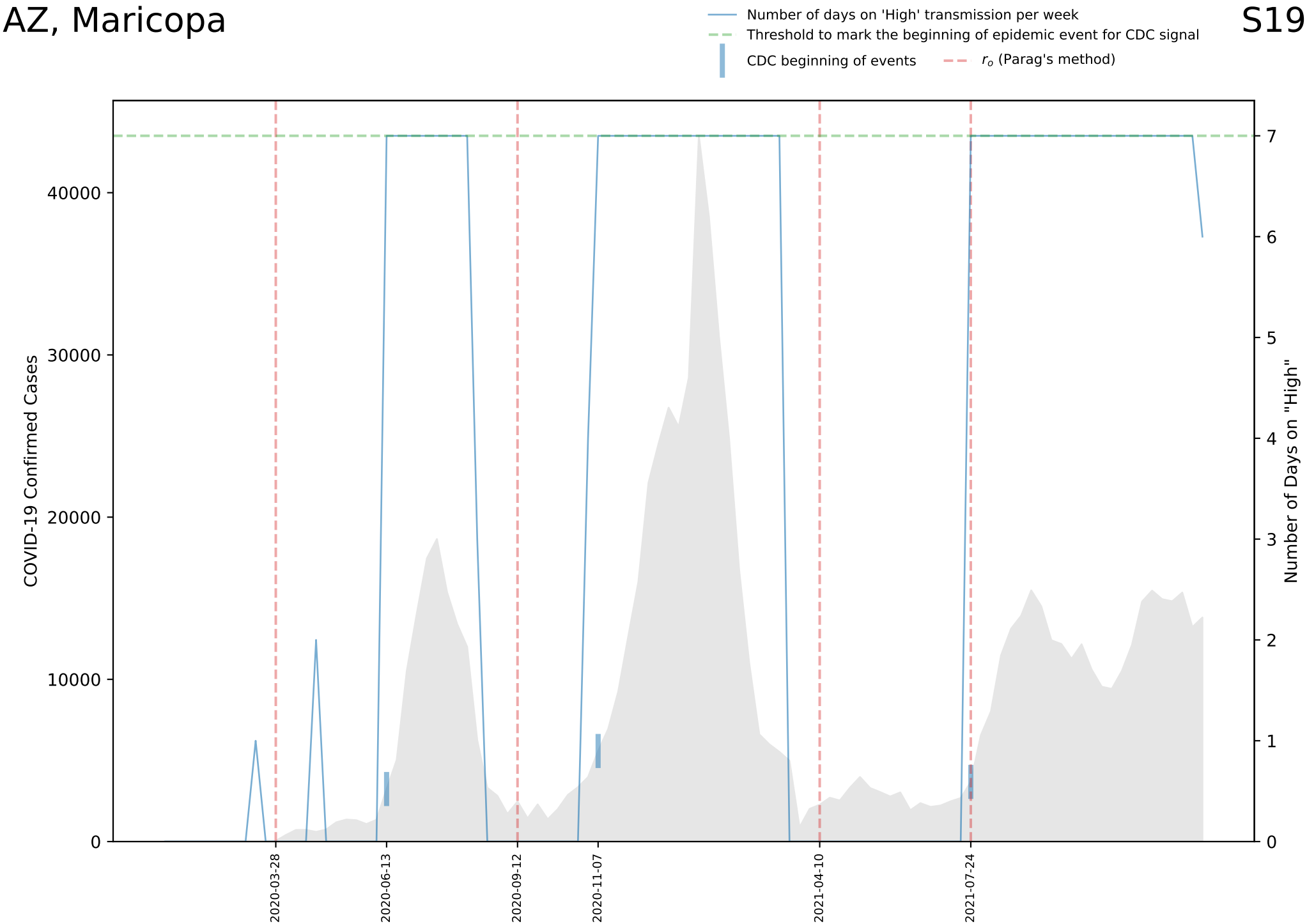
S191

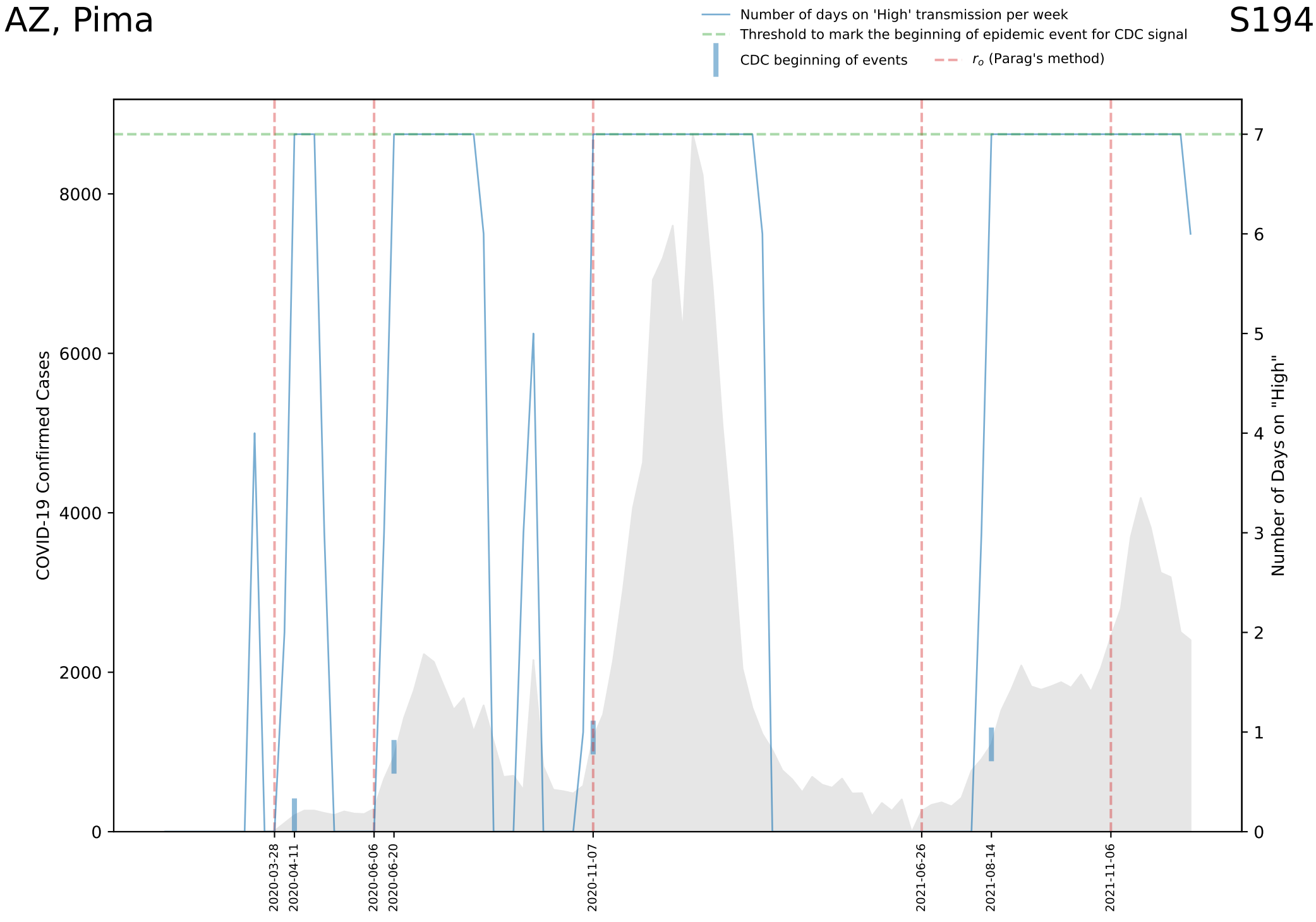


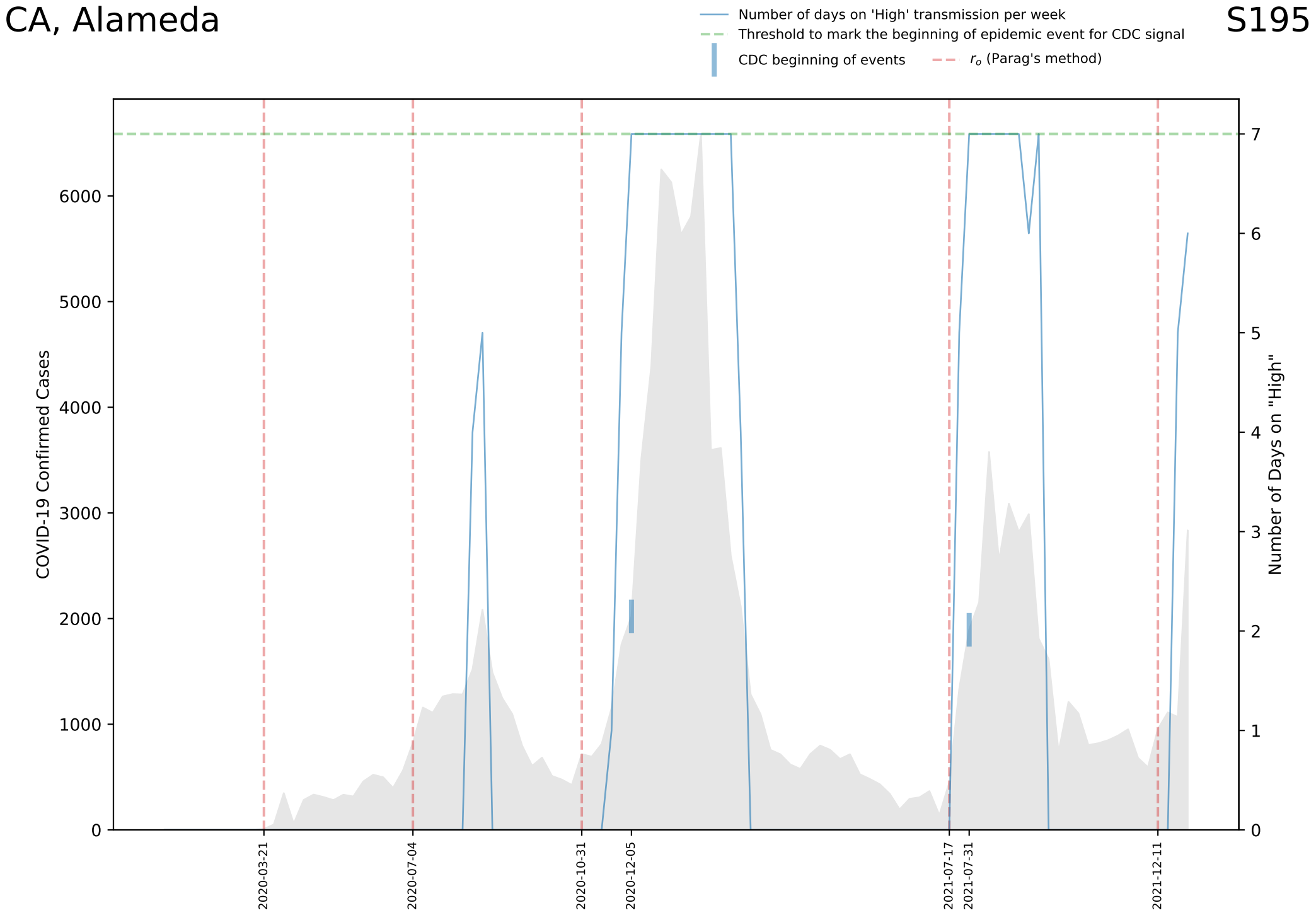

AR, Pulaski
S192
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
0
1
2
3
4
5
6
7
2020-04-04
2020-06-13
2020-07-04
2021-07-03
2021-07-10
2021-12-25

AZ, Maricopa

S193

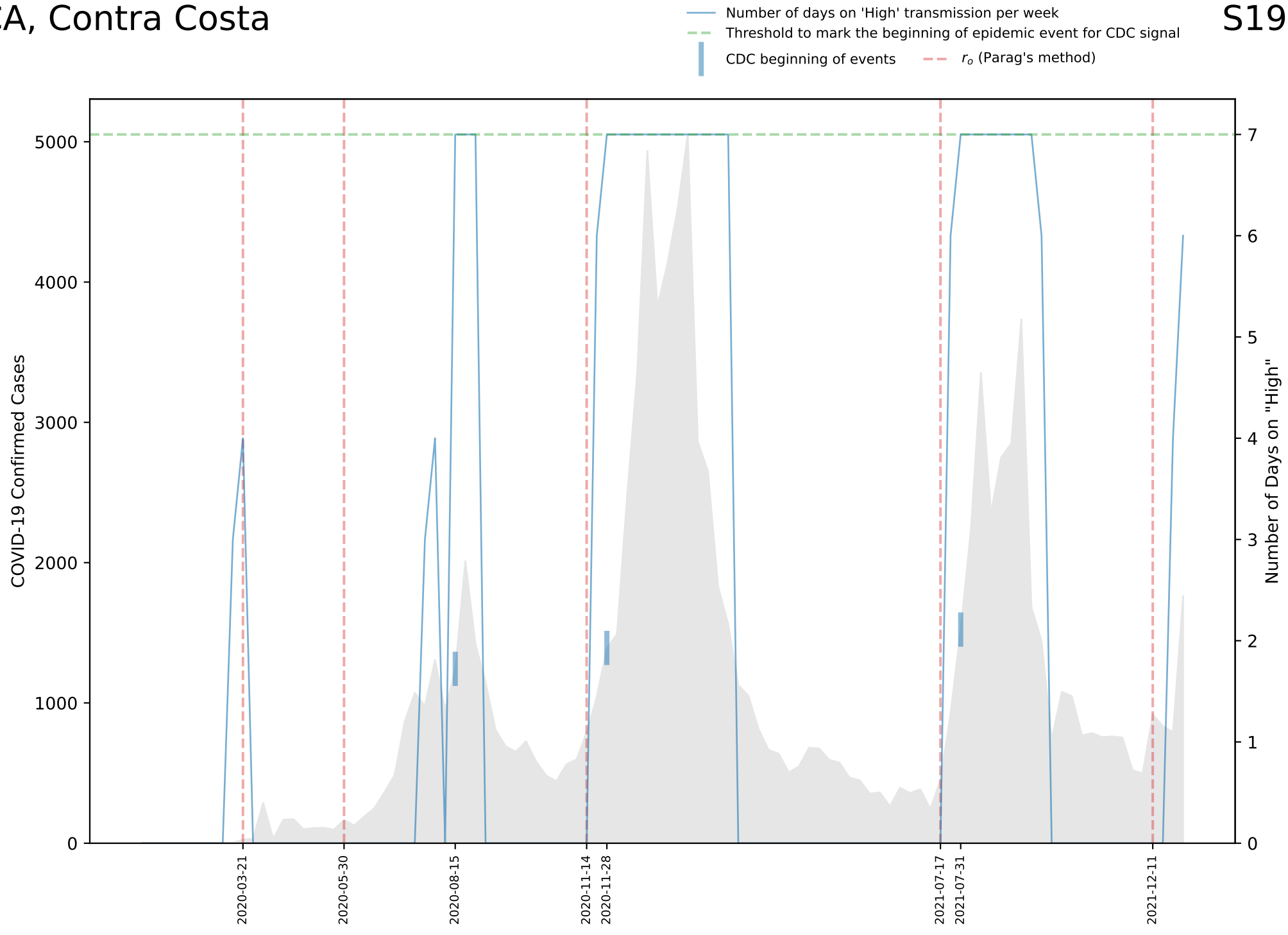



AZ, Pima
S194
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2000
4000
6000
8000
0
1
2
3
4
5
6
7
2020-03-28
2020-04-11
2020-06-06
2020-06-20
2020-11-07
2021-06-26
2021-08-14
2021-11-06


CA, Alameda
S195
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
0
1
2
3
4
5
6
7
2020-03-21
2020-07-04
2020-10-31
2020-12-05
2021-07-17
2021-07-31
2021-12-11

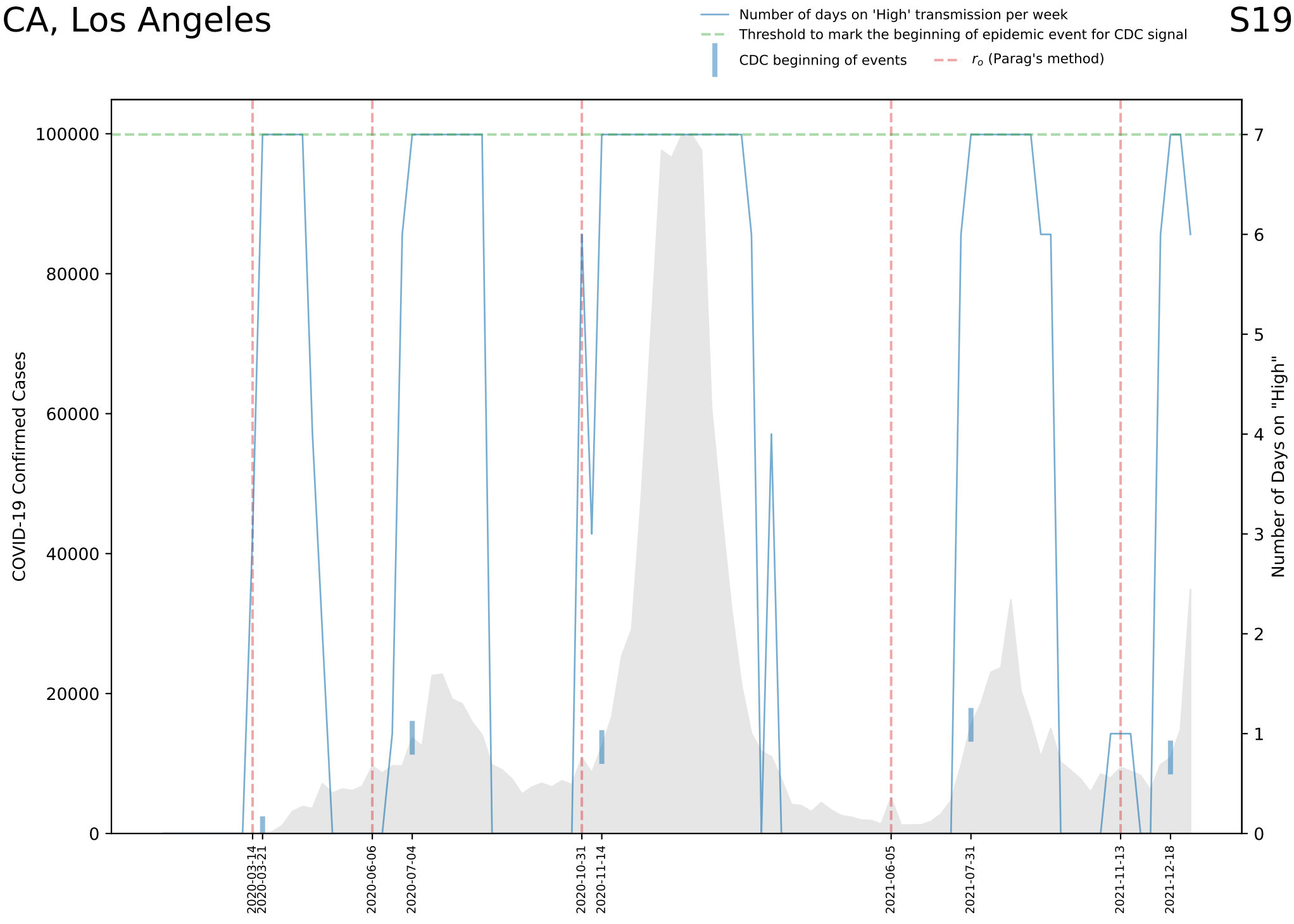
CA, Contra Costa

S196



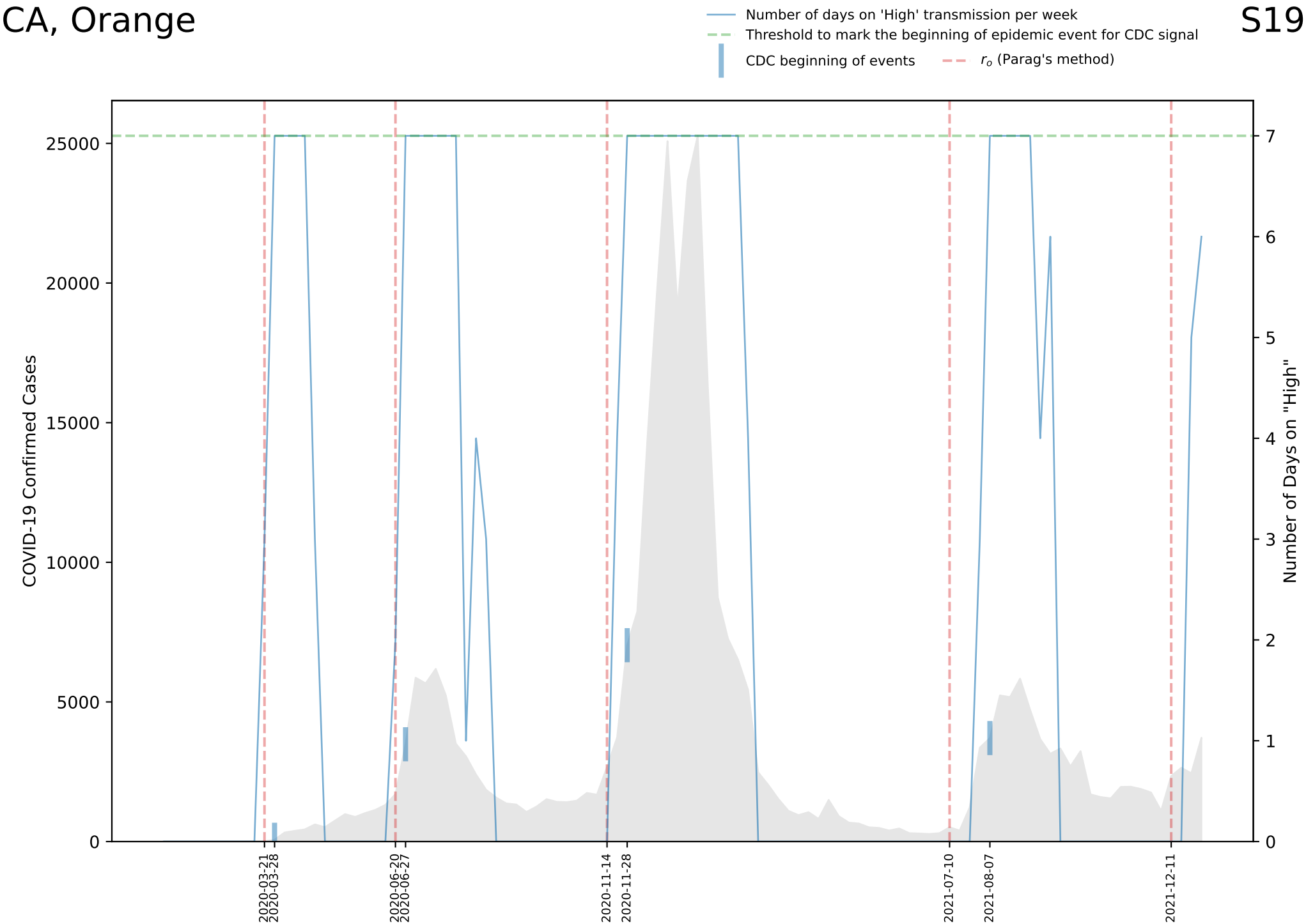
CA, Los Angeles

S197



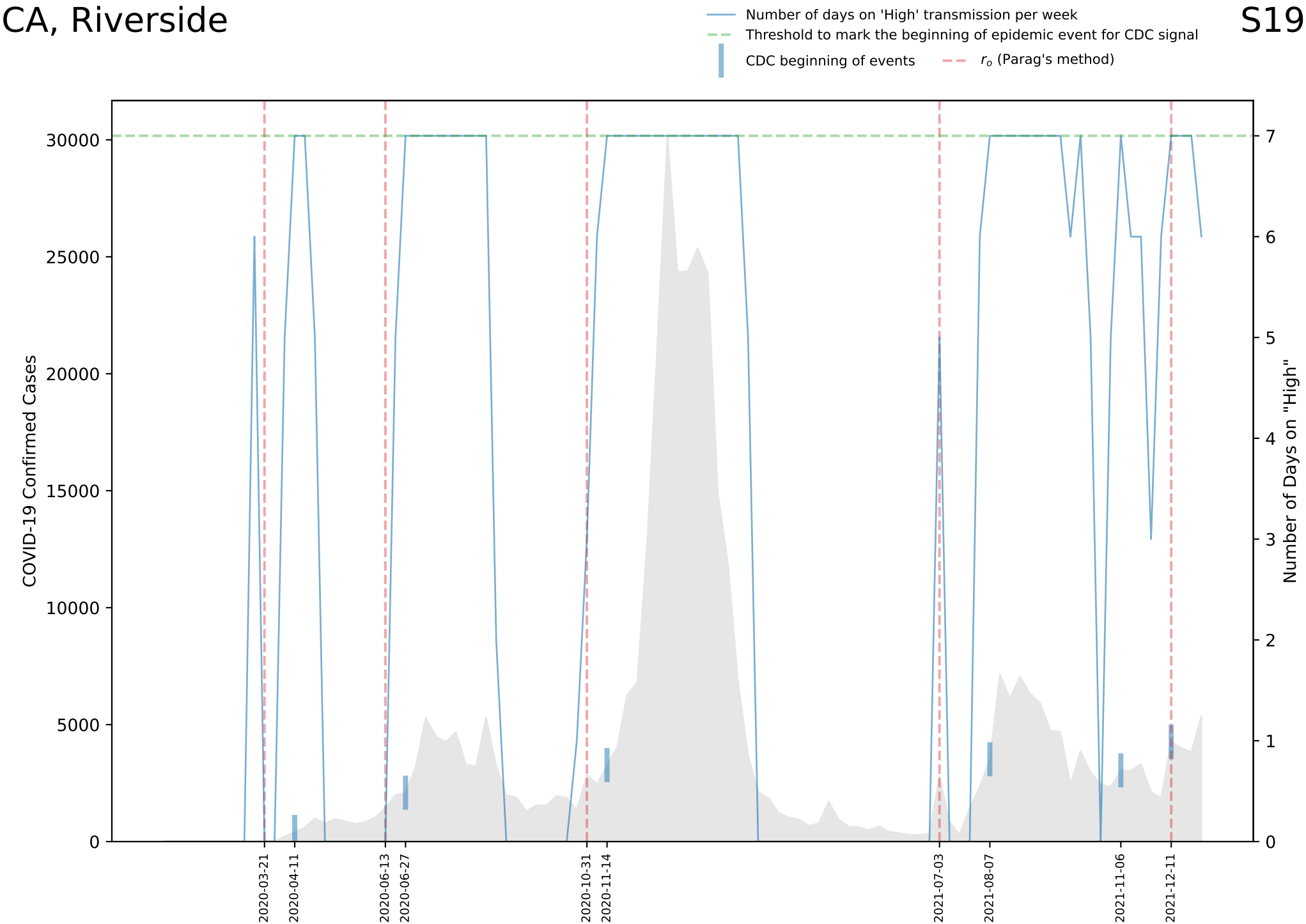
CA, Orange

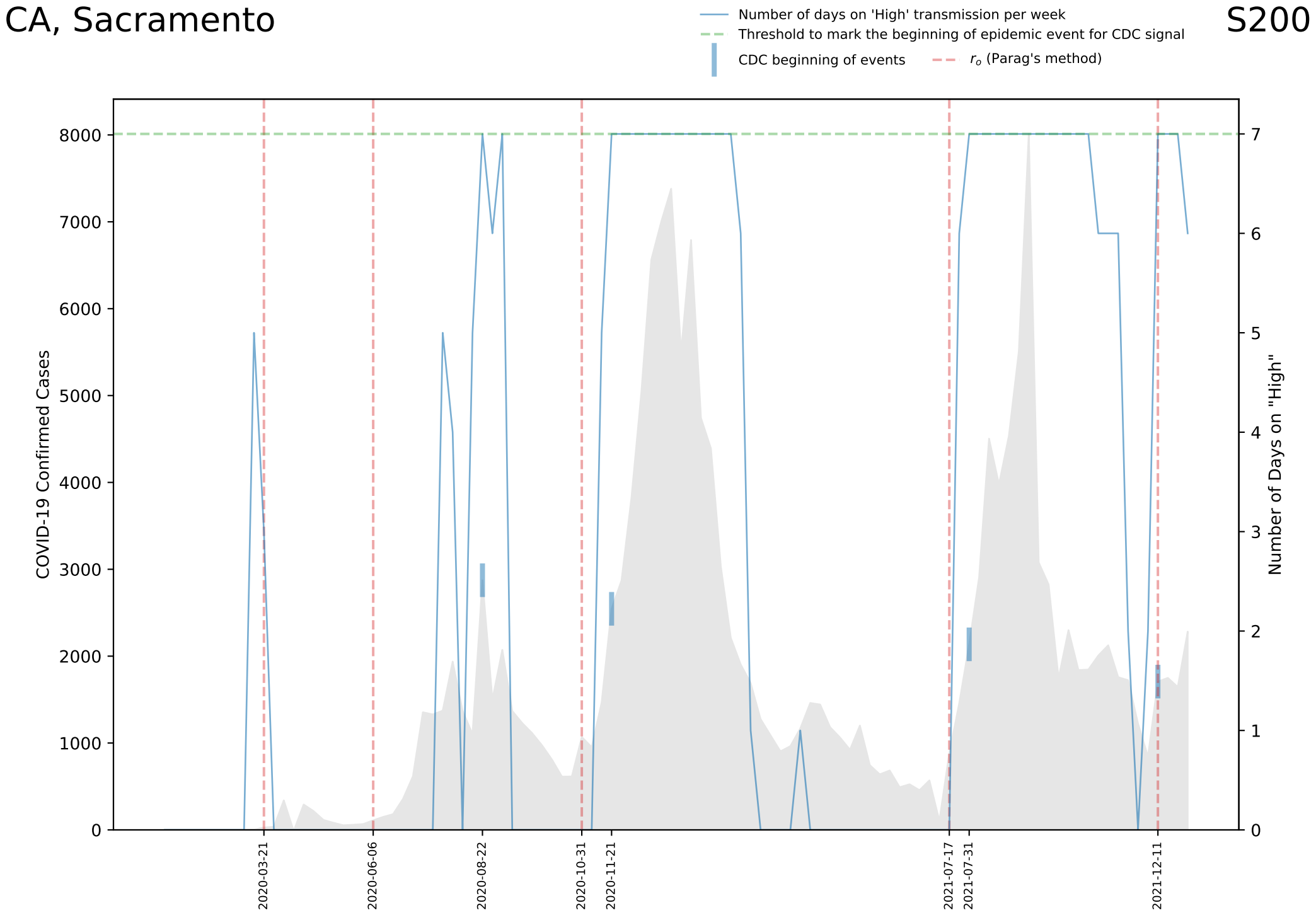
S198



CA, Riverside

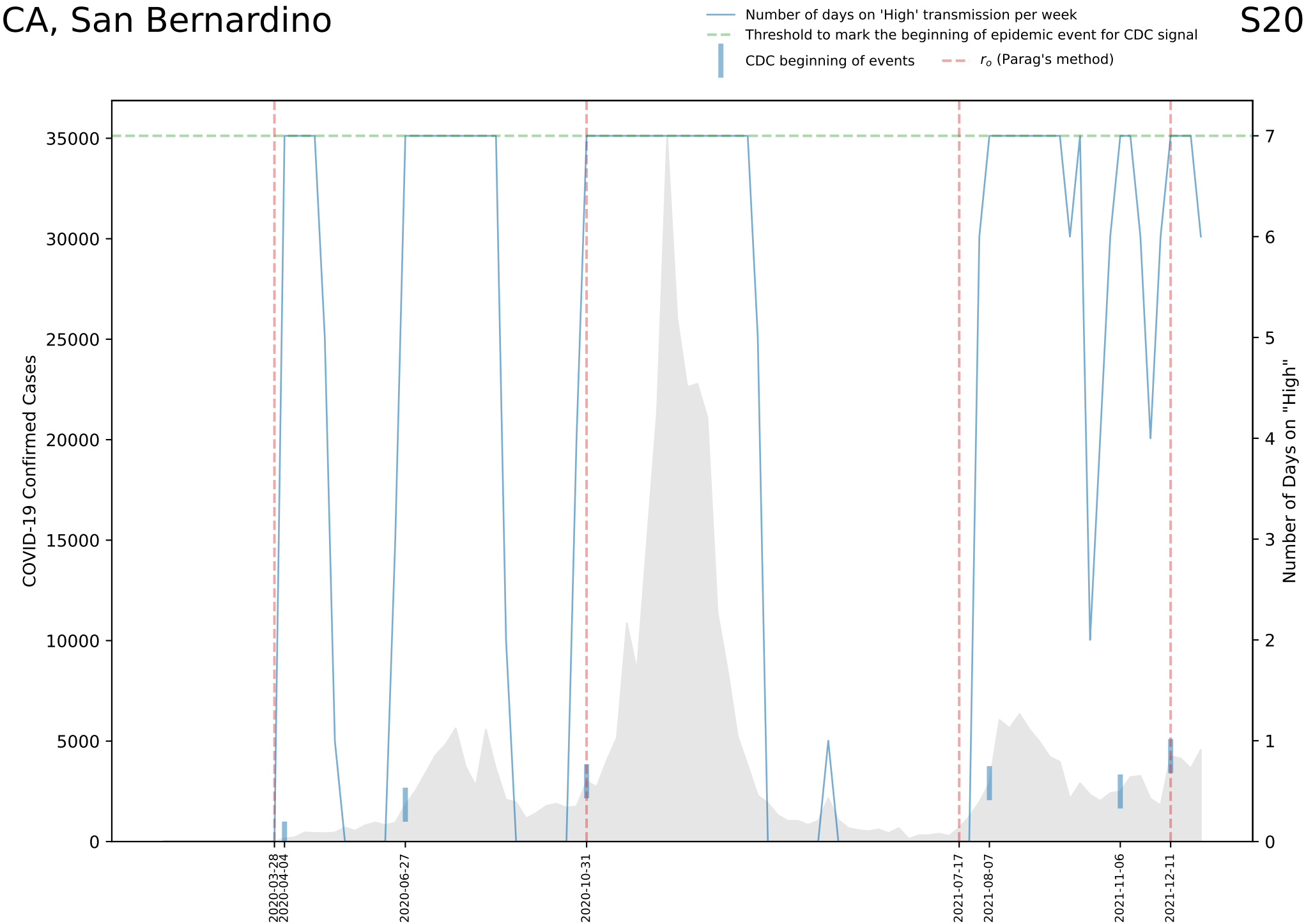
S199

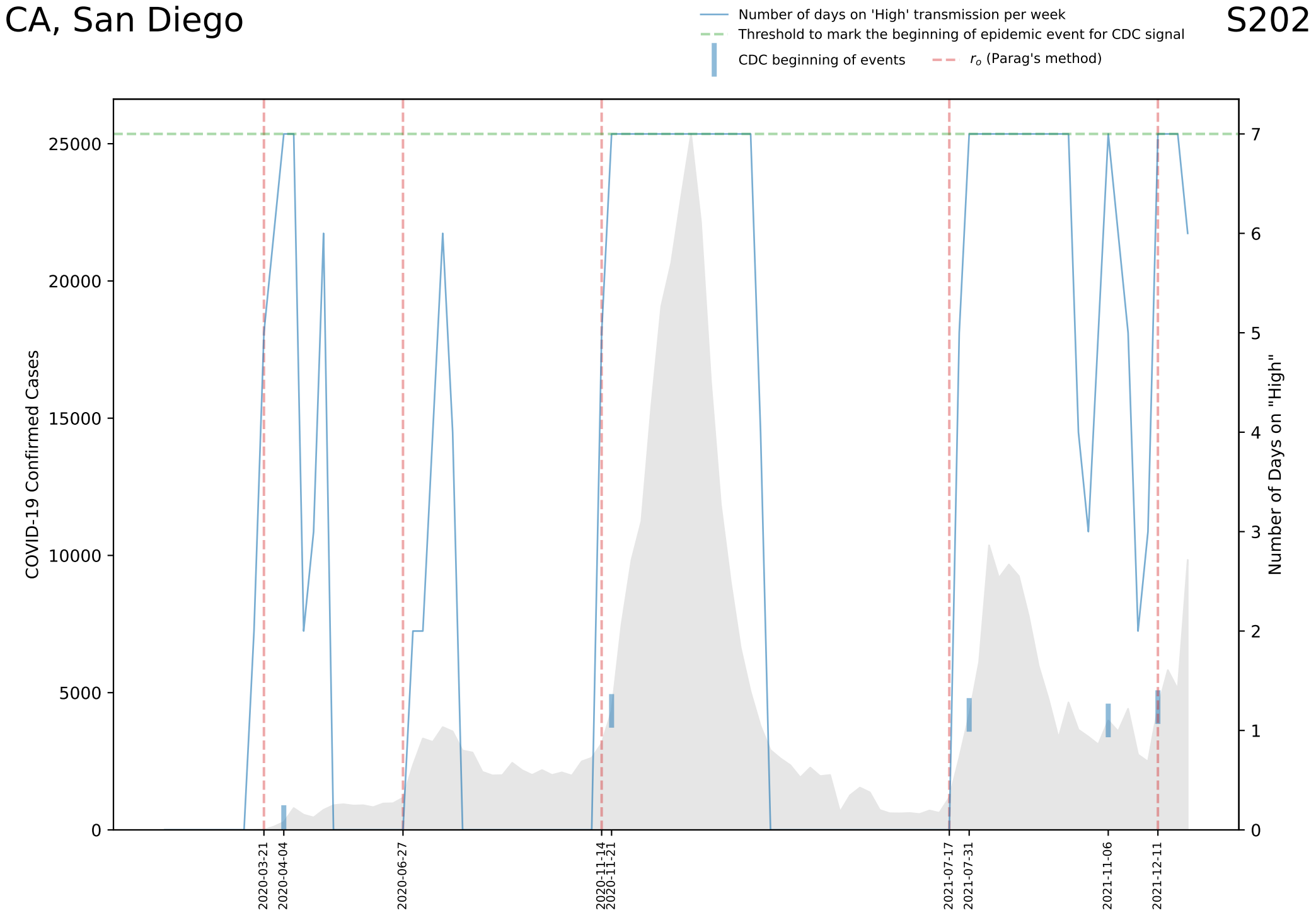



CA, Sacramento
S200
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
7000
8000
0
1
2
3
4
5
6
7
2020-03-21
2020-06-06
2020-08-22
2020-10-31
2020-11-21
2021-07-17
2021-07-31
2021-12-11

CA, San Bernardino

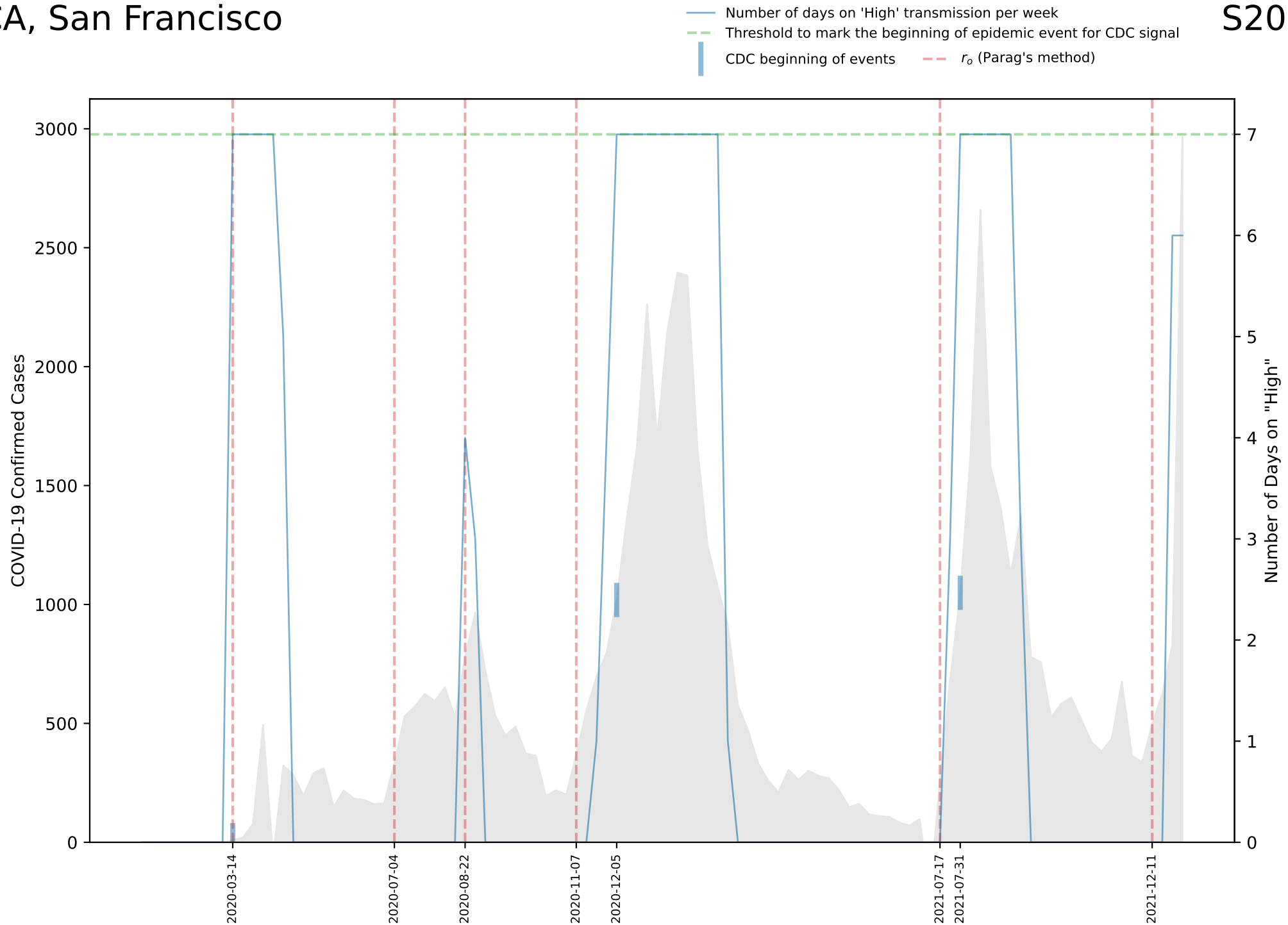
S201

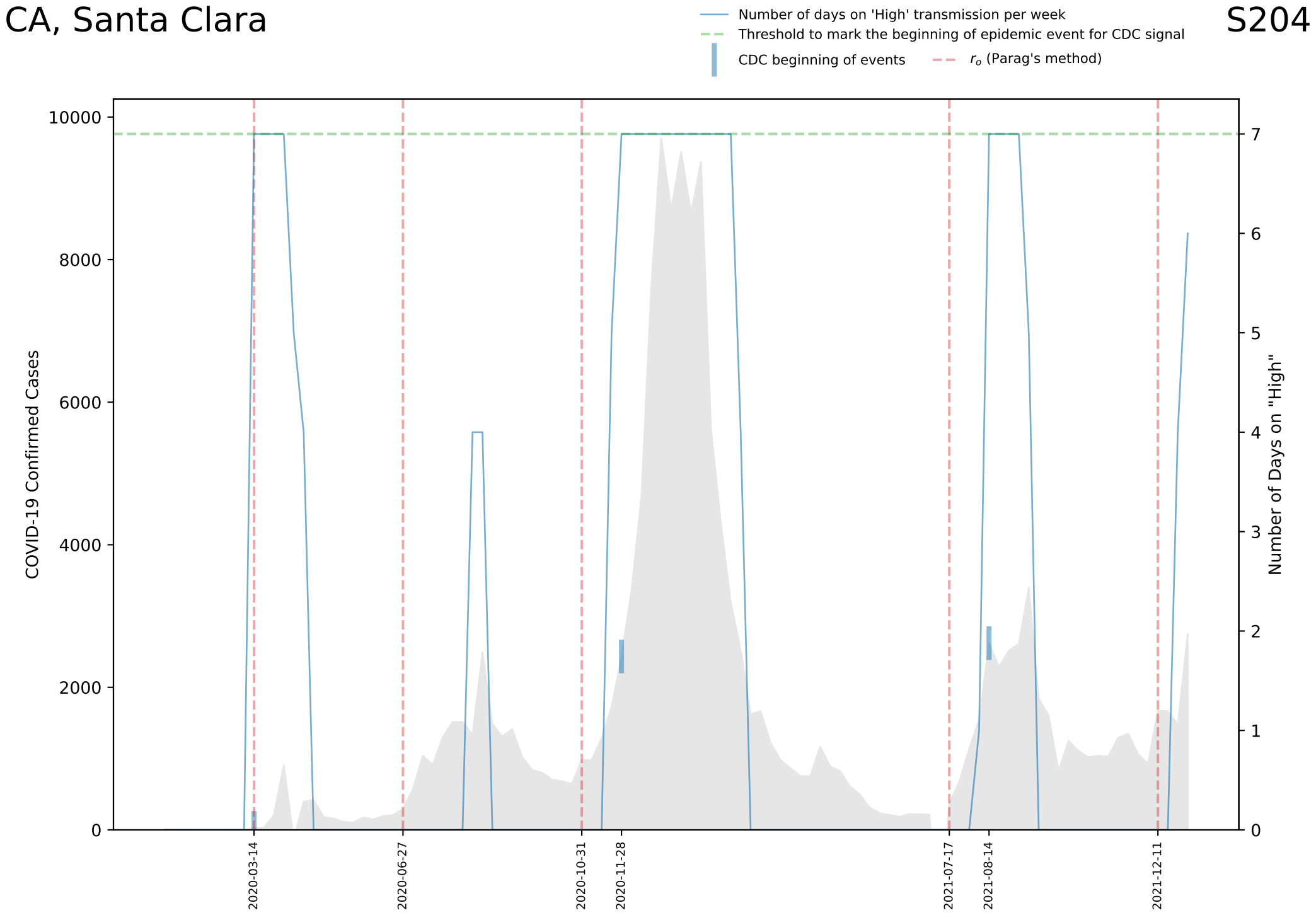


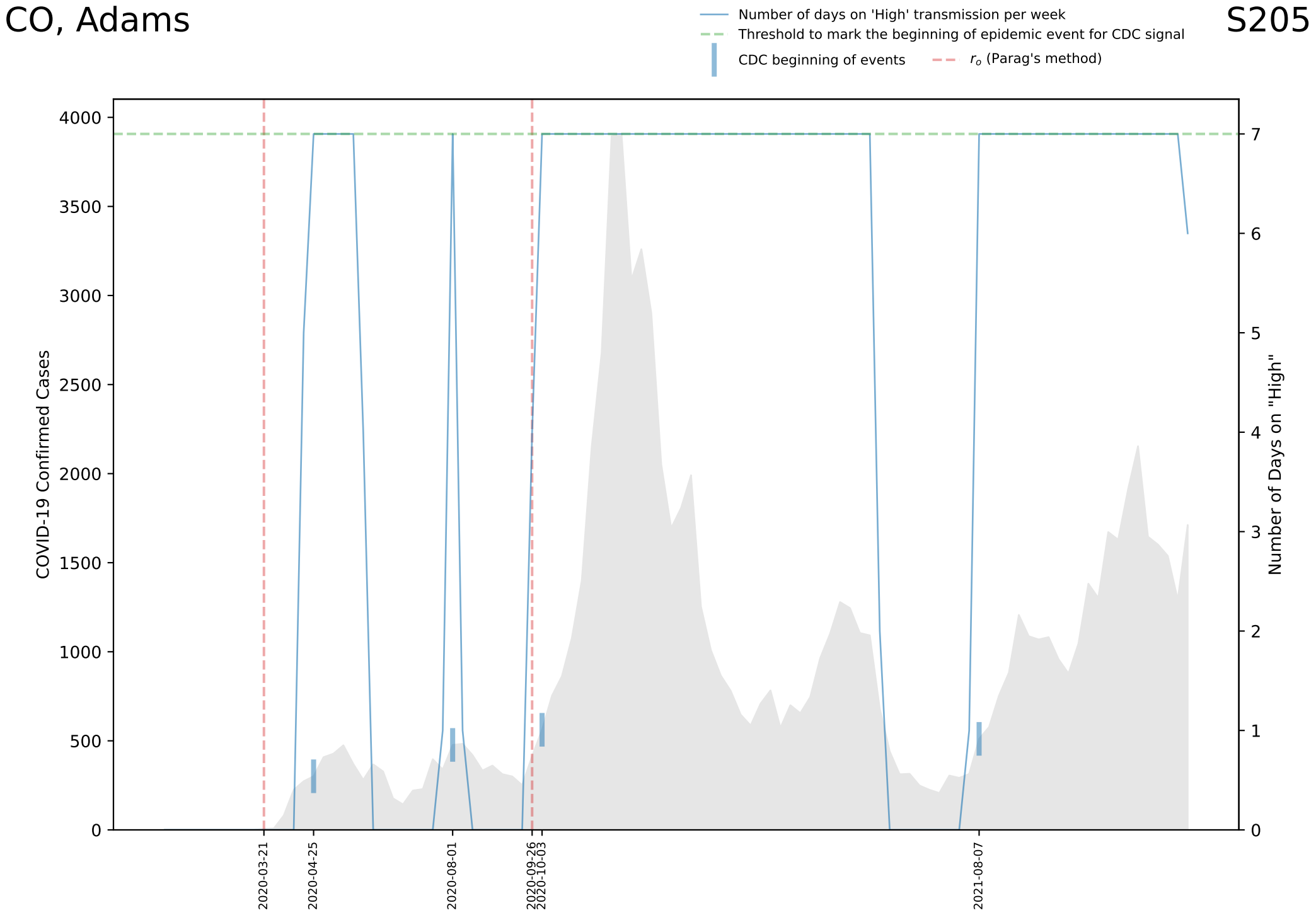

CA, San Diego
S202
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
5000
10000
15000
20000
25000
0
1
2
3
4
5
6
7
2020-03-21
2020-04-04
2020-06-27
2020-11-14
2020-11-21
2021-07-17
2021-07-31
2021-11-06
2021-12-11

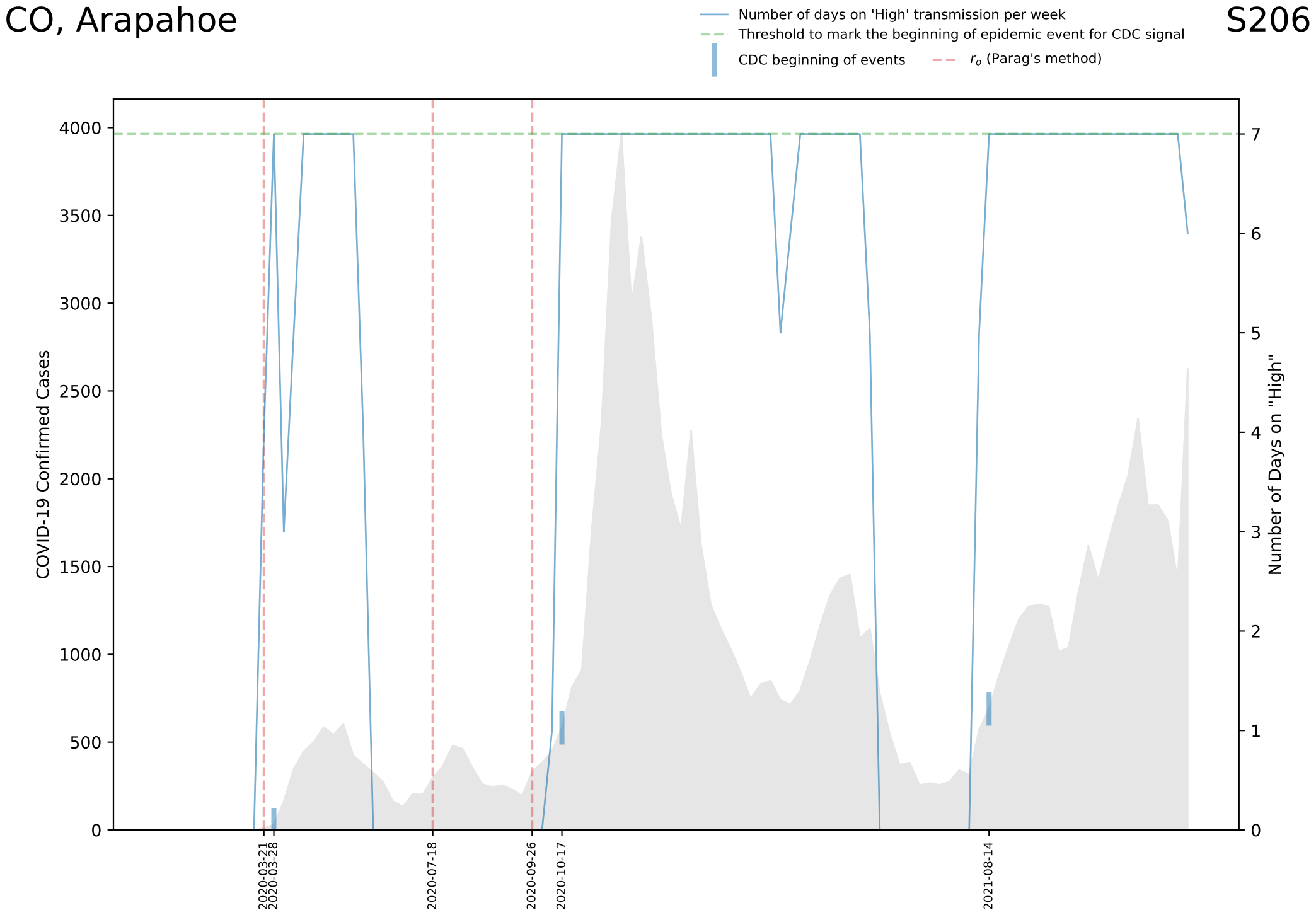
CA, San Francisco

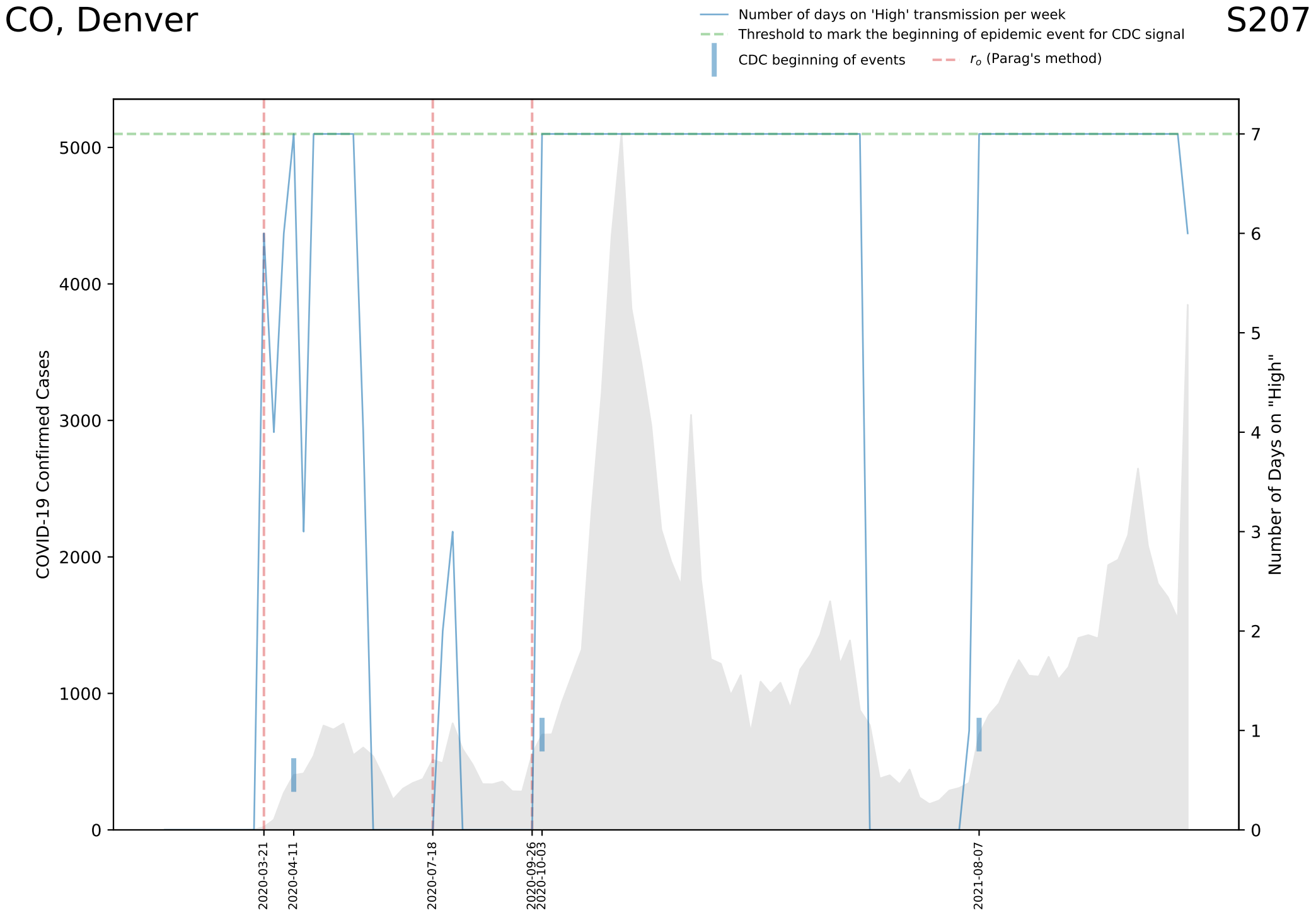
S203

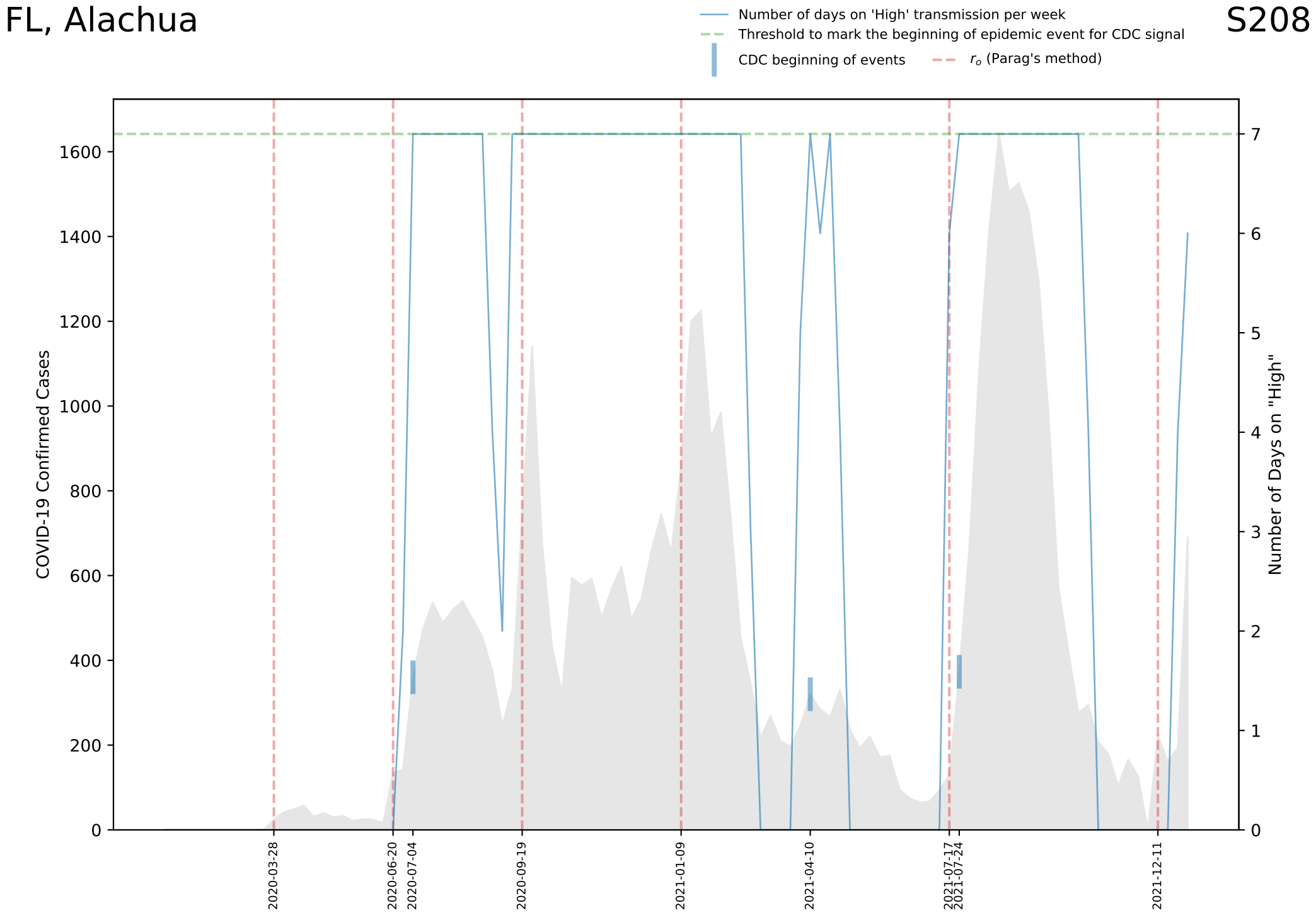


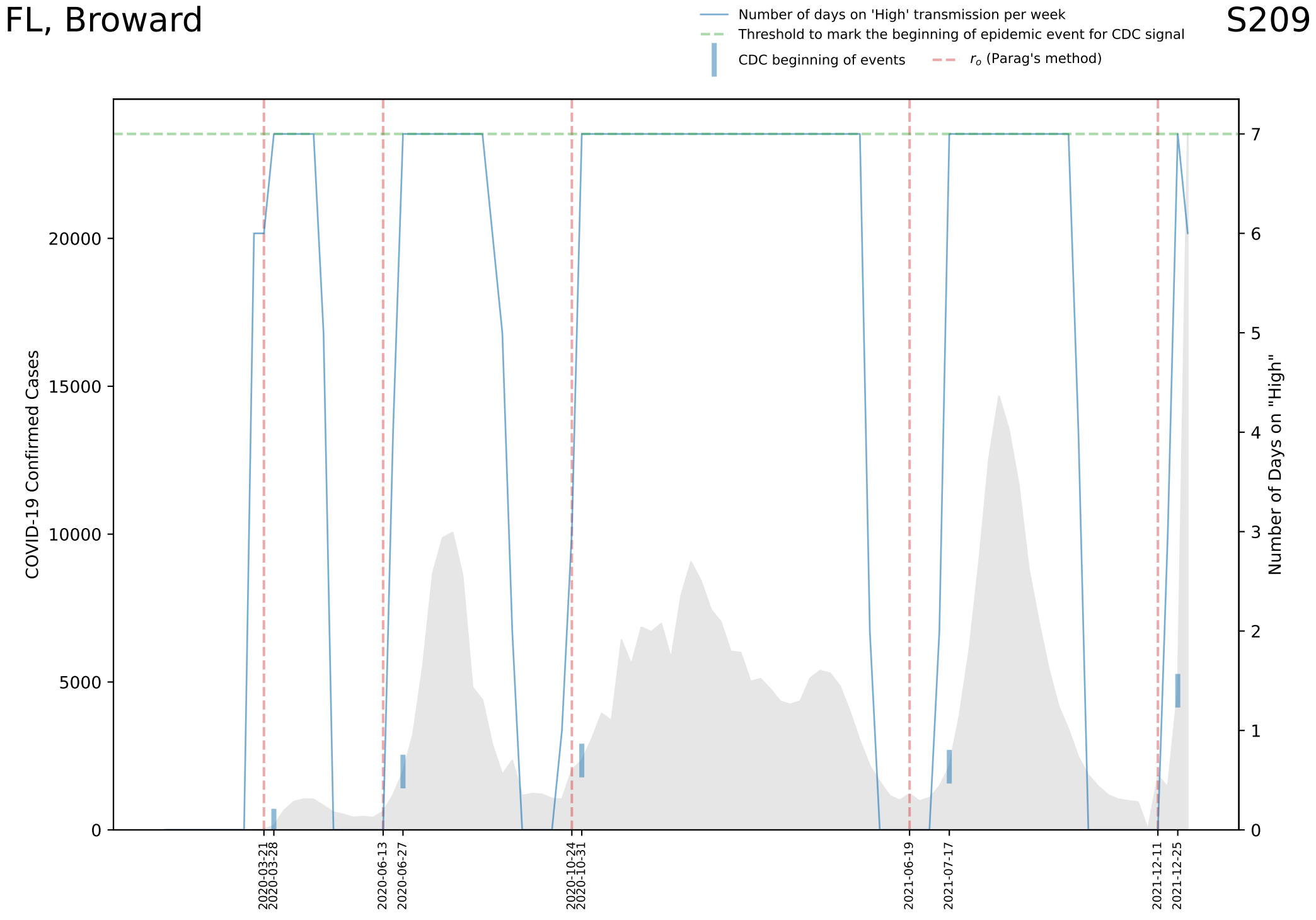

CA, Santa Clara
S204
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
10000
8000
6000
4000
2000
0
7
6
5
4
3
2
1
0
2020-03-14
2020-06-27
2020-10-31
2020-11-28
2021-07-17
2021-08-14
2021-12-11


CO, Adams
S205
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
3000
3500
4000
0
1
2
3
4
5
6
7
2020-03-21
2020-04-25
2020-08-01
2020-09-26
2020-10-03
2021-08-07


CO, Arapahoe
S206
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
3000
3500
4000
0
1
2
3
4
5
6
7
2020-03-21
2020-03-28
2020-07-18
2020-09-26
2020-10-17
2021-08-14

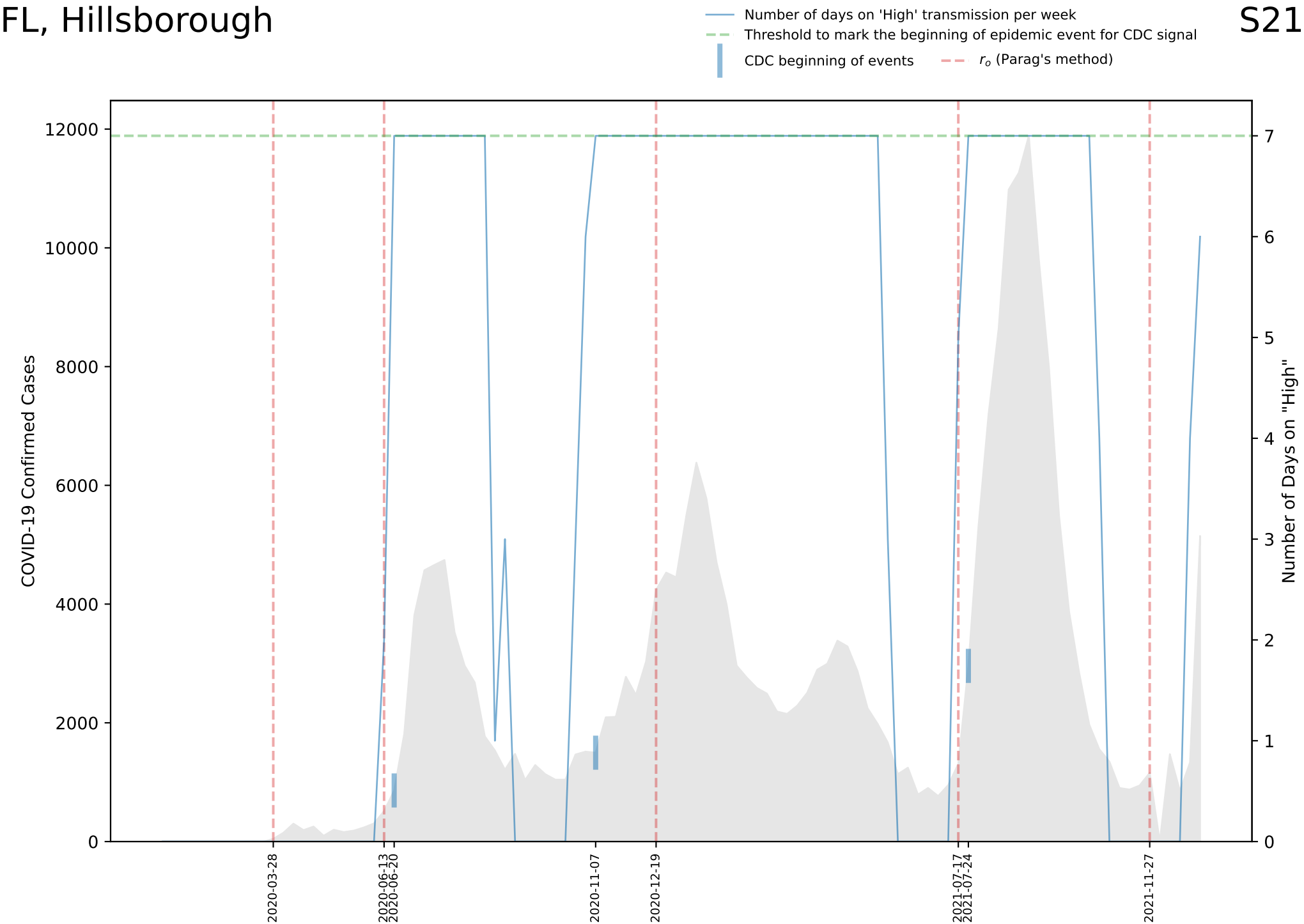

CO, Denver
S207
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
0
1
2
3
4
5
6
7
2020-03-21
2020-04-11
2020-07-18
2020-09-26
2020-10-03
2021-08-07

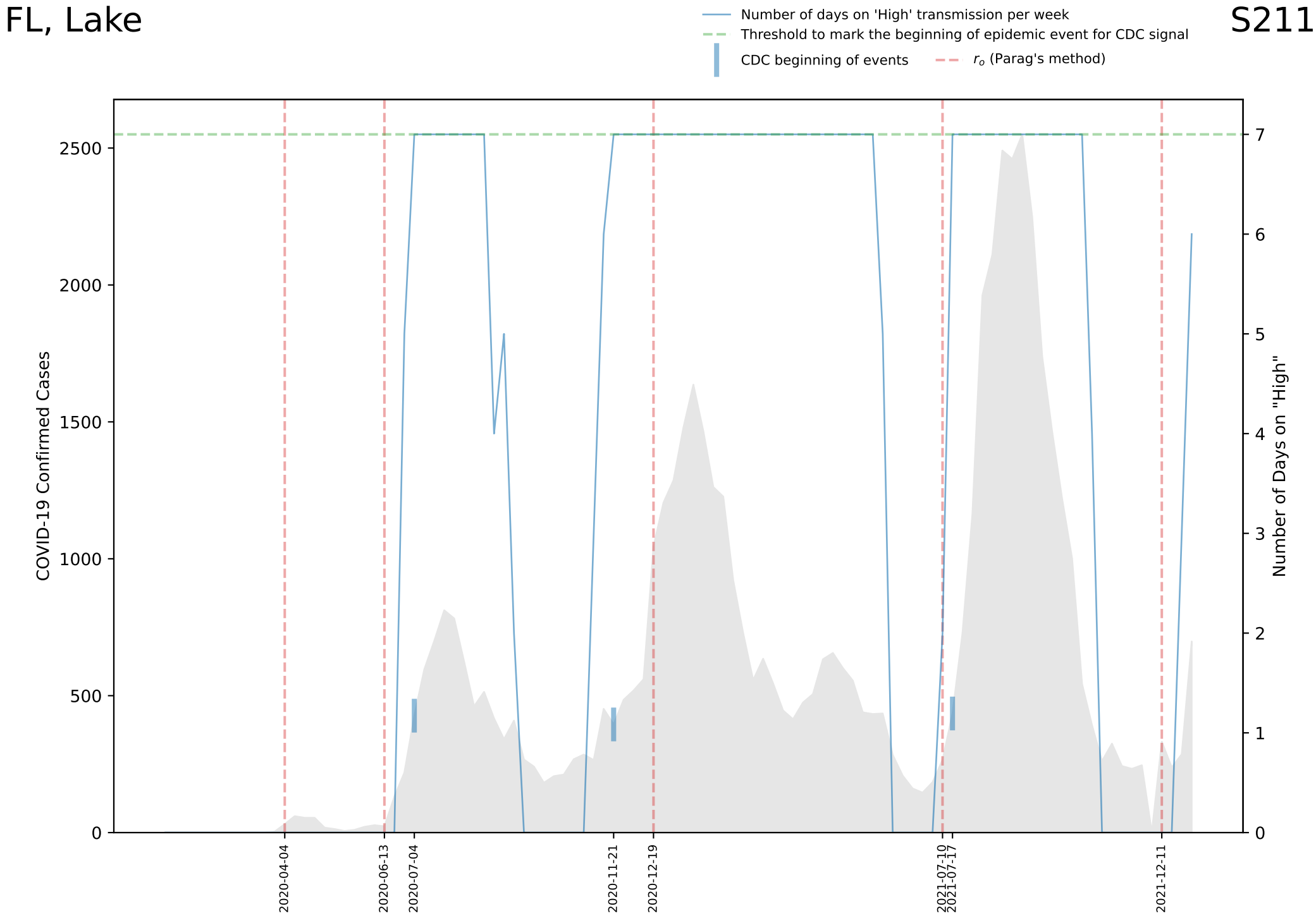

FL, Alachua
S208
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
200
400
600
800
1000
1200
1400
1600
0
1
2
3
4
5
6
7
2020-03-28
2020-06-20
2020-07-04
2020-09-19
2021-01-09
2021-04-10
2021-07-17
2021-07-24
2021-12-11

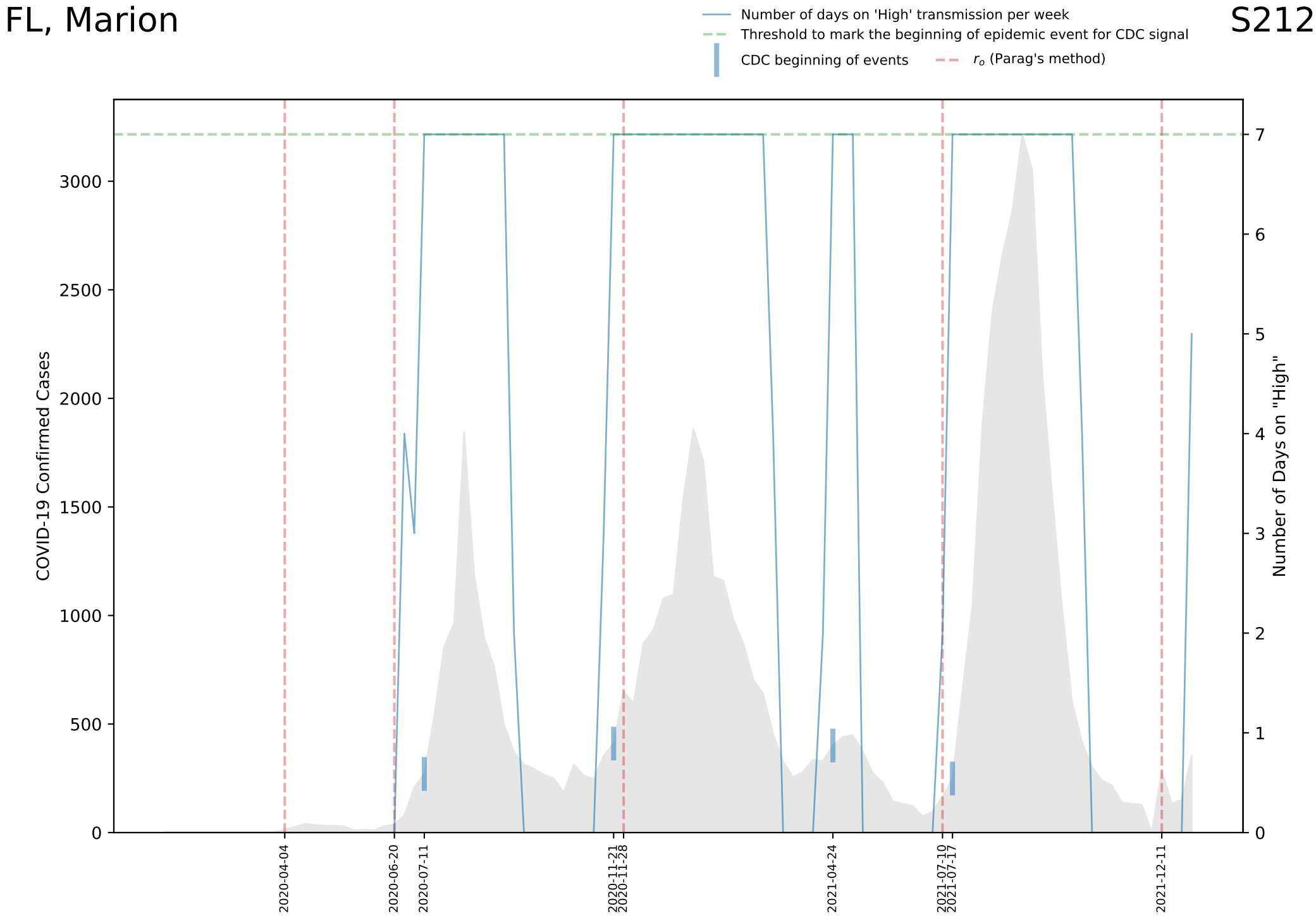

FL, Broward
S209
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
5000
10000
15000
20000
0
1
2
3
4
5
6
7
2020-03-21
2020-03-28
2020-06-13
2020-06-27
2020-10-24
2020-10-31
2021-06-19
2021-07-17
2021-12-11
2021-12-25

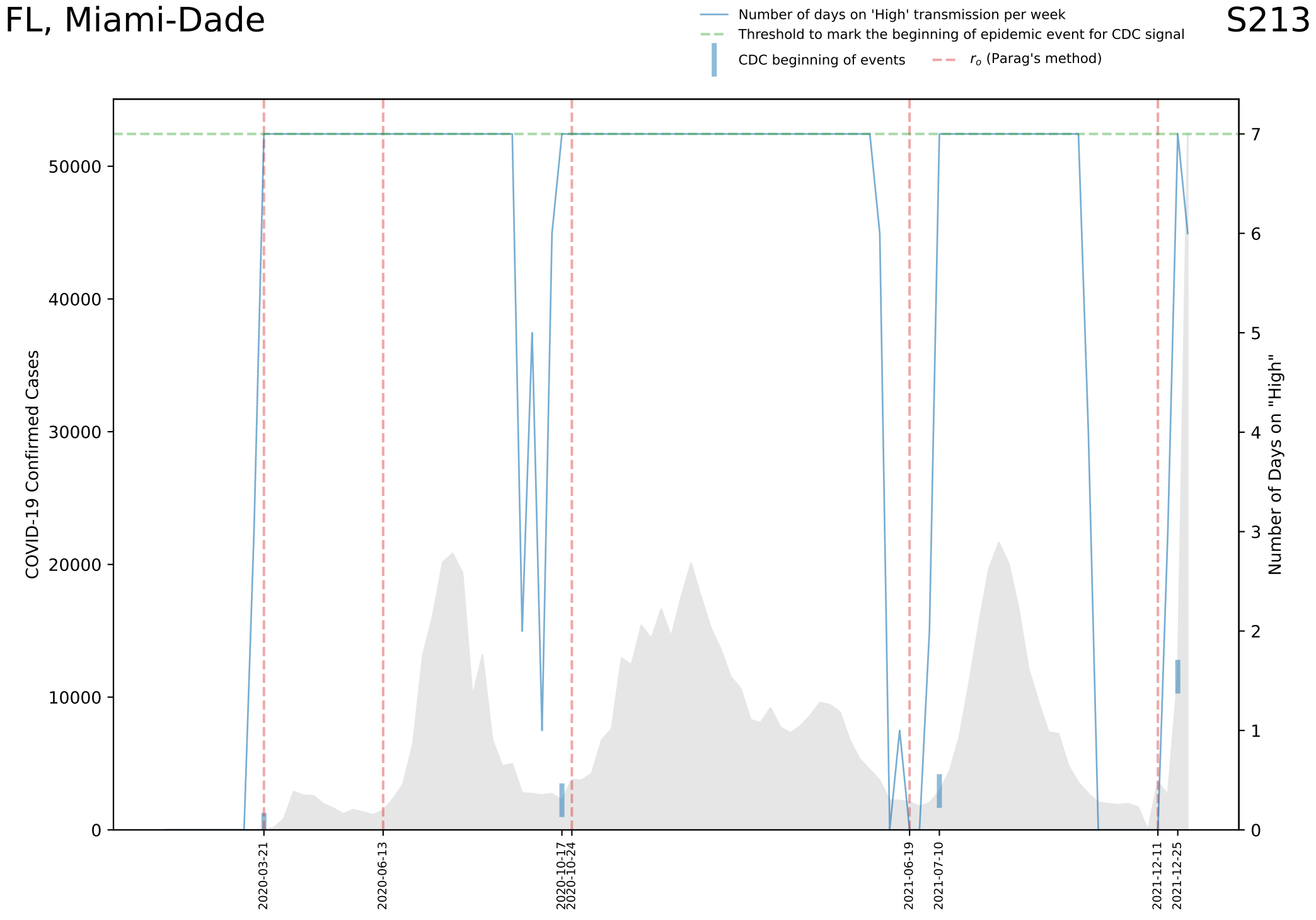
FL, Hillsborough

S210



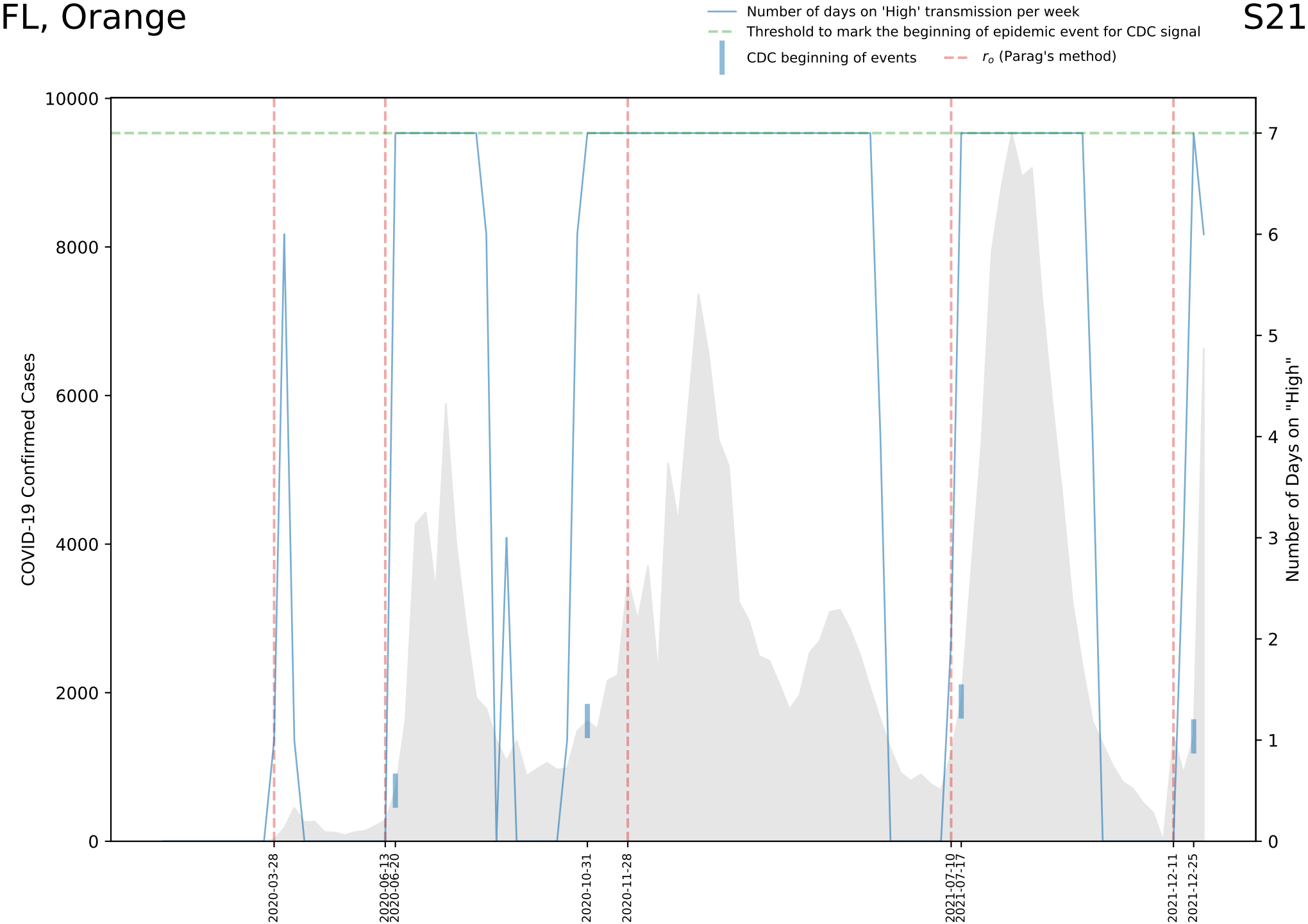

FL, Lake
S211
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
0
1
2
3
4
5
6
7
2020-04-04
2020-06-13
2020-07-04
2020-11-21
2020-12-19
2021-07-10
2021-07-17
2021-12-11


FL, Marion
S212
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
3000
0
1
2
3
4
5
6
7
2020-04-04
2020-06-20
2020-07-11
2020-11-21
2020-11-28
2021-04-24
2021-07-10
2021-07-17
2021-12-11


FL, Miami-Dade
S213
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
10000
20000
30000
40000
50000
0
1
2
3
4
5
6
7
2020-03-21
2020-06-13
2020-10-17
2020-10-24
2021-06-19
2021-07-10
2021-12-11
2021-12-25

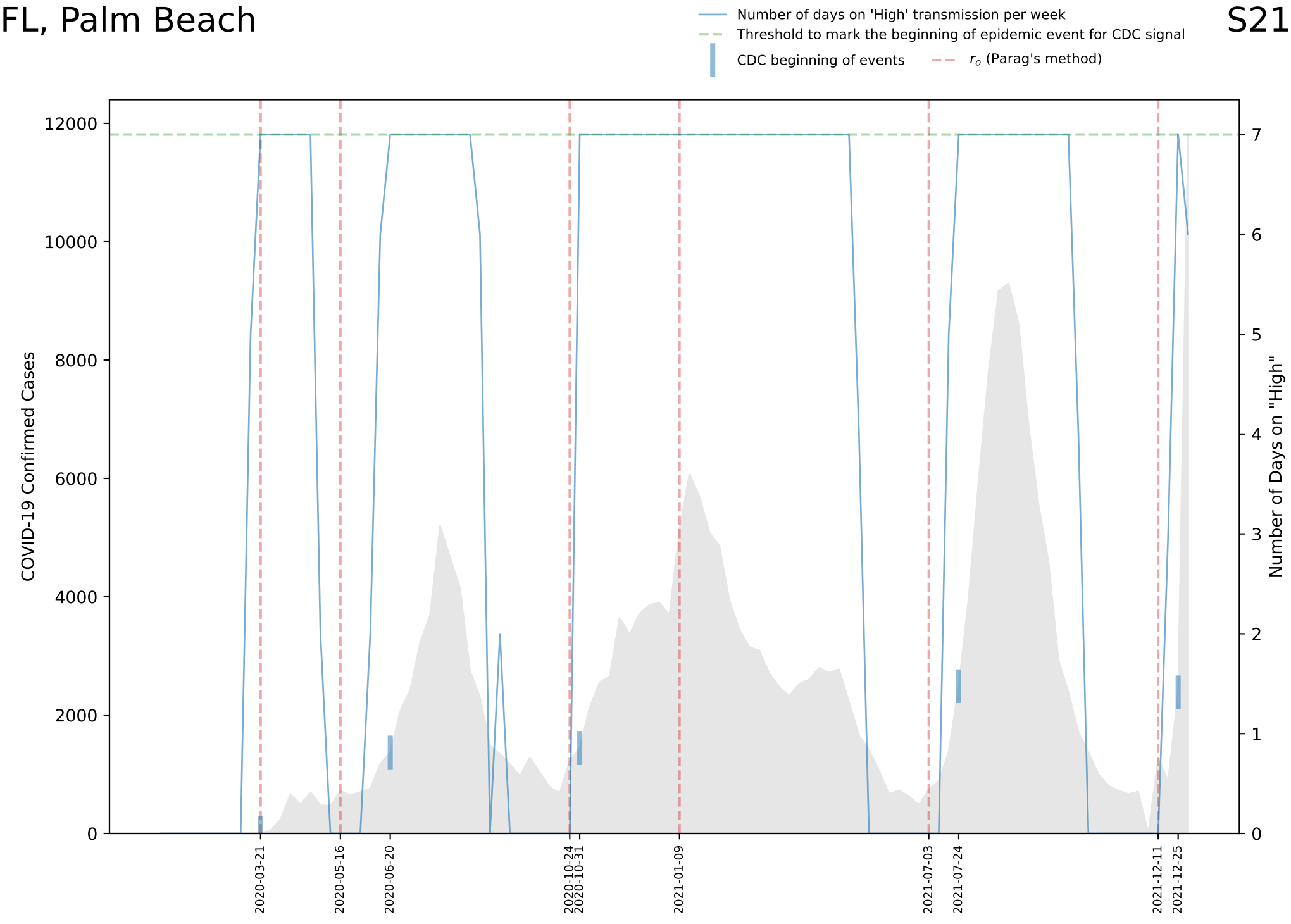
FL, Orange

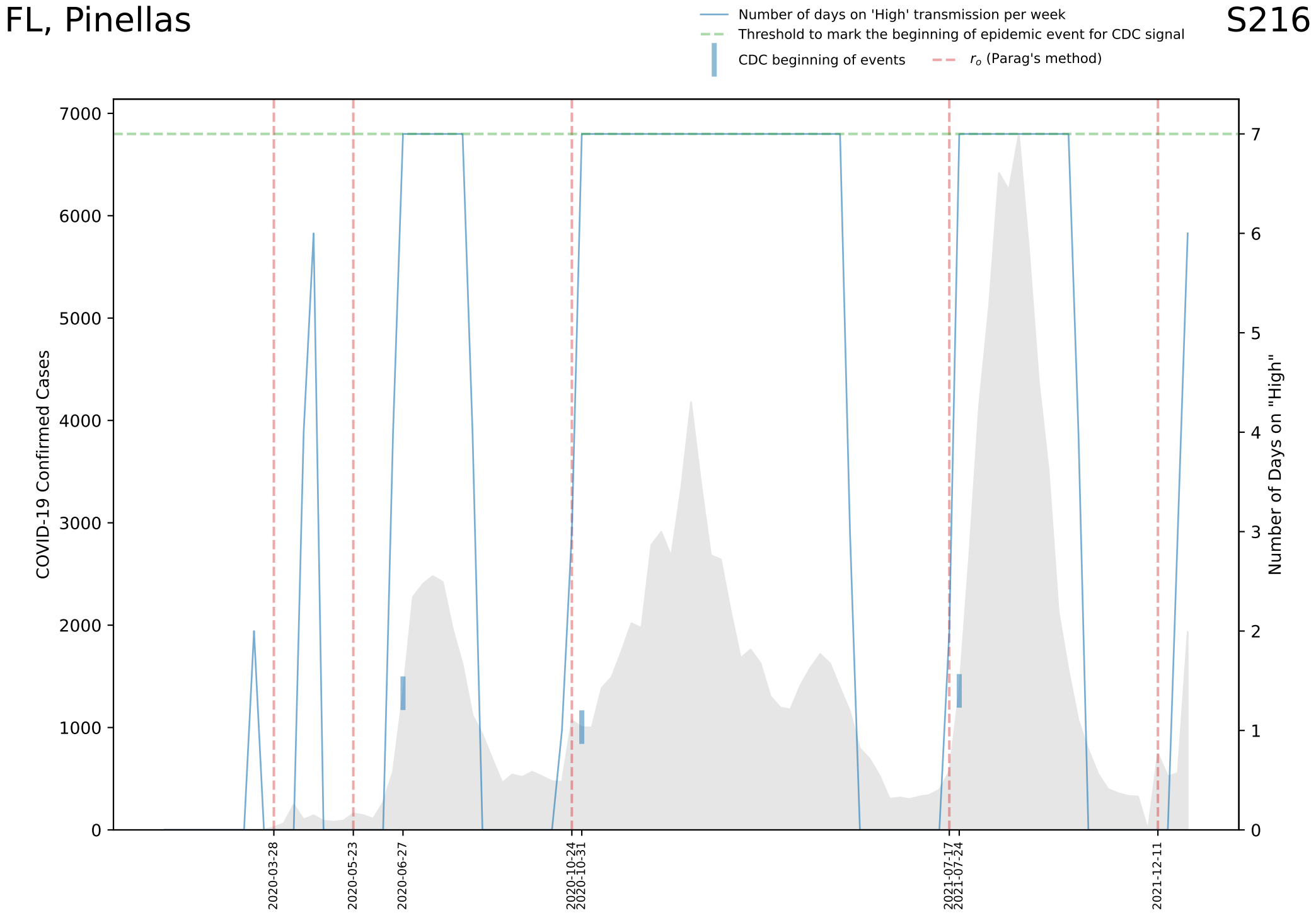
S214



FL, Palm Beach

S215




FL, Pinellas
S216
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
7000
0
1
2
3
4
5
6
7
2020-03-28
2020-05-23
2020-06-27
2020-10-24
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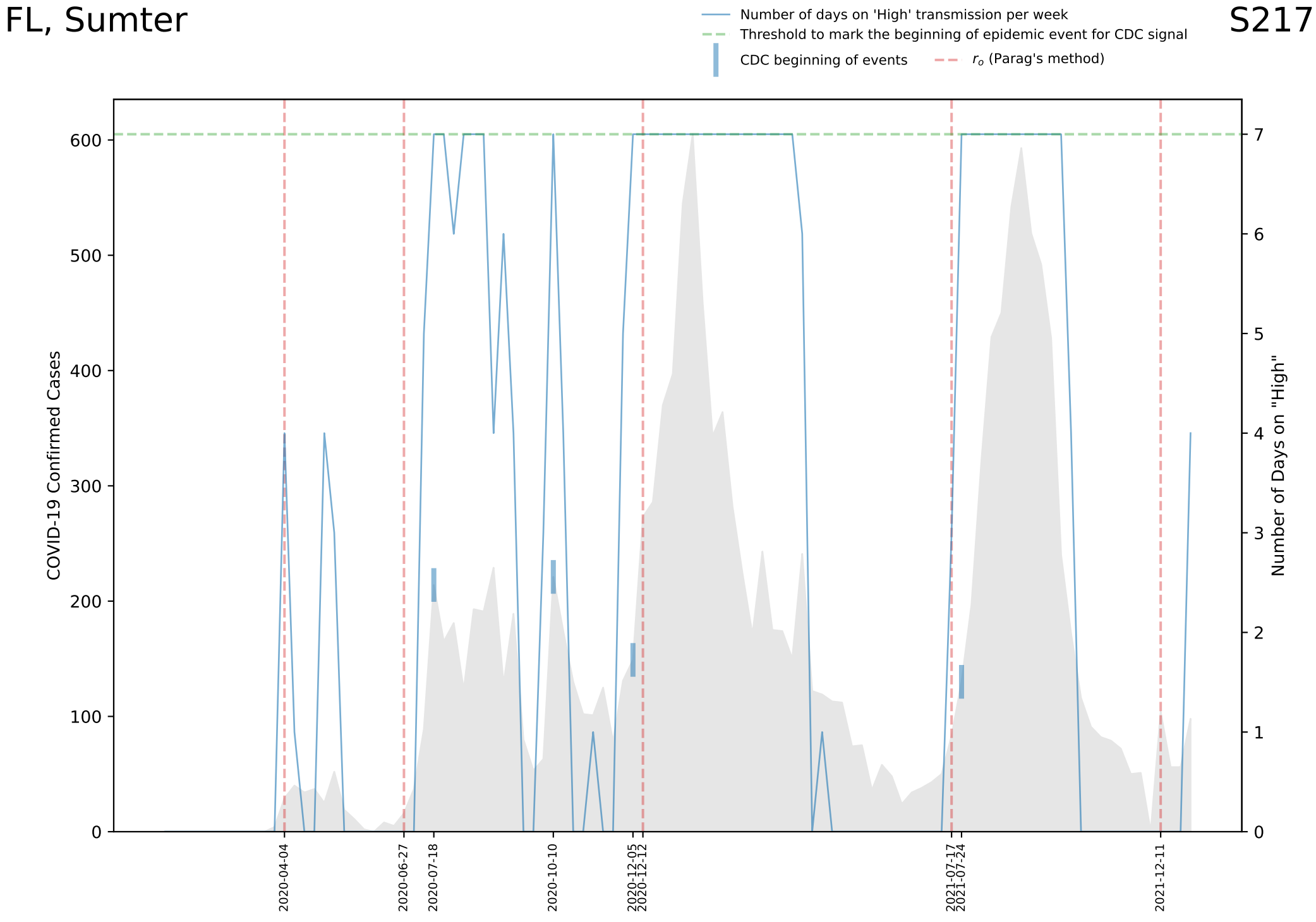
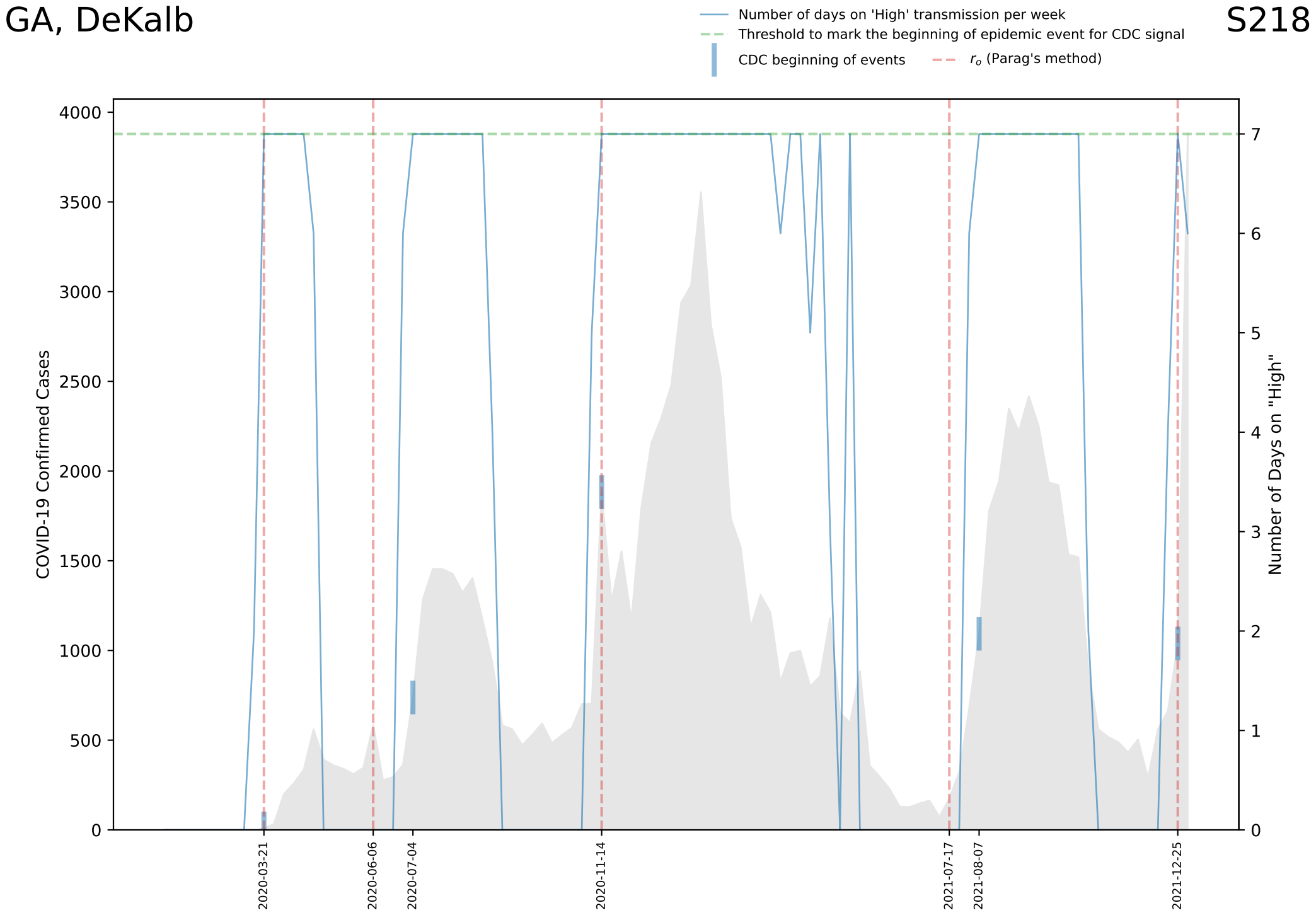
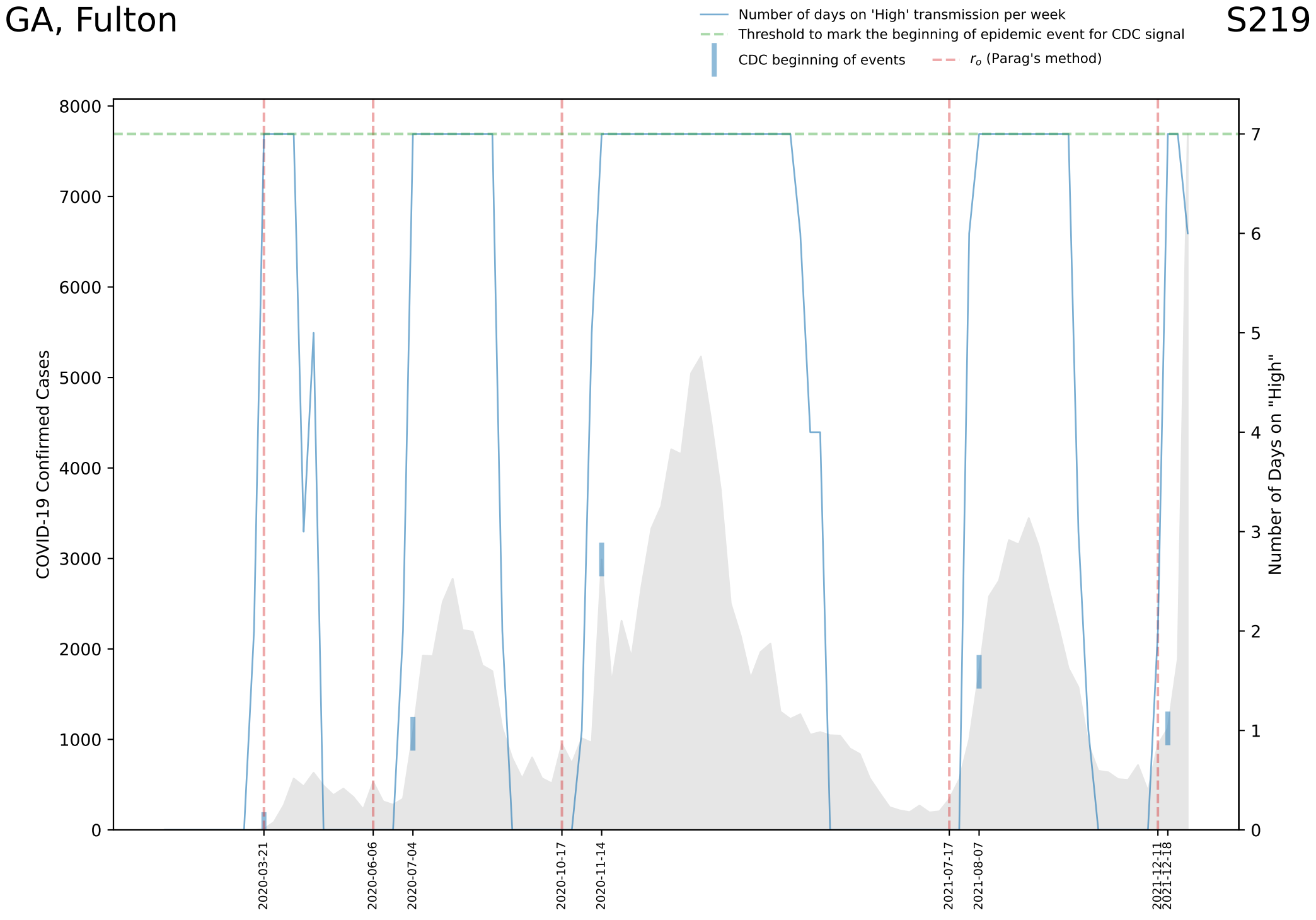
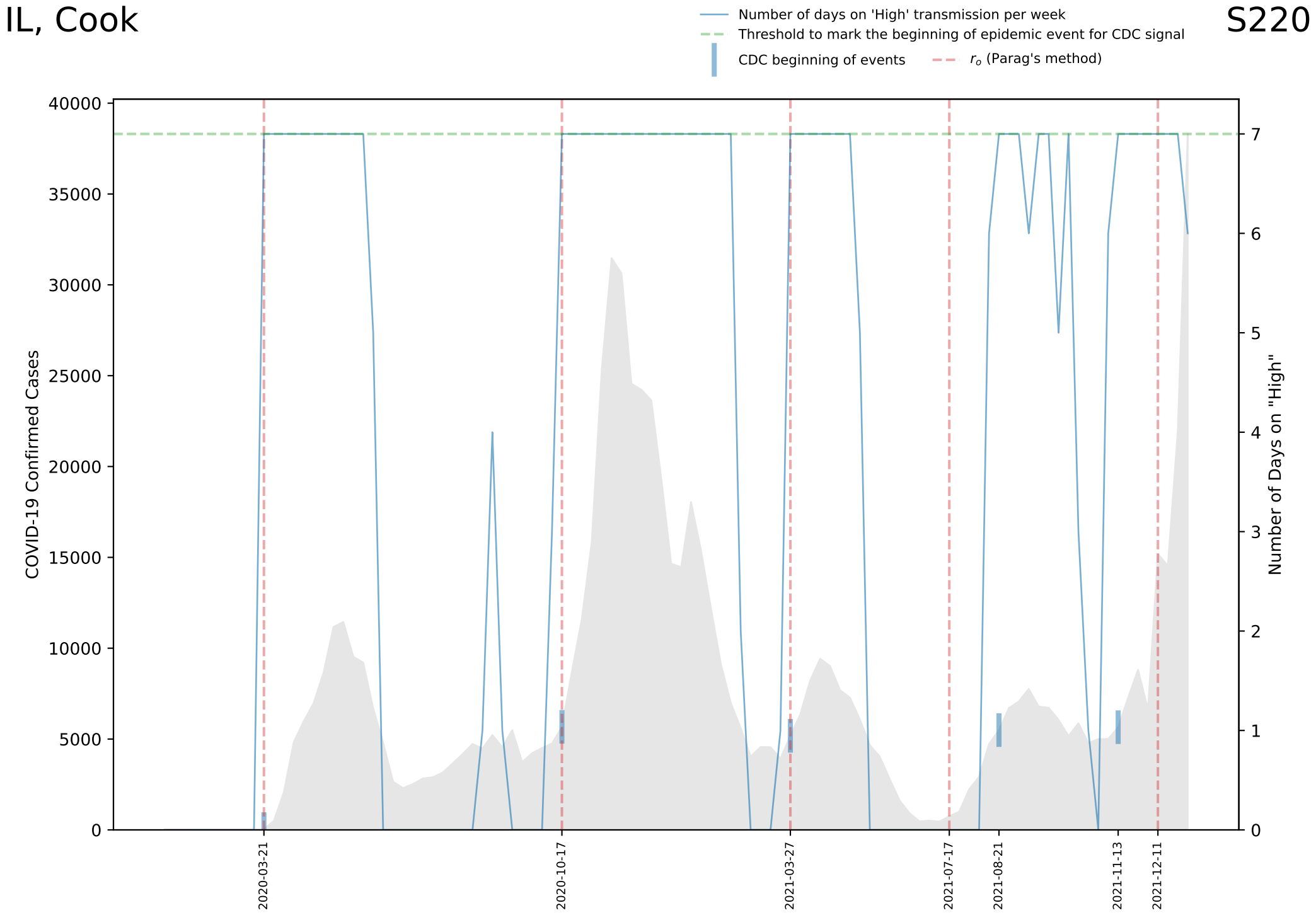
2021-07-17
2021-07-24
2021-12-11


FL, Sumter
S217
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
100
200
300
400
500
600
0
1
2
3
4
5
6
7
2020-04-04
2020-06-27
2020-07-18
2020-10-10
2020-12-05
2020-12-12
2021-07-17
2021-07-24
2021-12-11

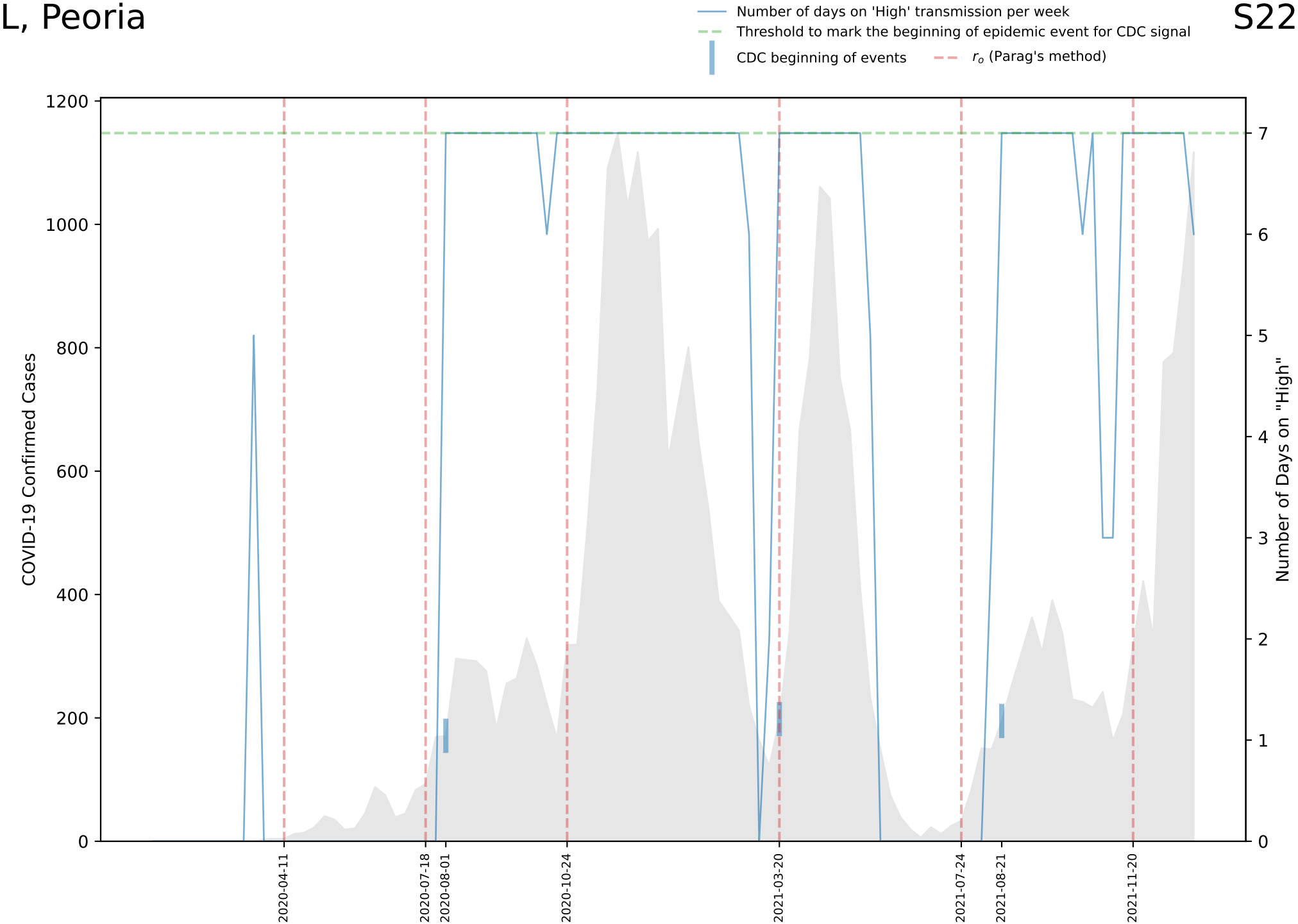

GA, DeKalb
S218
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
3000
3500
4000
0
1
2
3
4
5
6
7
2020-03-21
2020-06-06
2020-07-04
2020-11-14
2021-07-17
2021-08-07
2021-12-25

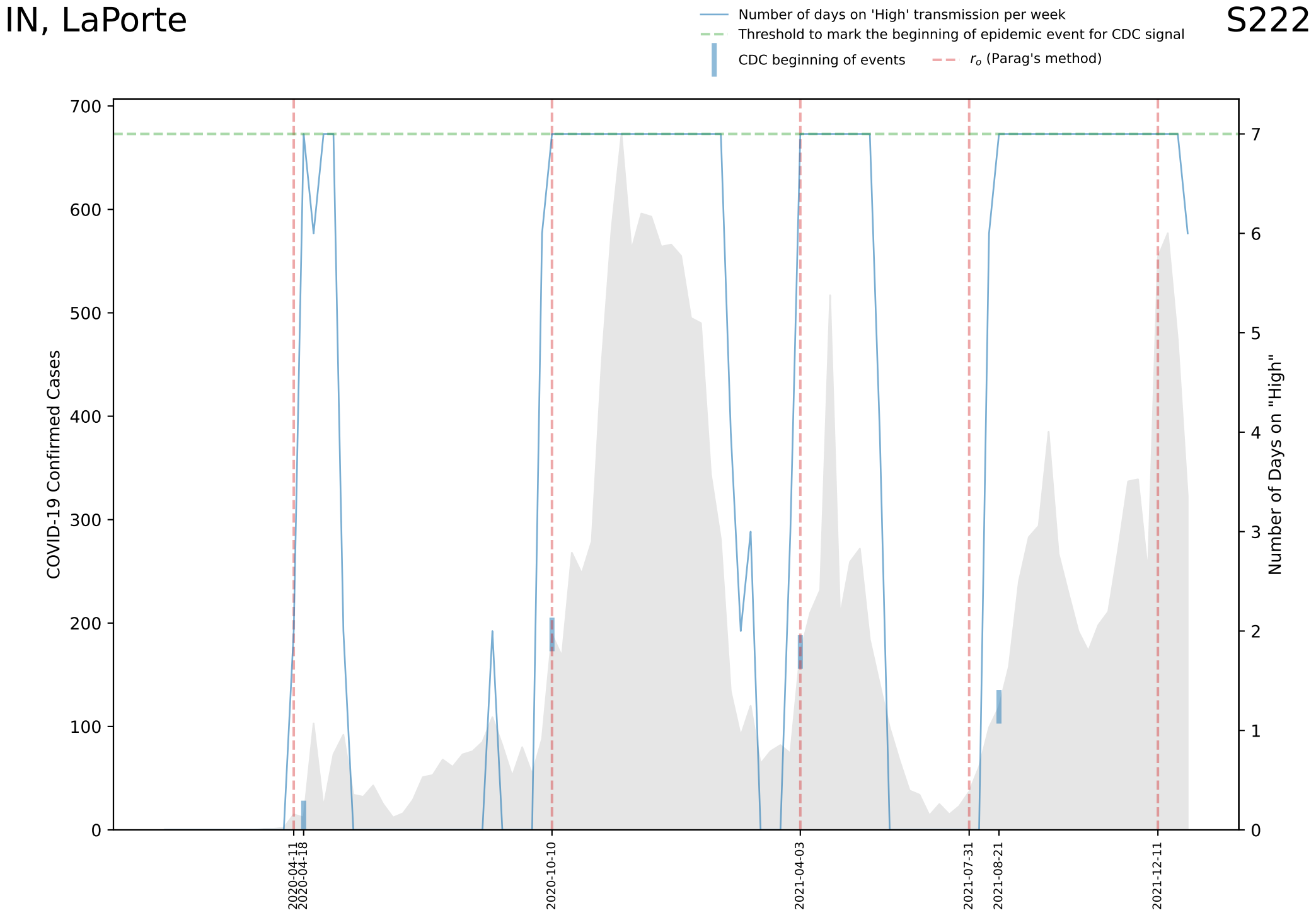

GA, Fulton
S219
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
7000
8000
0
1
2
3
4
5
6
7
2020-03-21
2020-06-06
2020-07-04
2020-10-17
2020-11-14
2021-07-17
2021-08-07
2021-12-11
2021-12-18

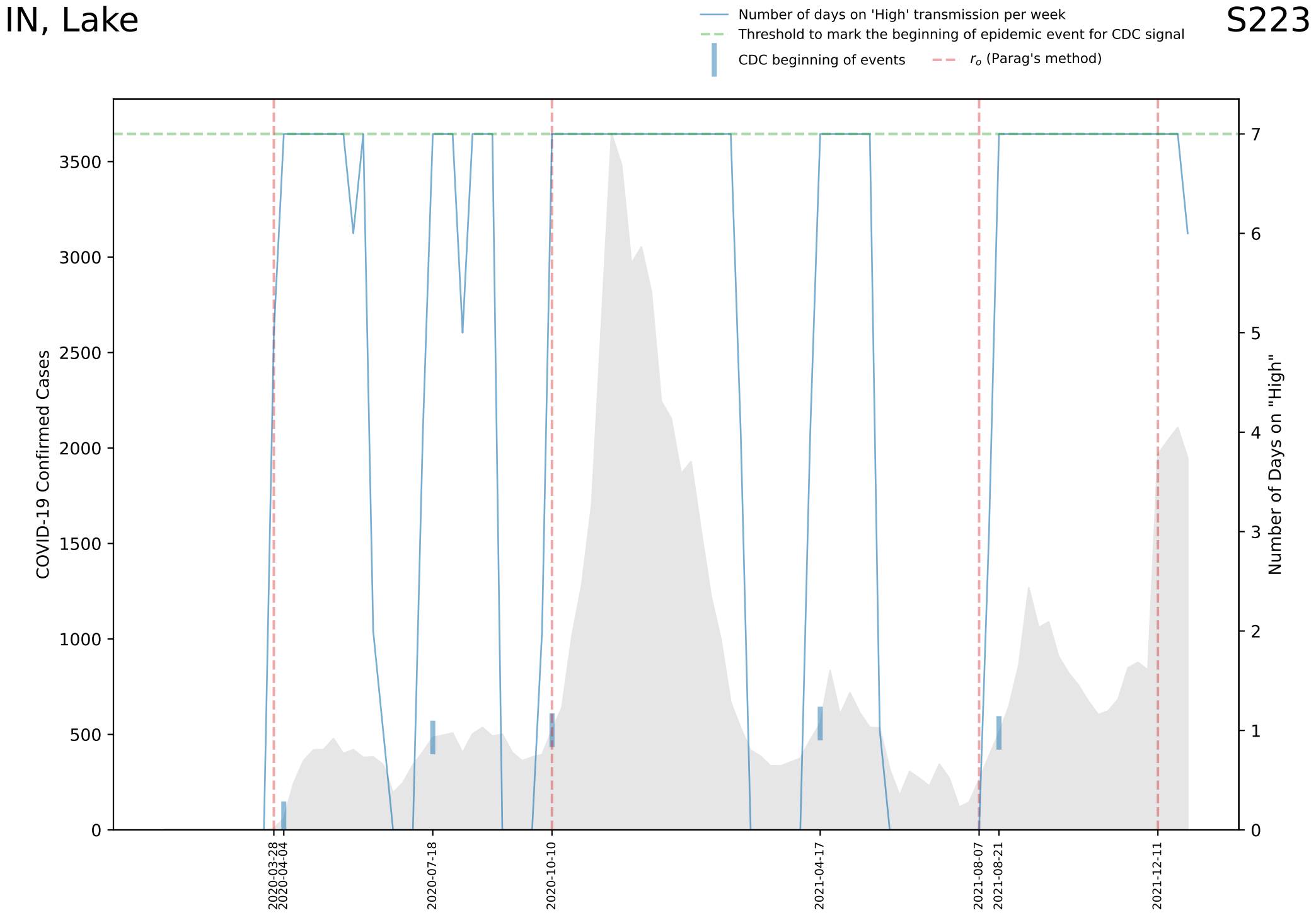

IL, Cook
S220
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
5000
10000
15000
20000
25000
30000
35000
40000
0
1
2
3
4
5
6
7
2020-03-21
2020-10-17
2021-03-27
2021-07-17
2021-08-21
2021-11-13
2021-12-11

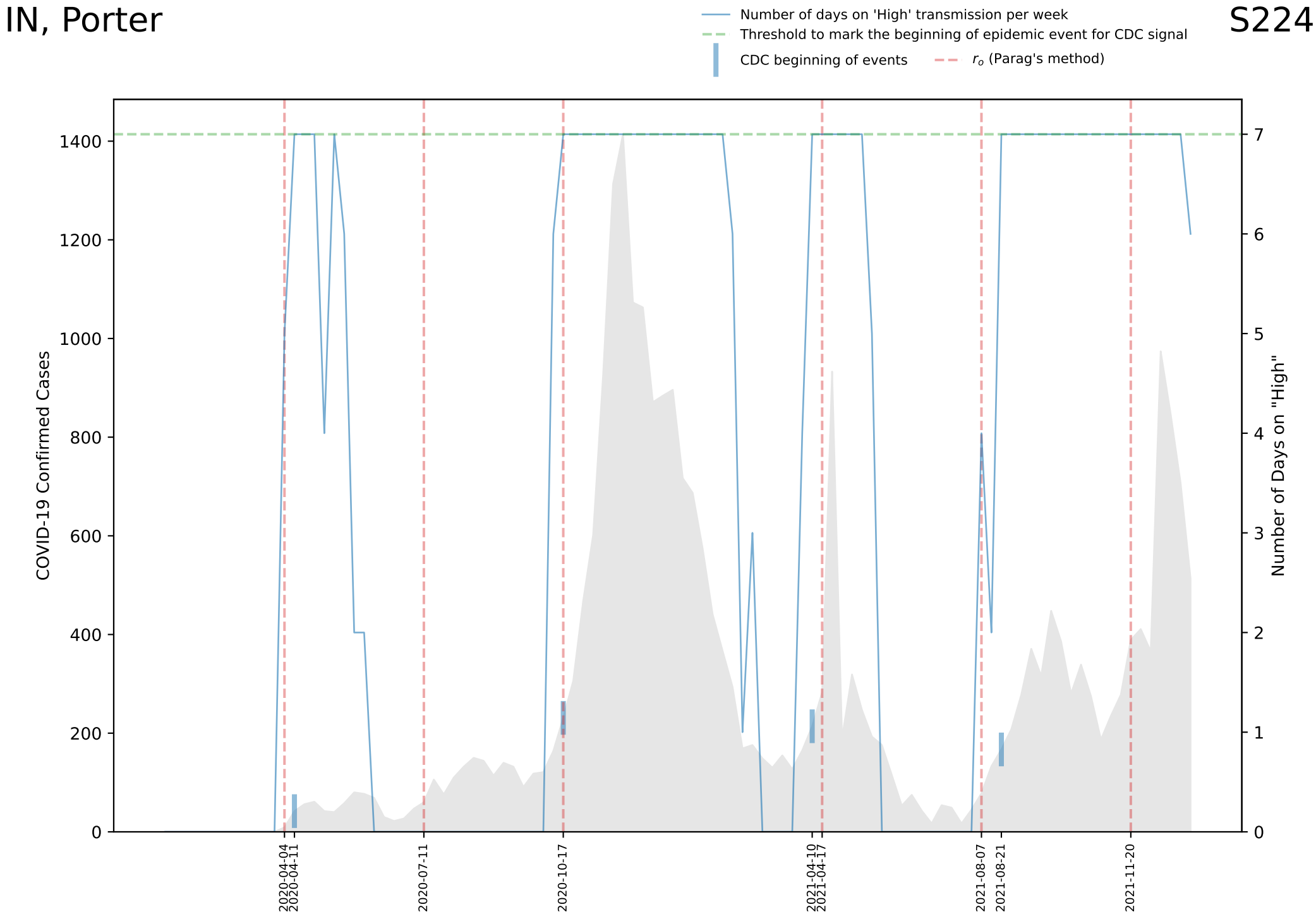
IL, Peoria

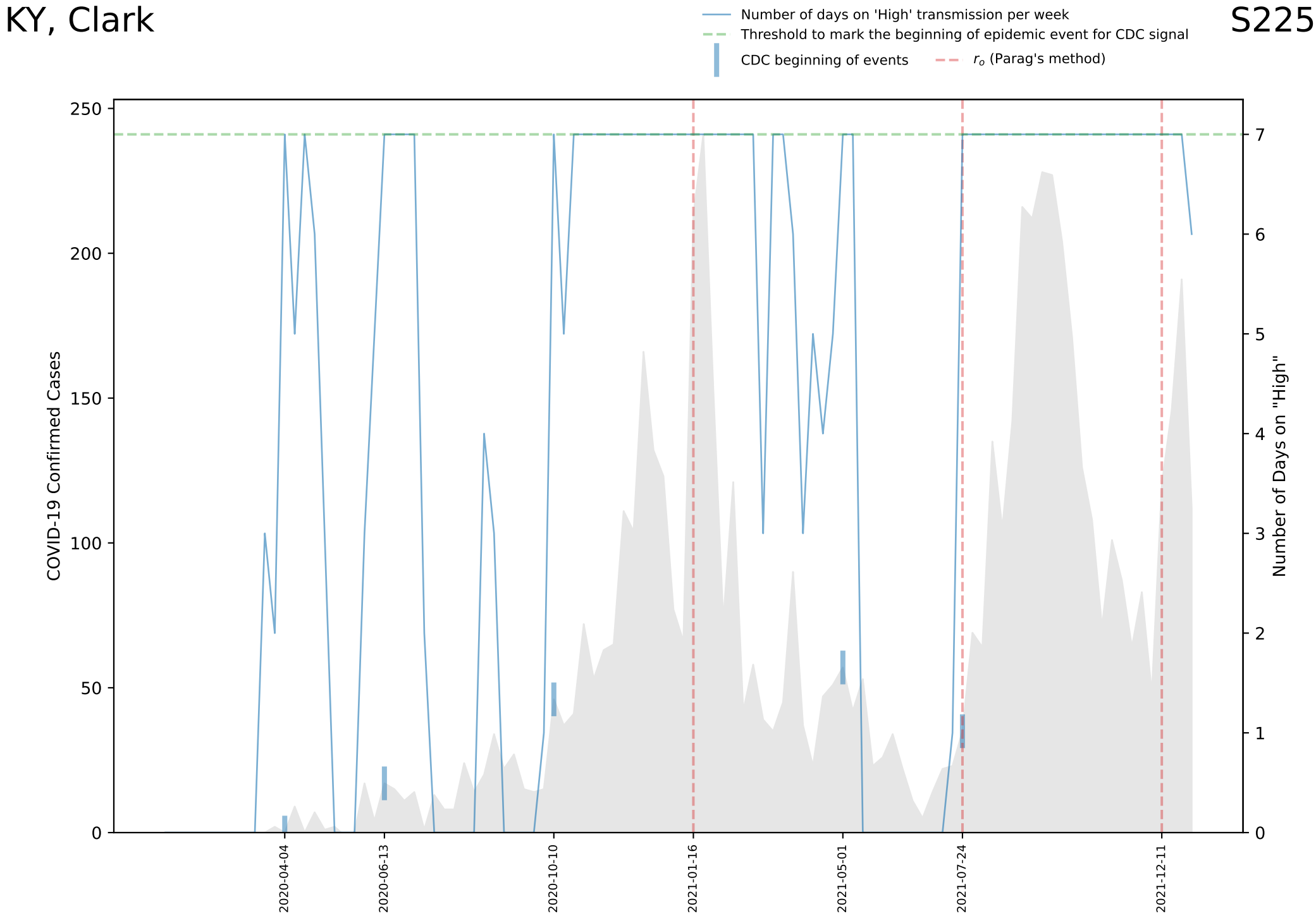
S221

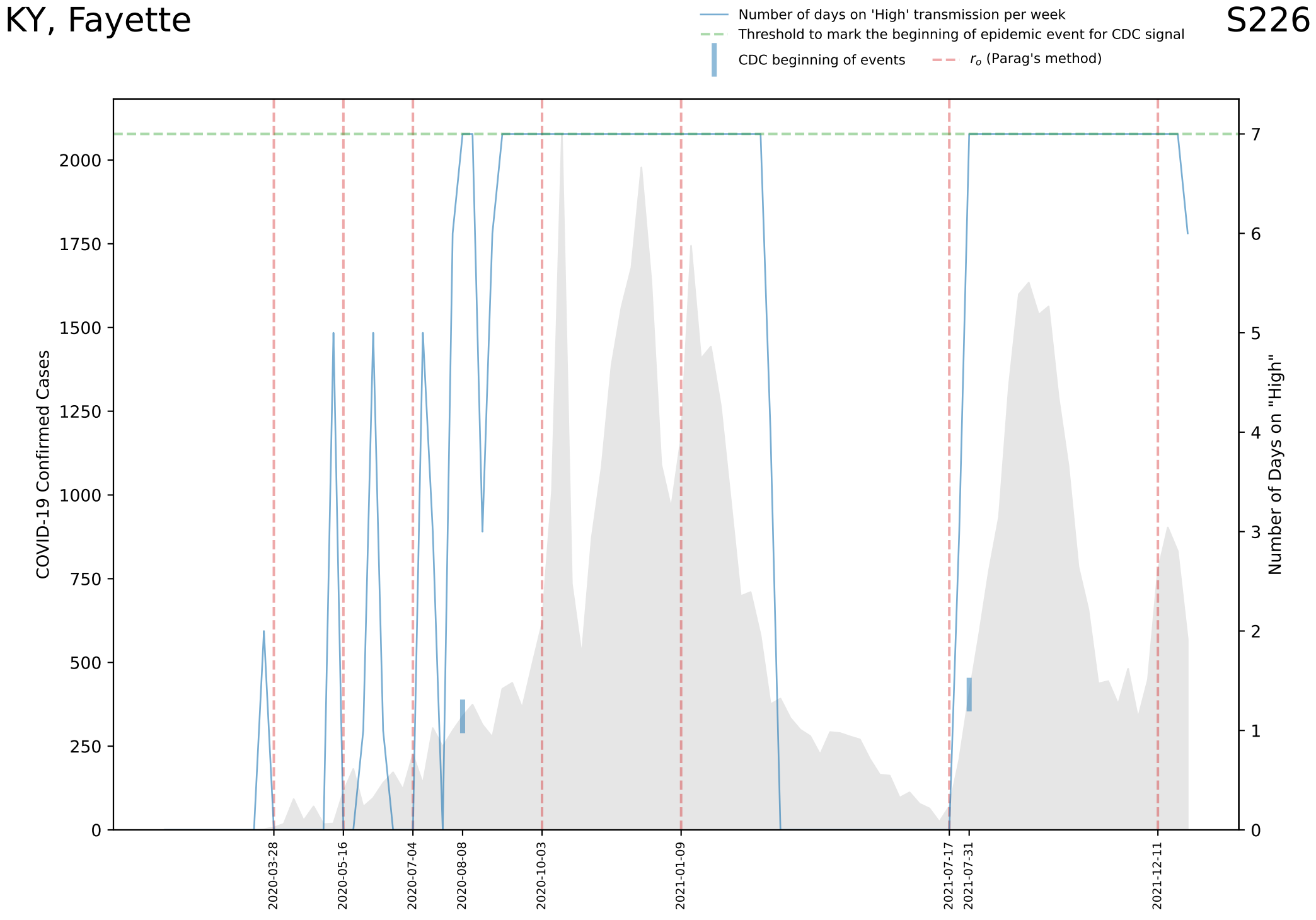



IN, LaPorte
S222
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
100
200
300
400
500
600
700
0
1
2
3
4
5
6
7
2020-04-11
2020-04-18
2020-10-10
2021-04-03
2021-07-31
2021-08-21
2021-12-11


IN, Lake
S223
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
3000
3500
0
1
2
3
4
5
6
7
2020-03-28
2020-04-04
2020-07-18
2020-10-10
2021-04-17
2021-08-07
2021-08-21
2021-12-11

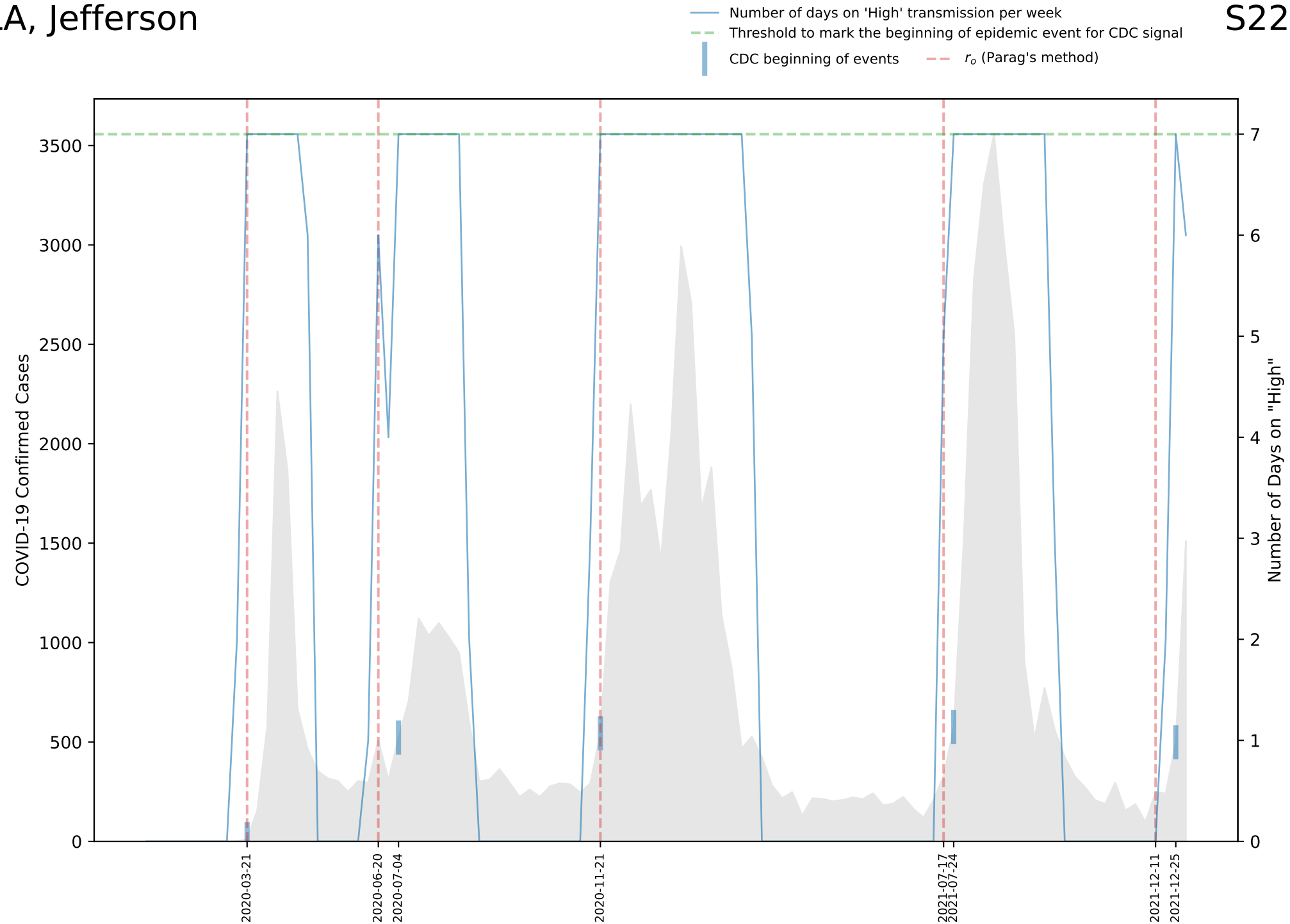

IN, Porter
S224
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
200
400
600
800
1000
1200
1400
0
1
2
3
4
5
6
7
2020-04-04
2020-04-11
2020-07-11
2020-10-17
2021-04-10
2021-04-17
2021-08-07
2021-08-21
2021-11-20


KY, Clark
S225
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
50
100
150
200
250
0
1
2
3
4
5
6
7
2020-04-04
2020-06-13
2020-10-10
2021-01-16
2021-05-01
2021-07-24
2021-12-11


KY, Fayette
S226
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
250
500
750
1000
1250
1500
1750
2000
0
1
2
3
4
5
6
7
2020-03-28
2020-05-16
2020-07-04
2020-08-08
2020-10-03
2021-01-09
2021-07-17
2021-07-31
2021-12-11

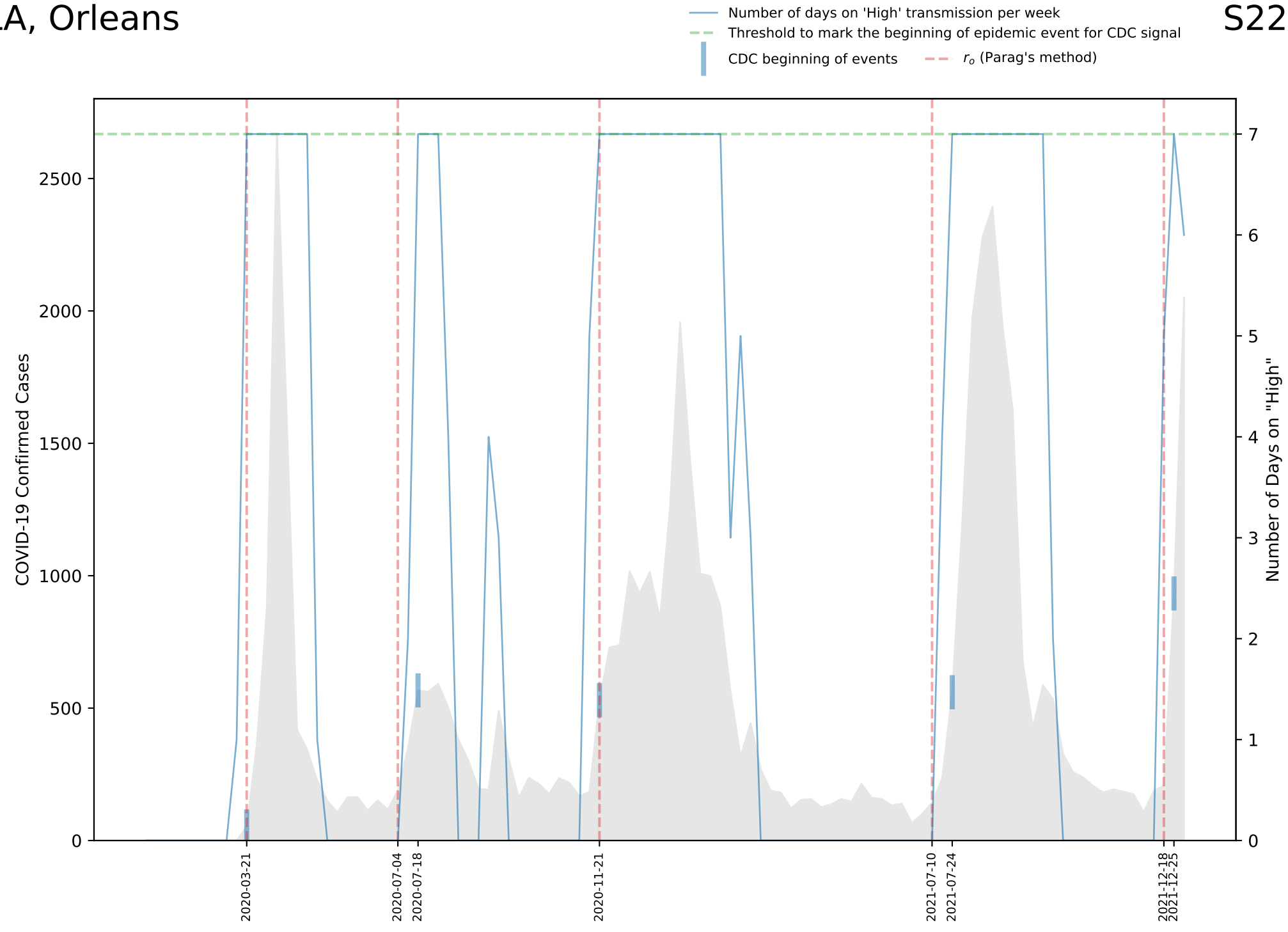
LA, Jefferson

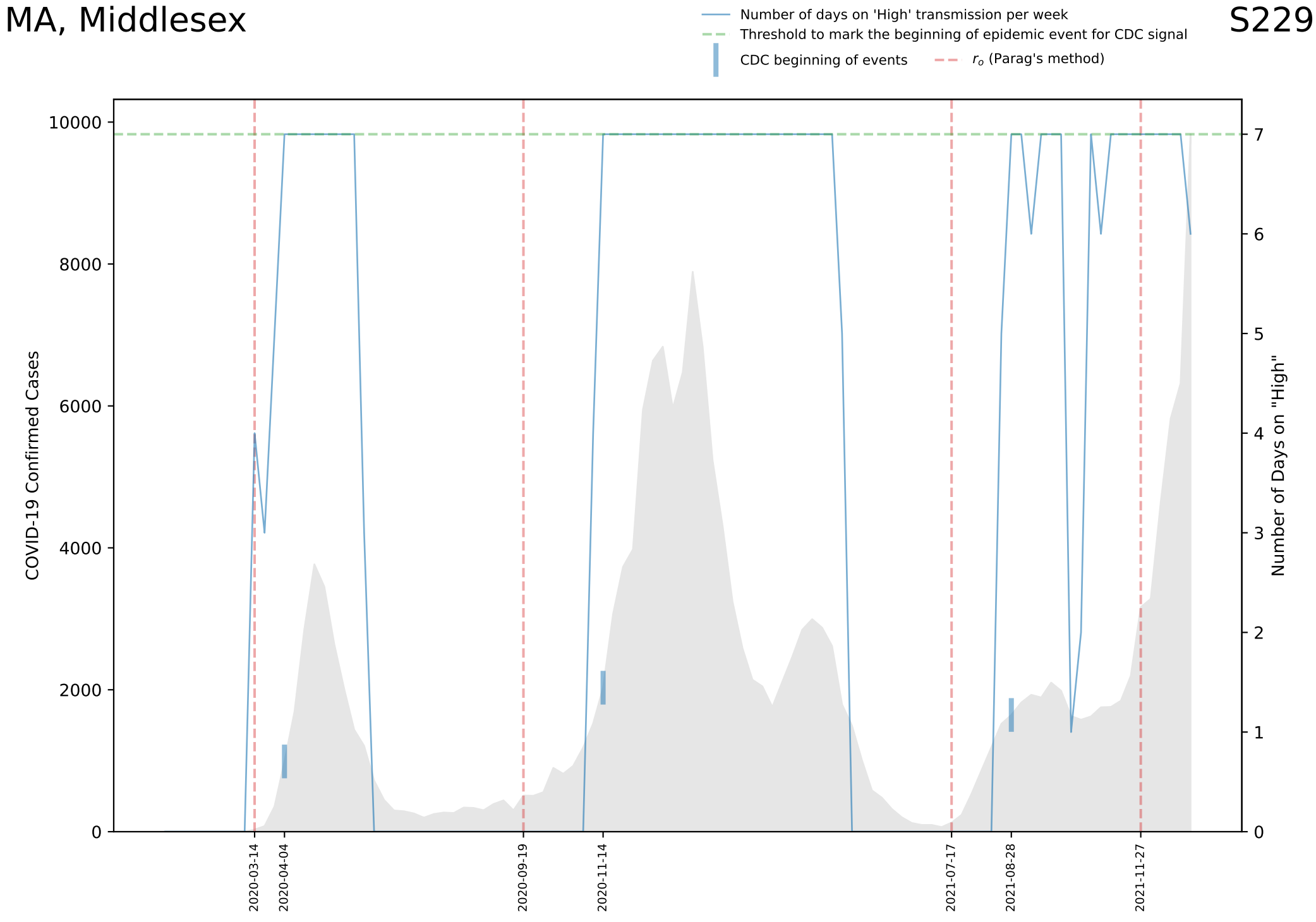
S227

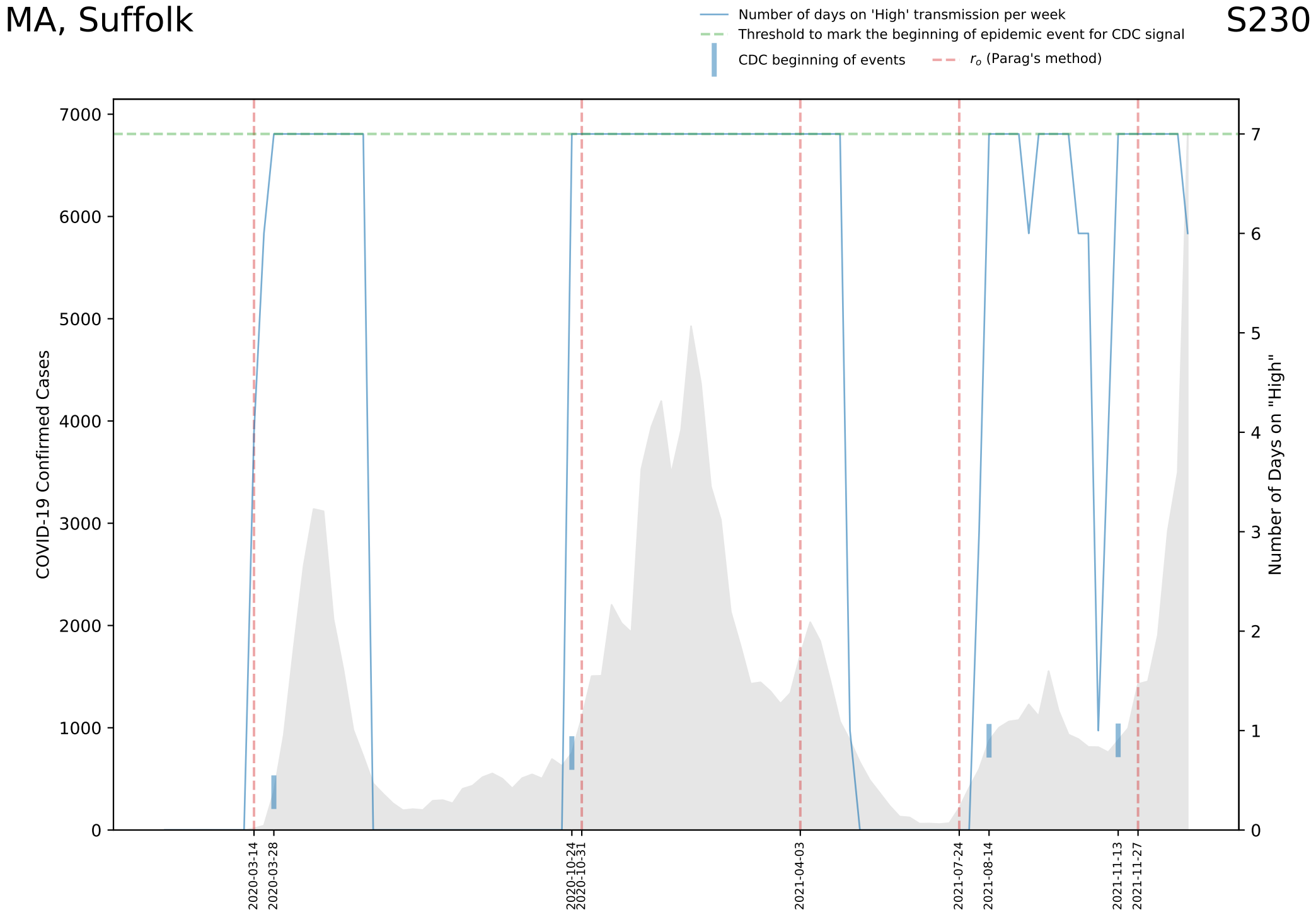


LA, Orleans

S228

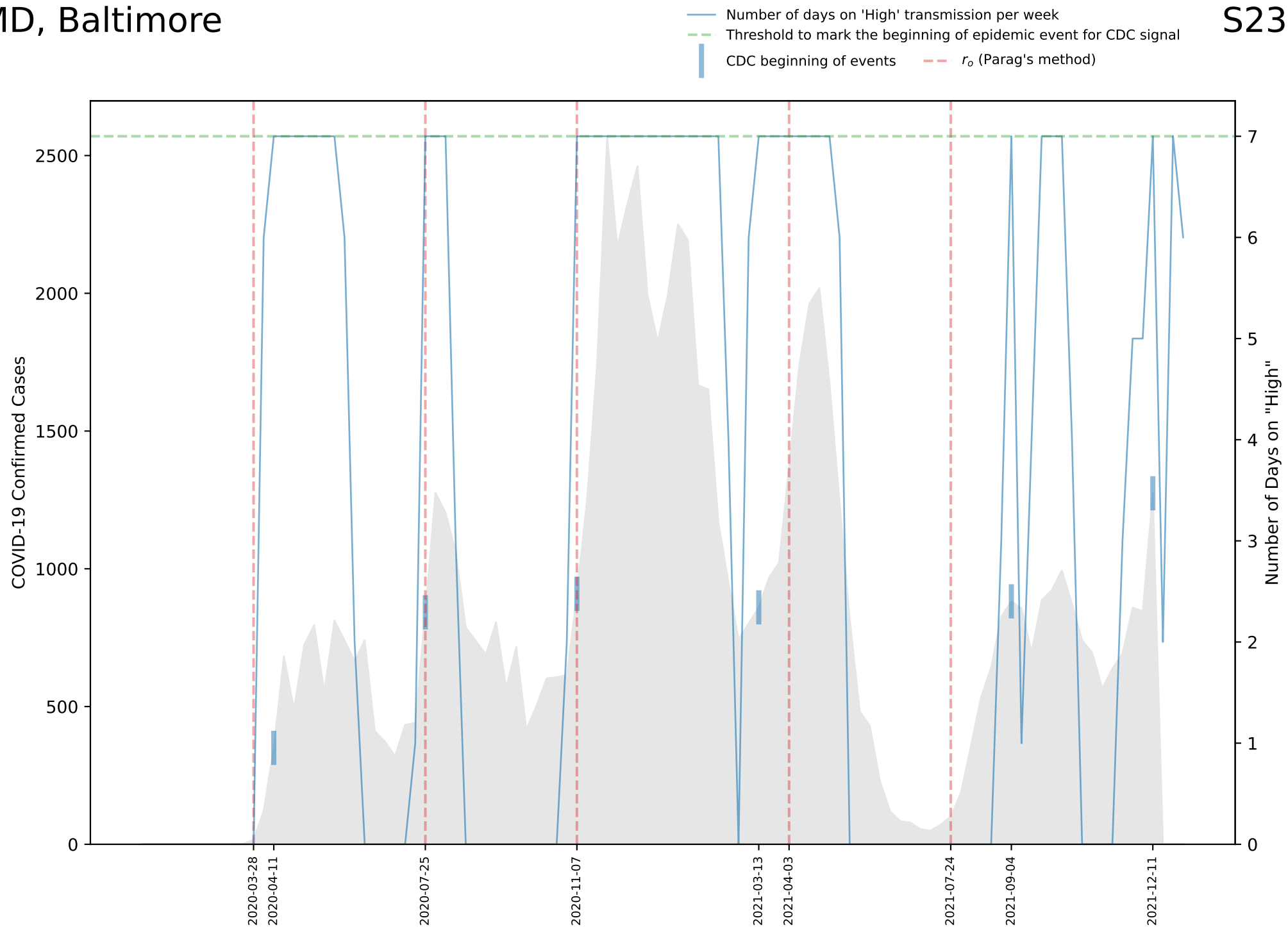



MA, Middlesex
S229
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2000
4000
6000
8000
10000
0
1
2
3
4
5
6
7
2020-03-14
2020-04-04
2020-09-19
2020-11-14
2021-07-17
2021-08-28
2021-11-27


MA, Suffolk
S230
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
7000
0
1
2
3
4
5
6
7
2020-03-14
2020-03-28
2020-10-24
2020-10-31
2021-04-03
2021-07-24
2021-08-14
2021-11-13
2021-11-27

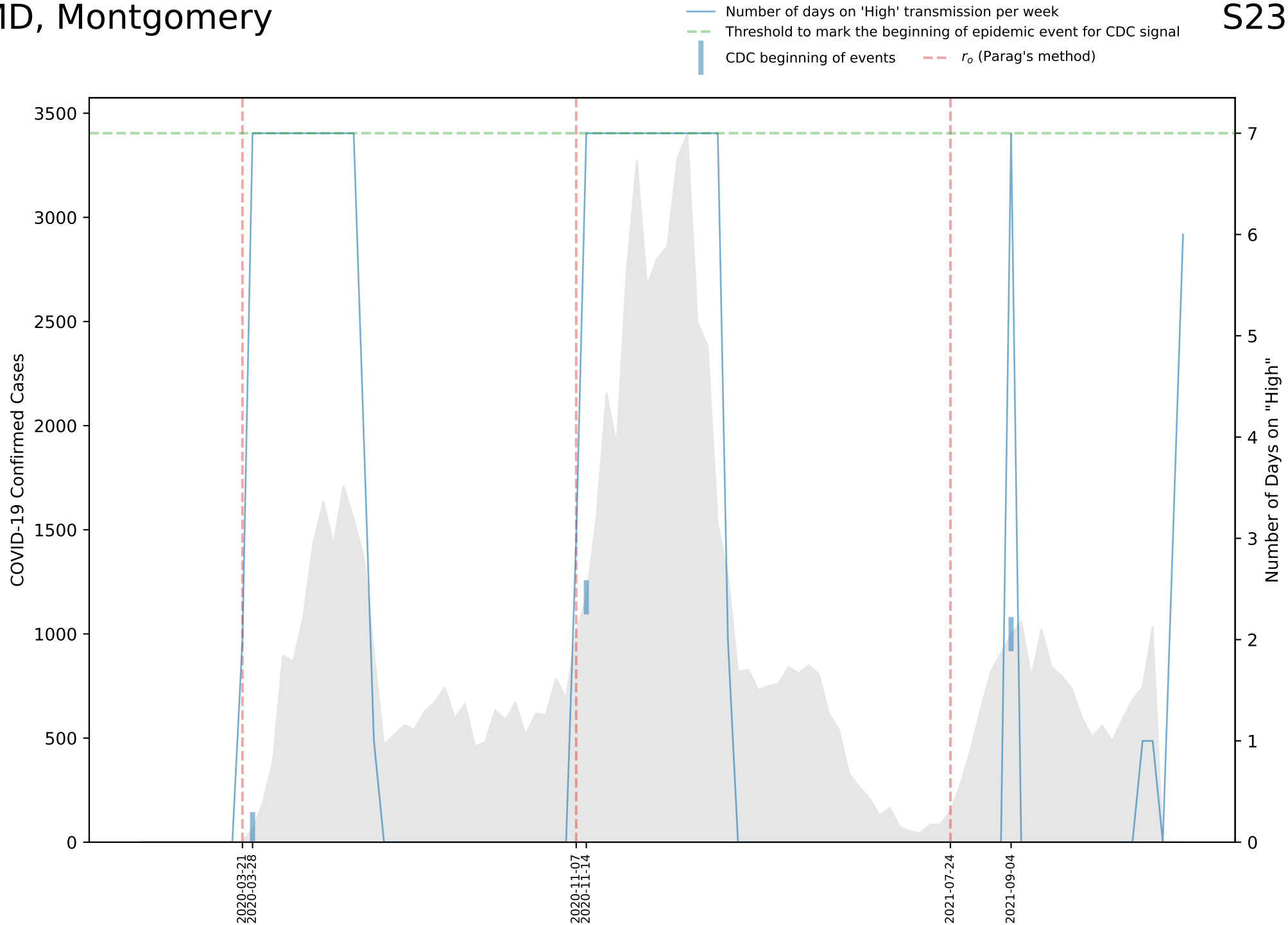
MD, Baltimore

S231



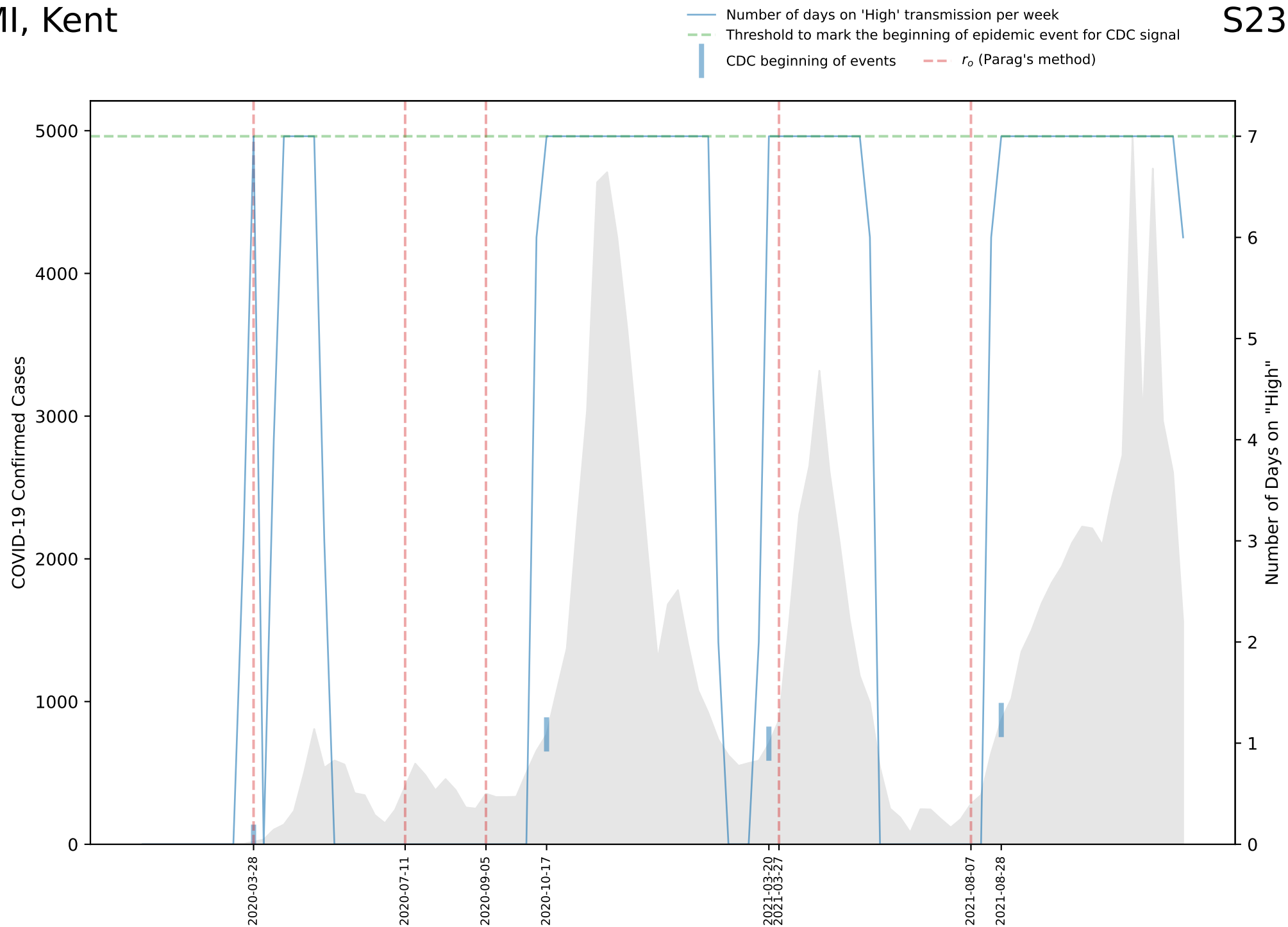
MD, Montgomery

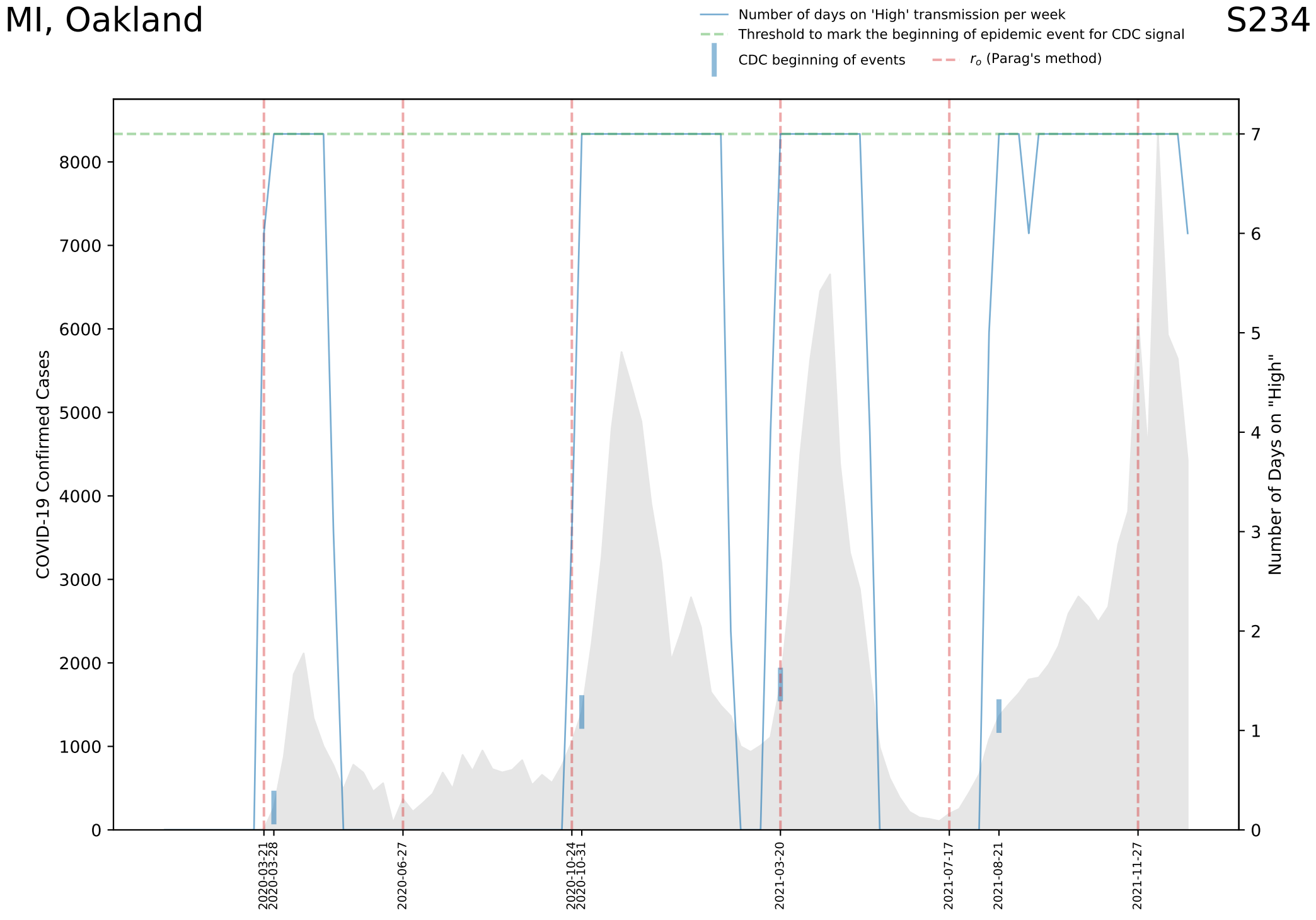
S232



MI, Kent

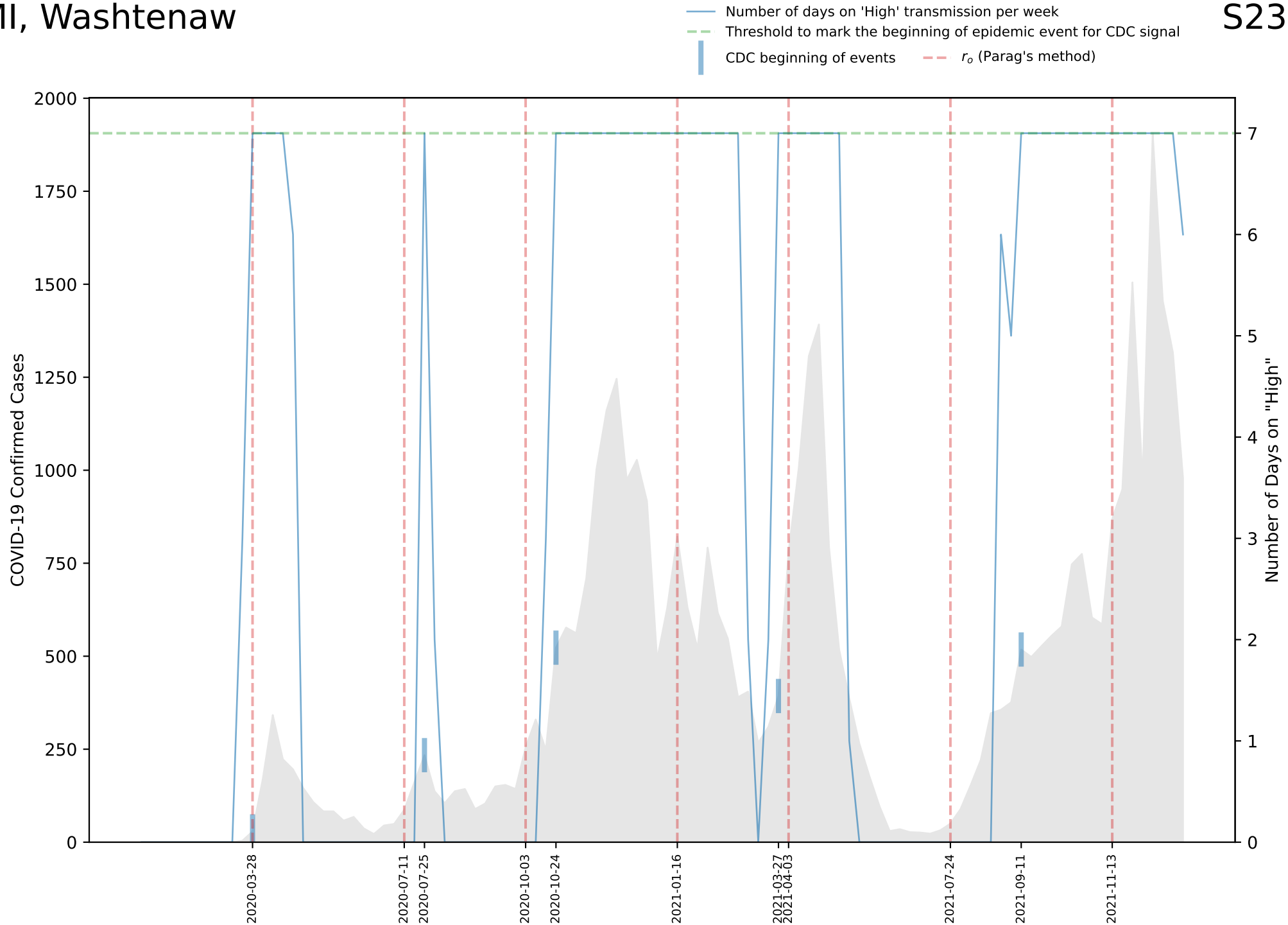
S233

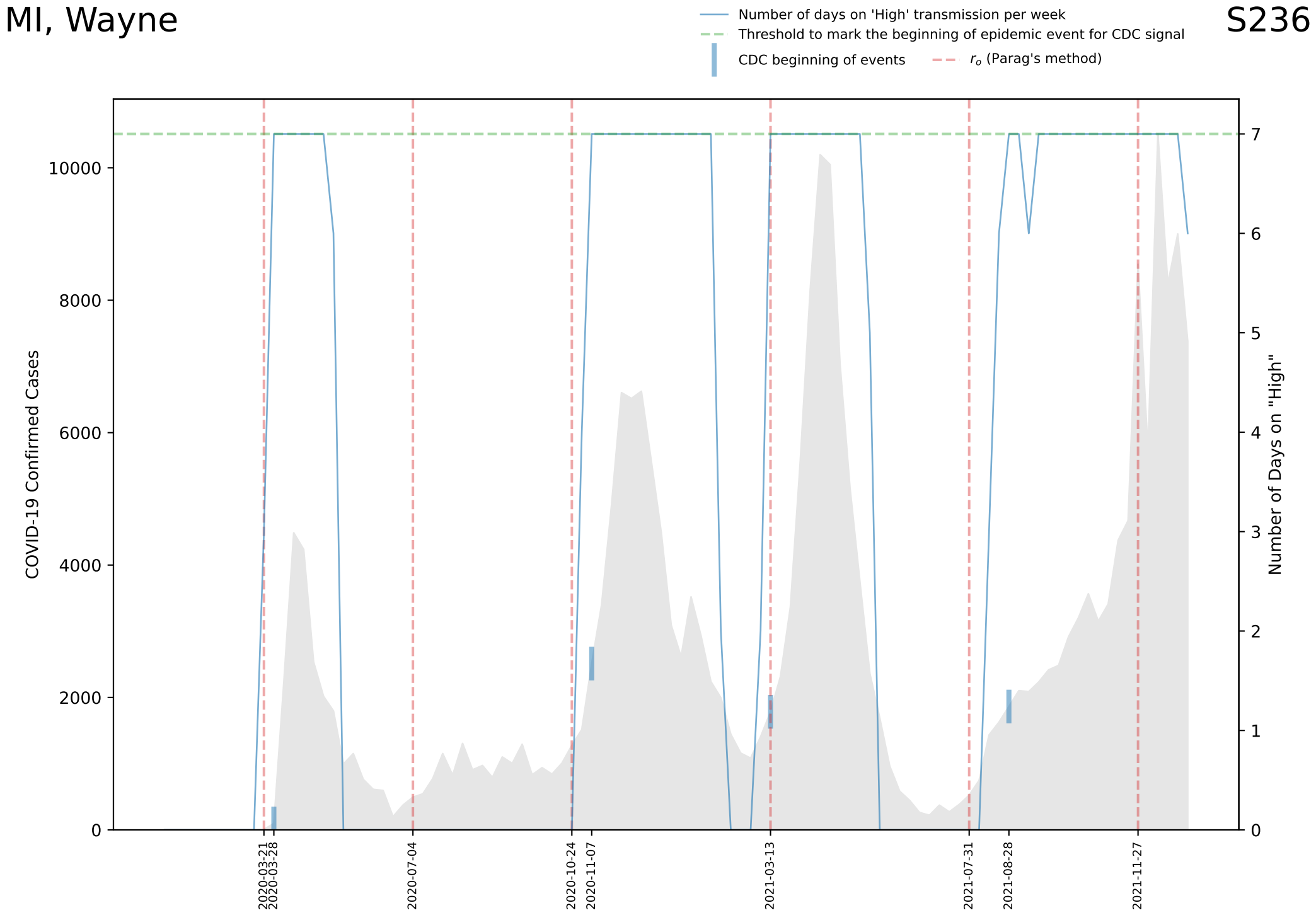

Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
0
1
2
3
4
5
6
7
2020-03-28
2020-07-11
2020-09-05
2020-10-17
2021-03-20
2021-03-27
2021-08-07
2021-08-28


MI, Oakland
S234
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
7000
8000
0
1
2
3
4
5
6
7
2020-03-21
2020-03-28
2020-06-27
2020-10-24
2020-10-31
2021-03-20
2021-07-17
2021-08-21
2021-11-27

MI, Washtenaw

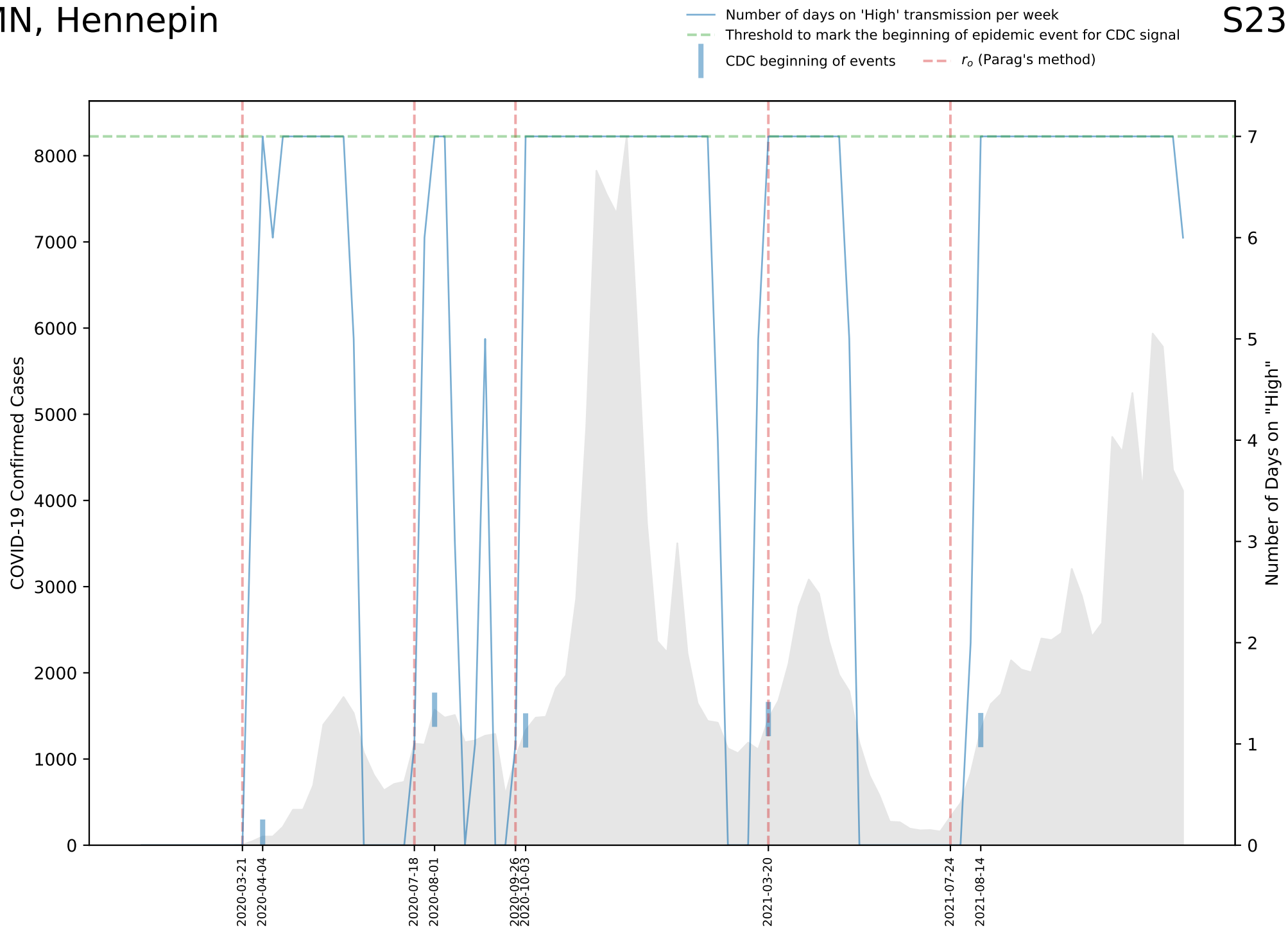
S235

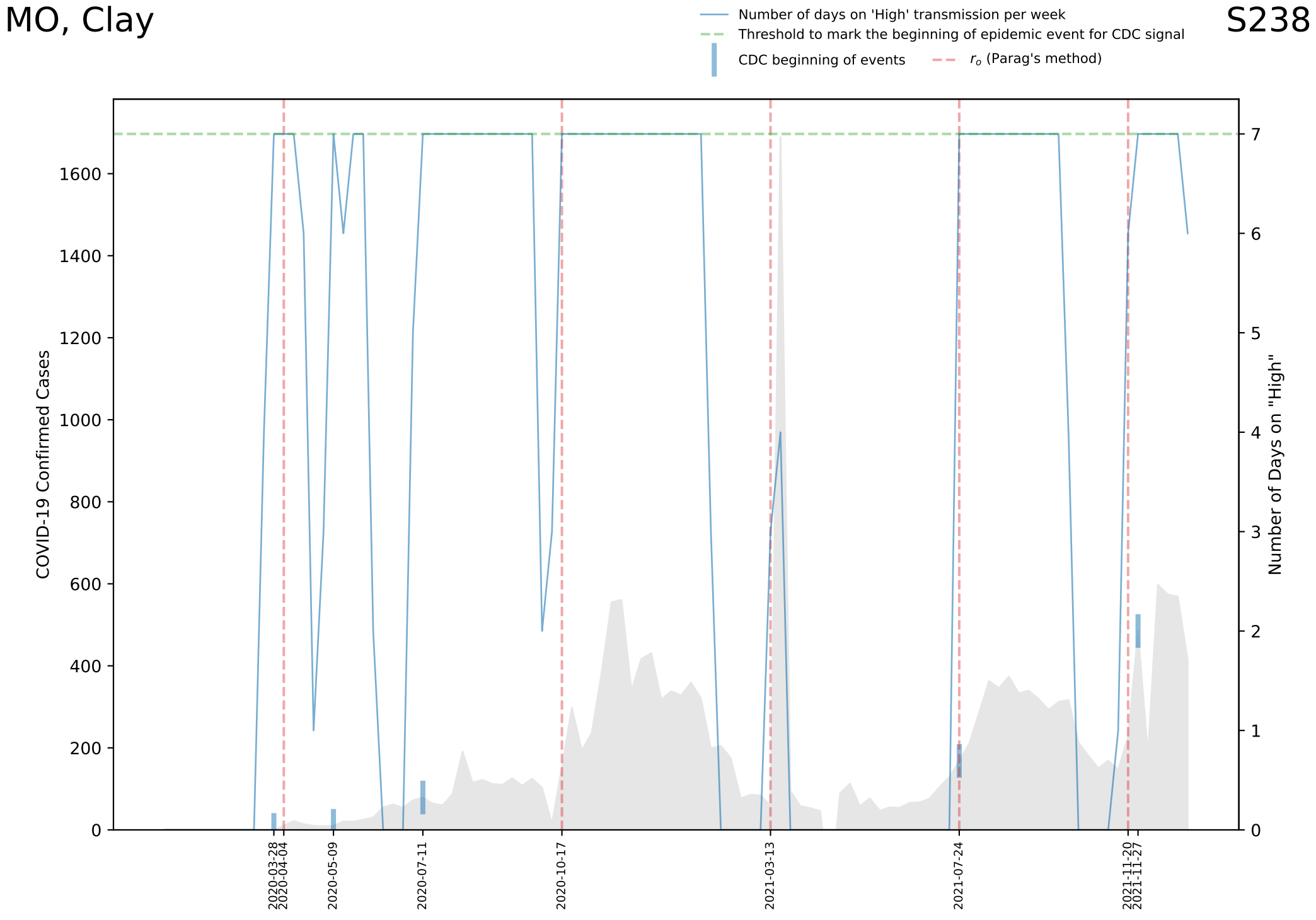


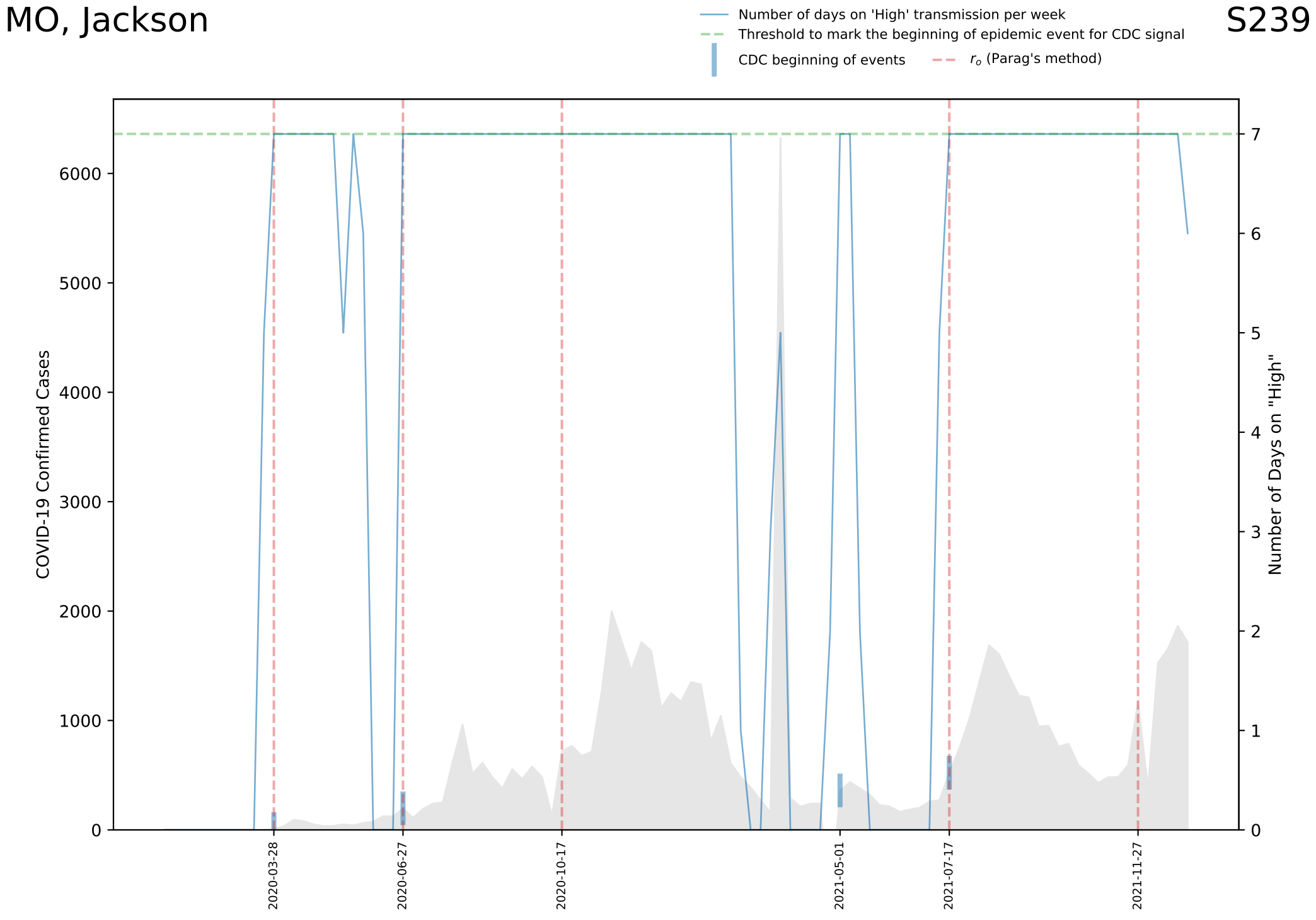

MI, Wayne
S236
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2000
4000
6000
8000
10000
0
1
2
3
4
5
6
7
2020-03-21
2020-03-28
2020-07-04
2020-10-24
2020-11-07
2021-03-13
2021-07-31
2021-08-28
2021-11-27

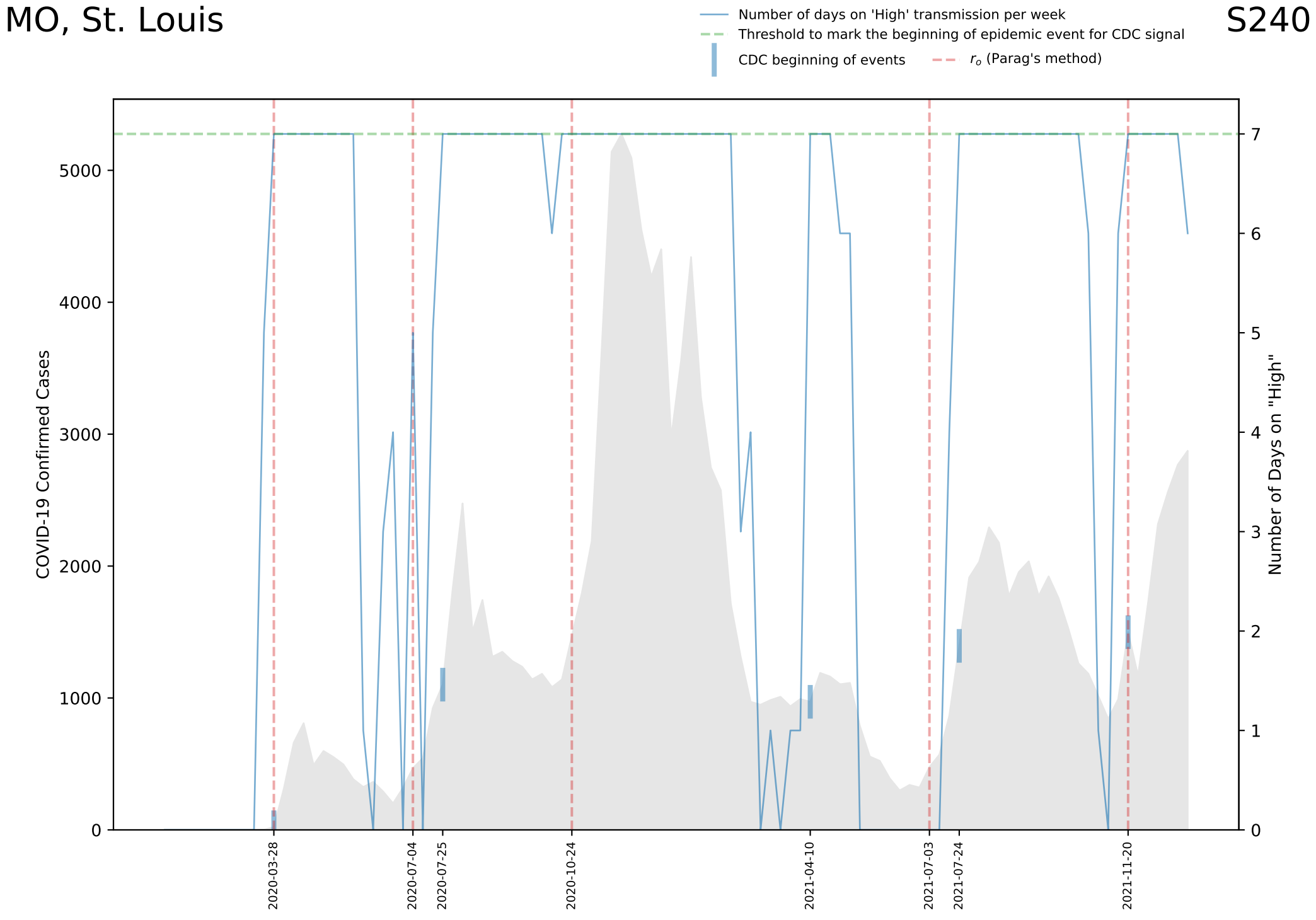
MN, Hennepin

S237



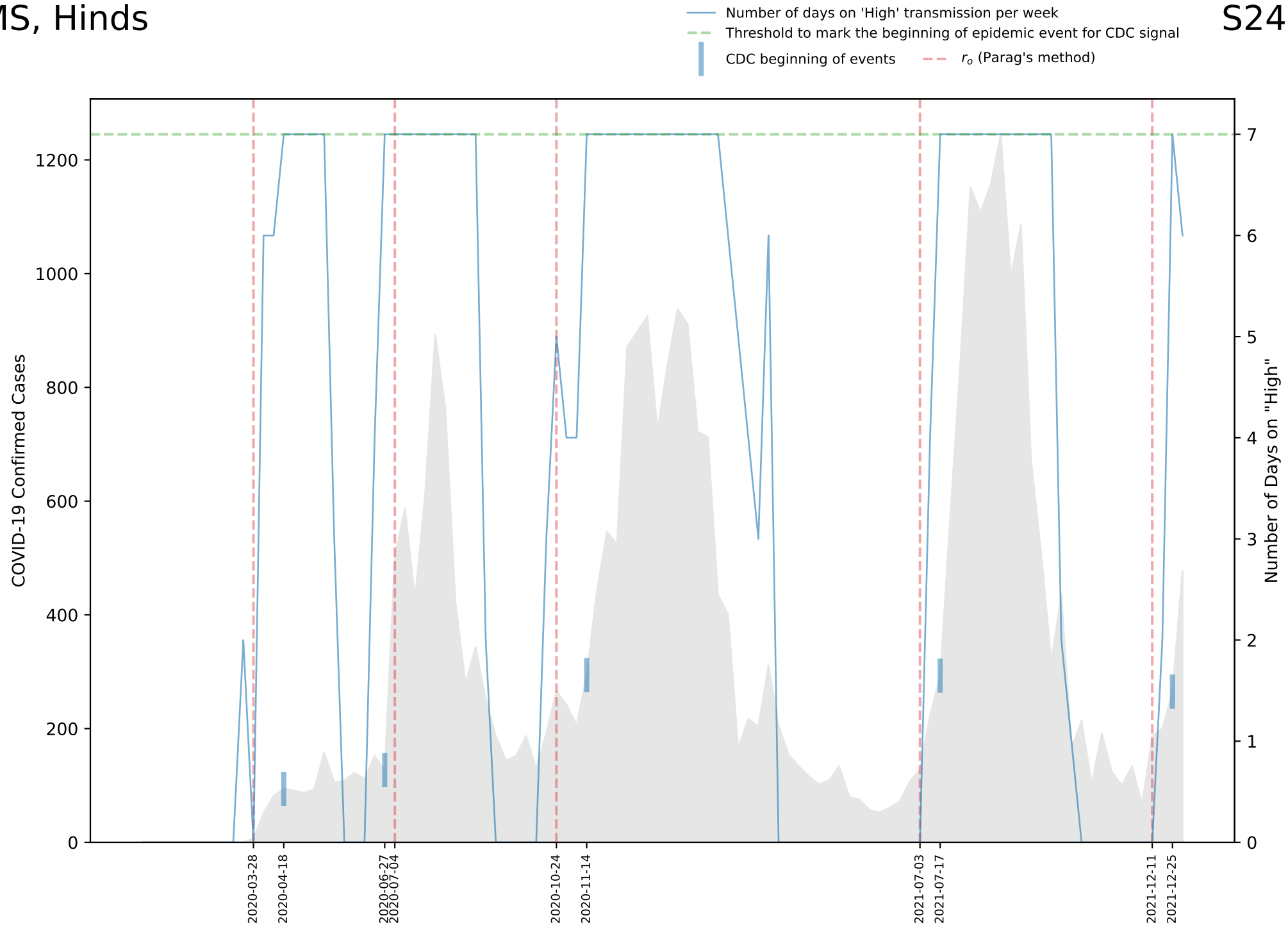

MO, Clay
S238
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
200
400
600
800
1000
1200
1400
1600
0
1
2
3
4
5
6
7
2020-03-28
2020-04-04
2020-05-09
2020-07-11
2020-10-17
2021-03-13
2021-07-24
2021-11-20
2021-11-27


MO, Jackson
S239
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
0
1
2
3
4
5
6
7
2020-03-28
2020-06-27
2020-10-17
2021-05-01
2021-07-17
2021-11-27


MO, St. Louis
S240
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
0
1
2
3
4
5
6
7
2020-03-28
2020-07-04
2020-07-25
2020-10-24
2021-04-10
2021-07-03
2021-07-24
2021-11-20

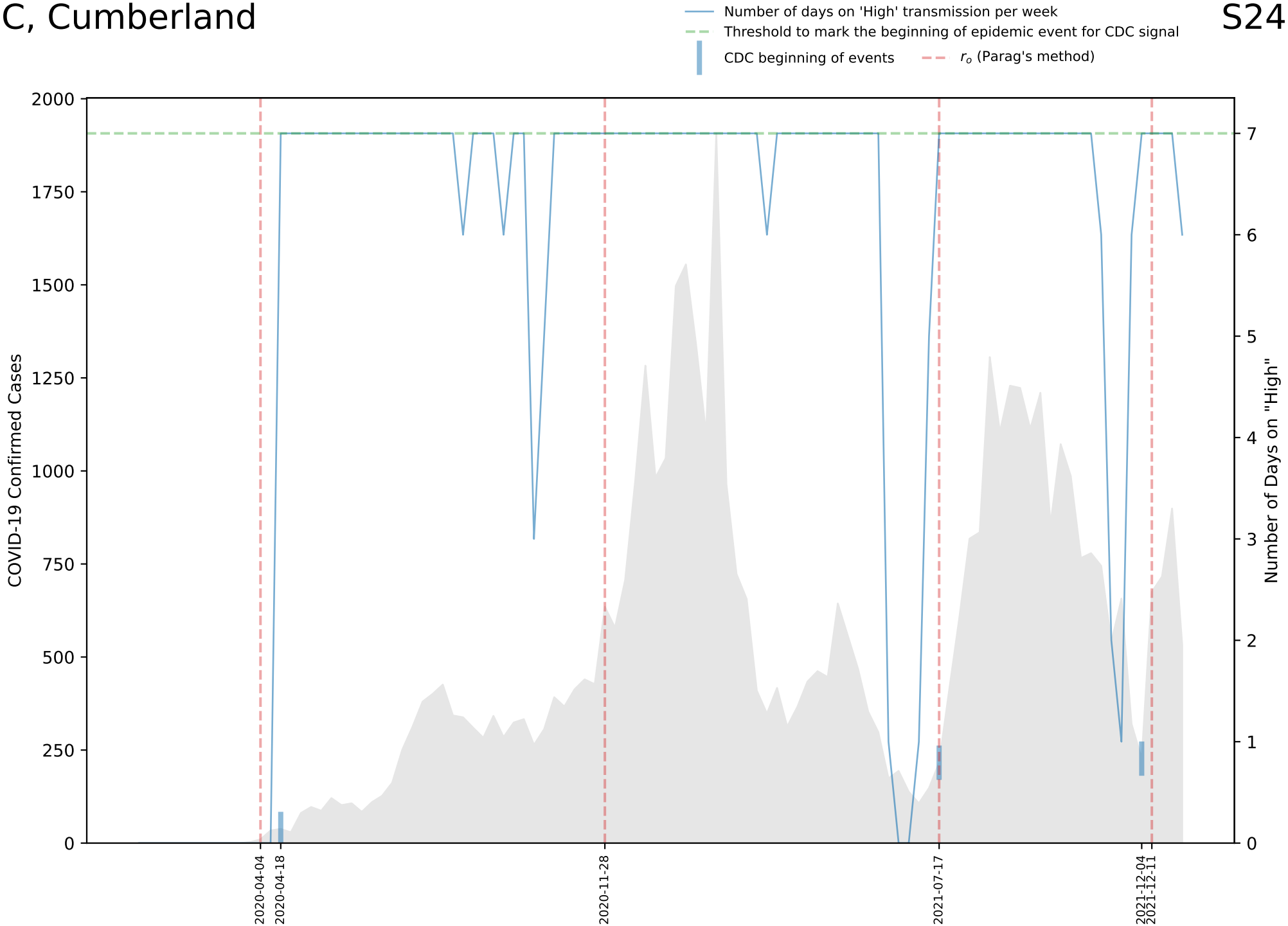
MS, Hinds

S241



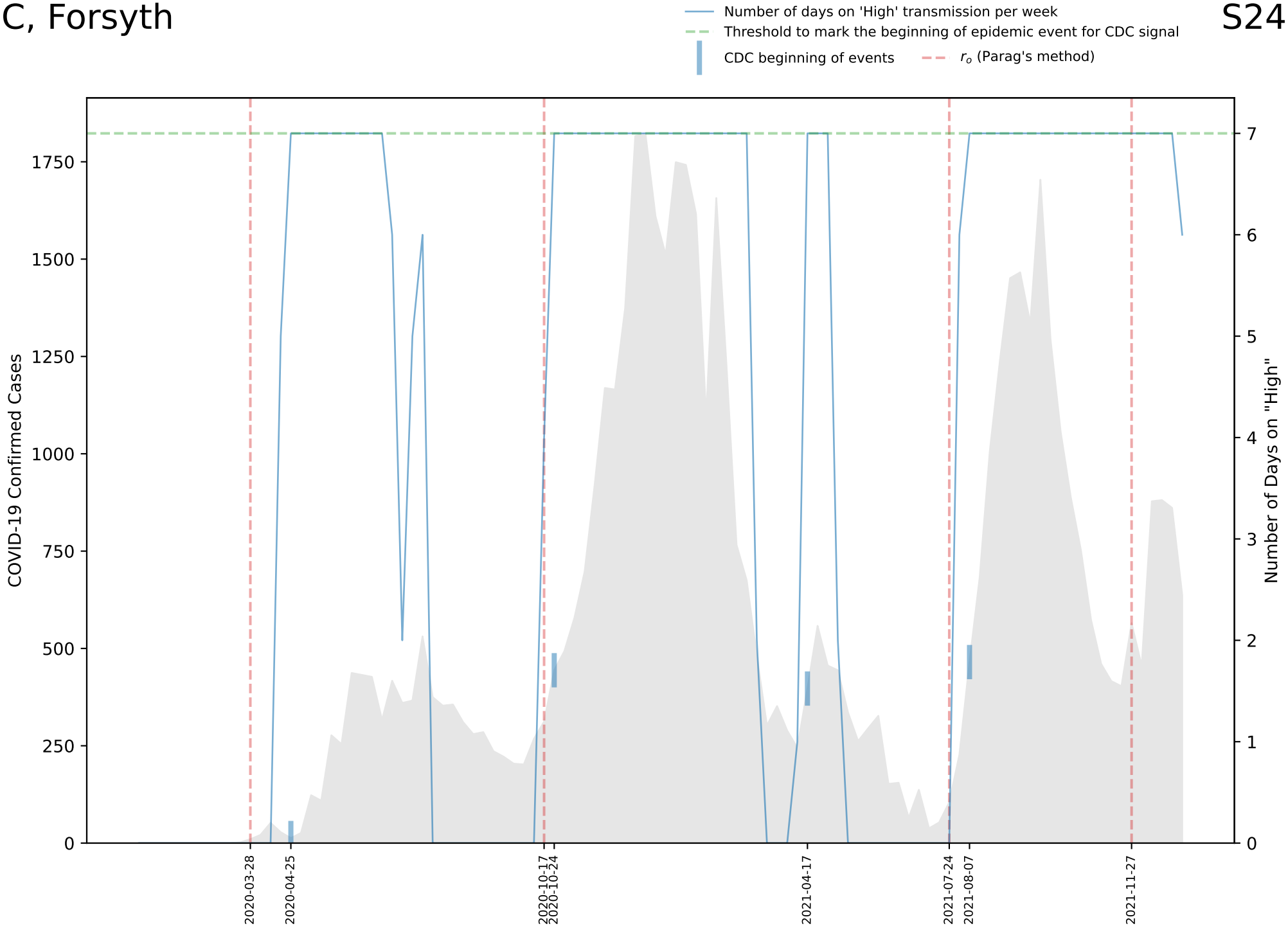
NC, Cumberland

S242



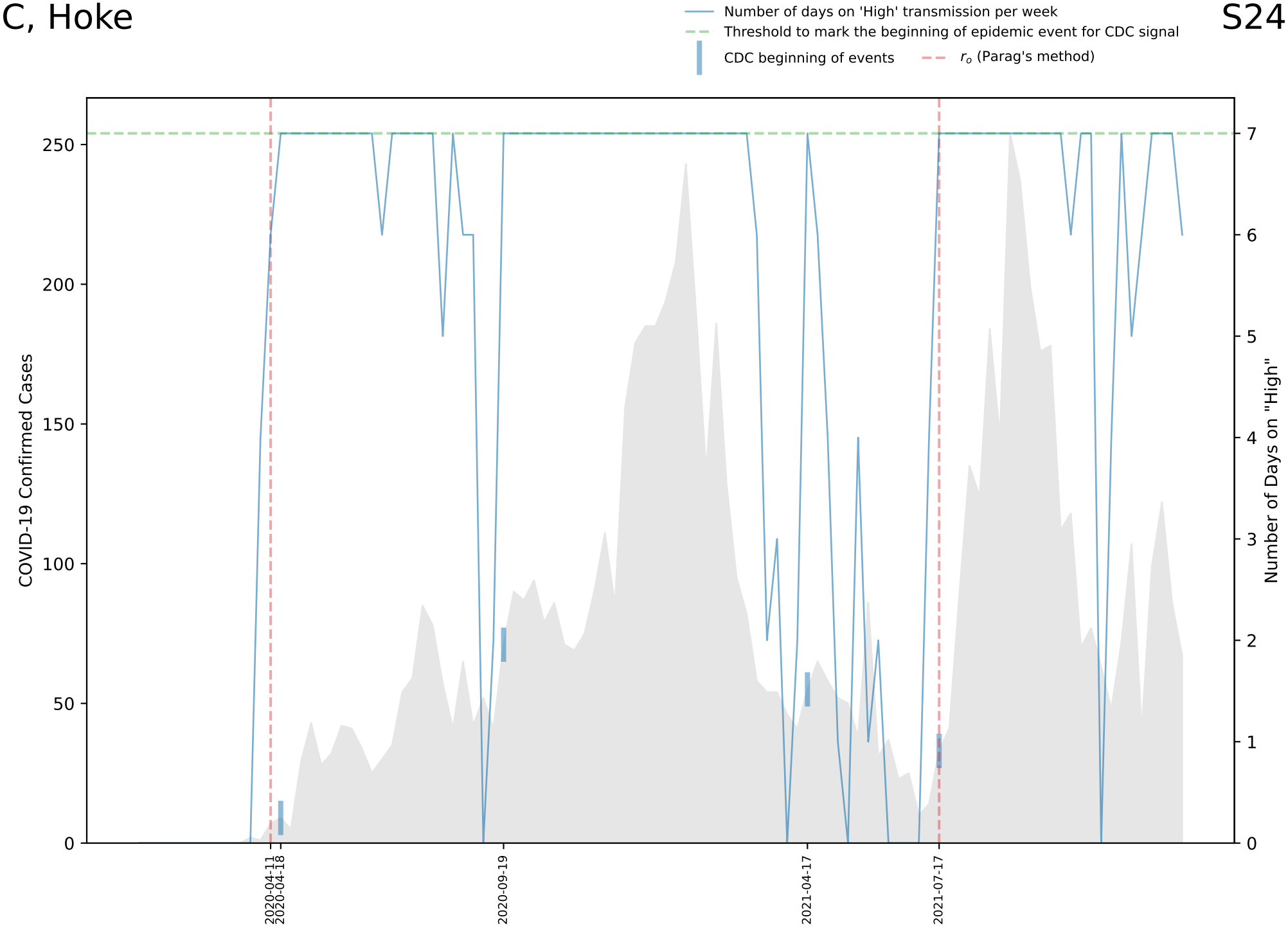
NC, Forsyth

S243



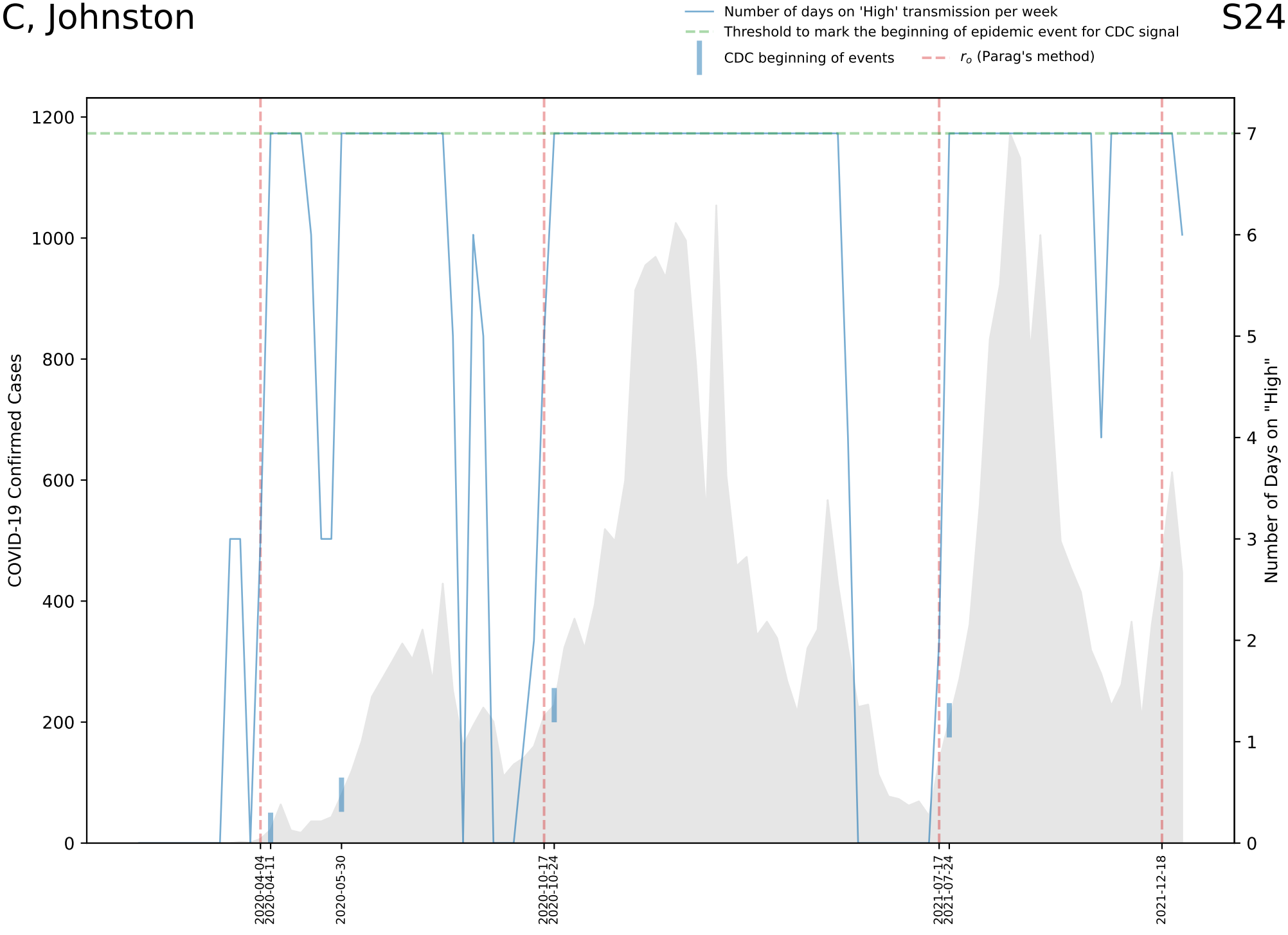
NC, Hoke

S244


Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
50
100
150
200
250
0
1
2
3
4
5
6
7
2020-04-11
2020-04-18
2020-09-19
2021-04-17
2021-07-17

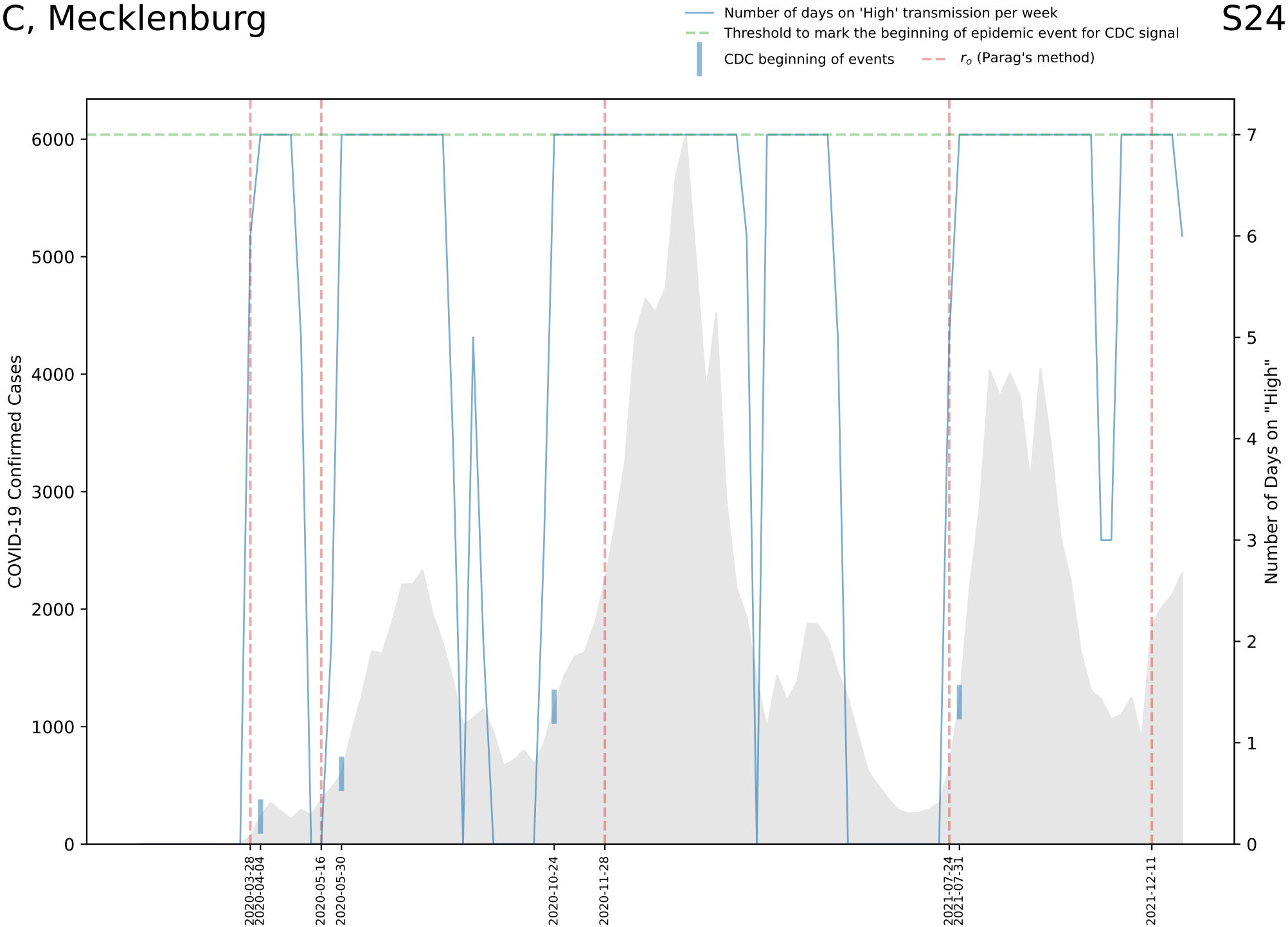
NC, Johnston

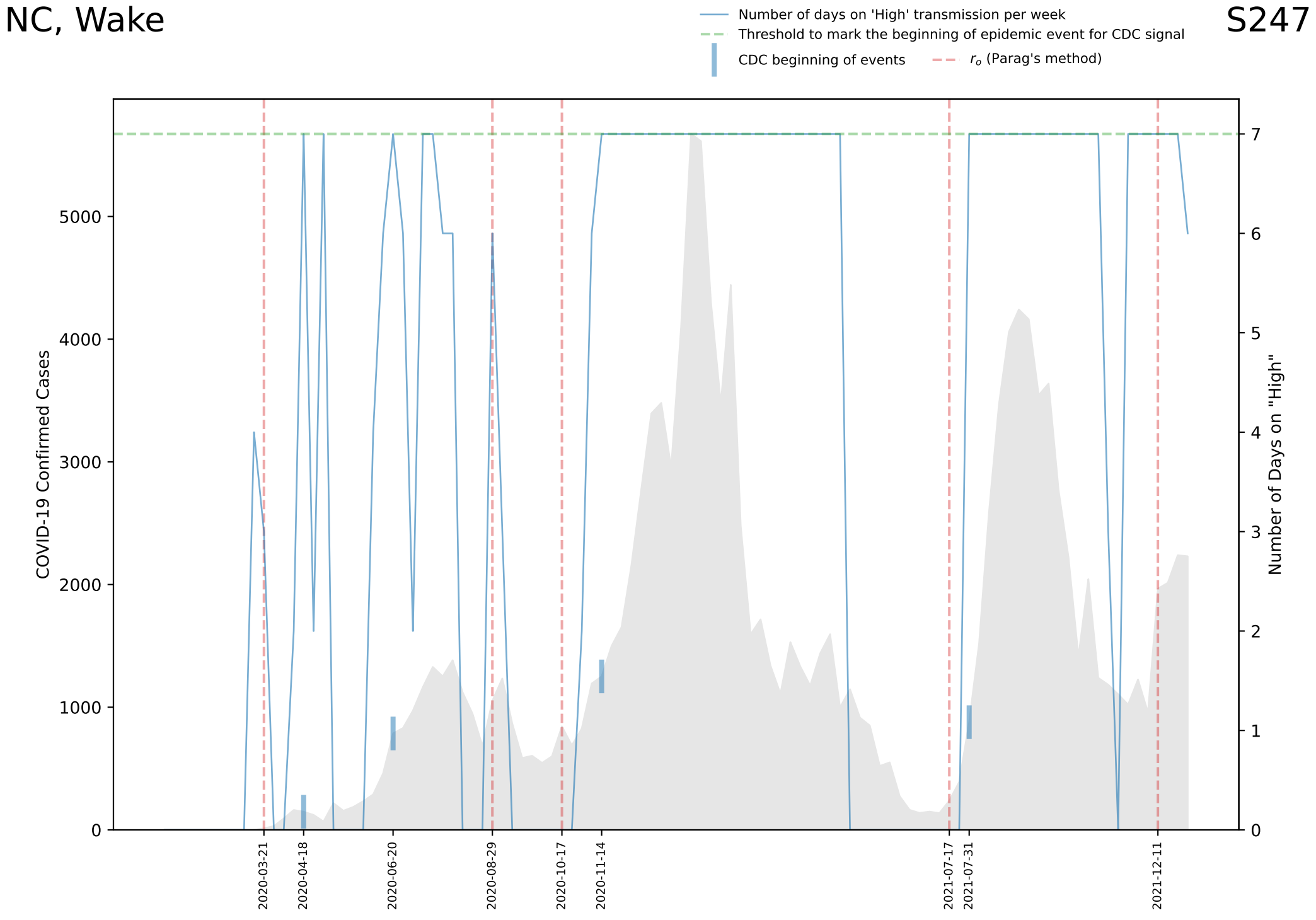
S245

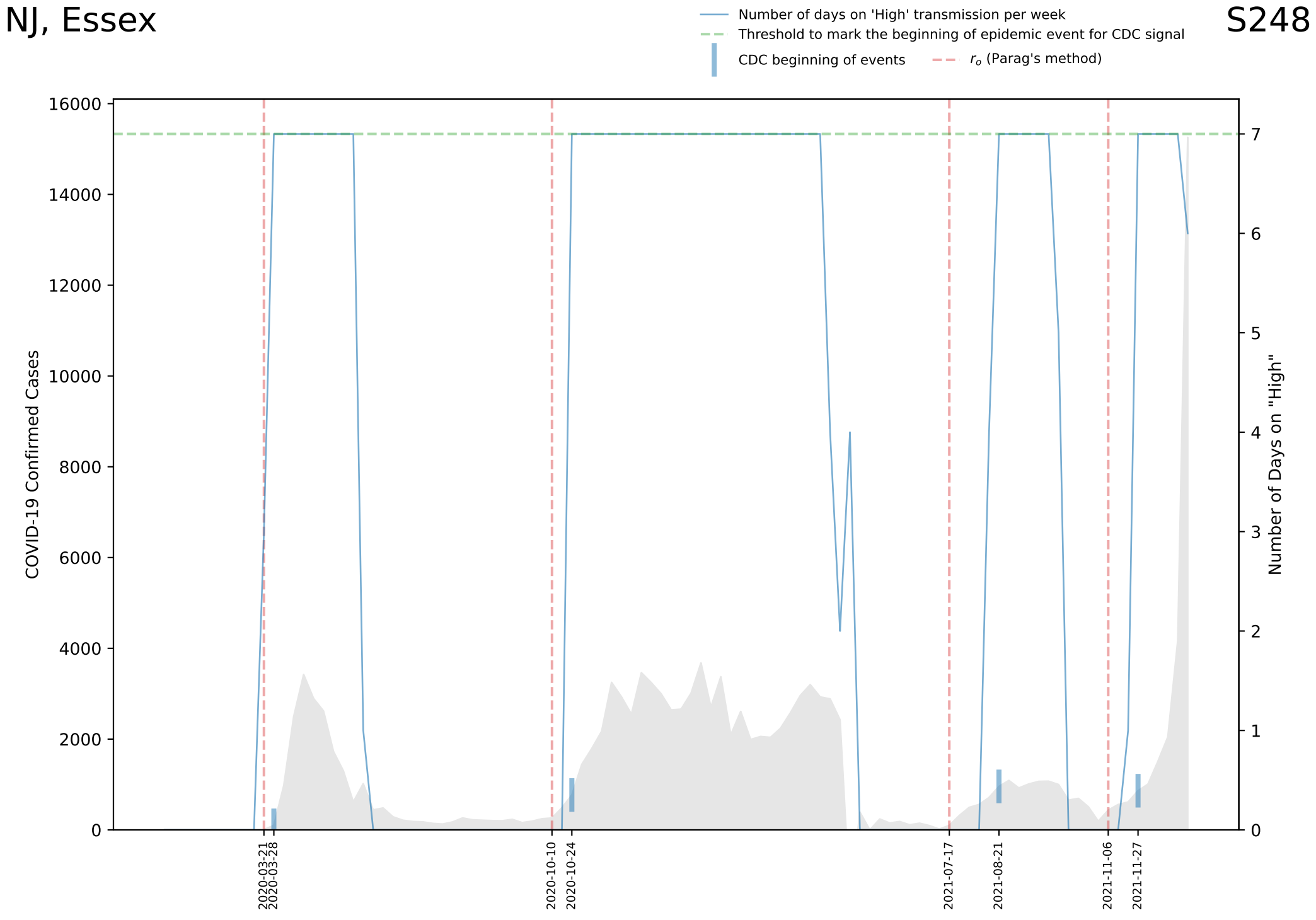


NC, Mecklenburg

S246

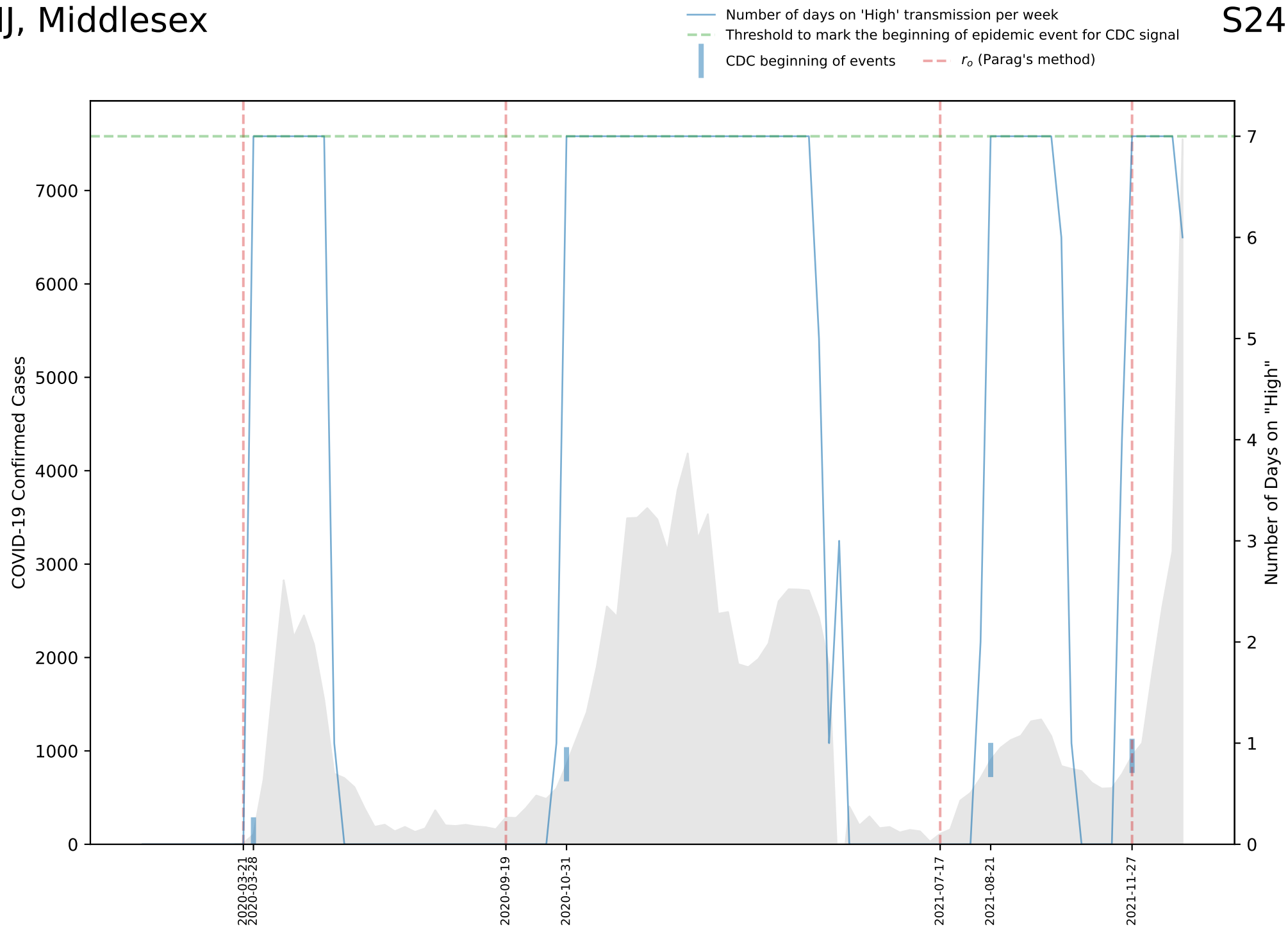


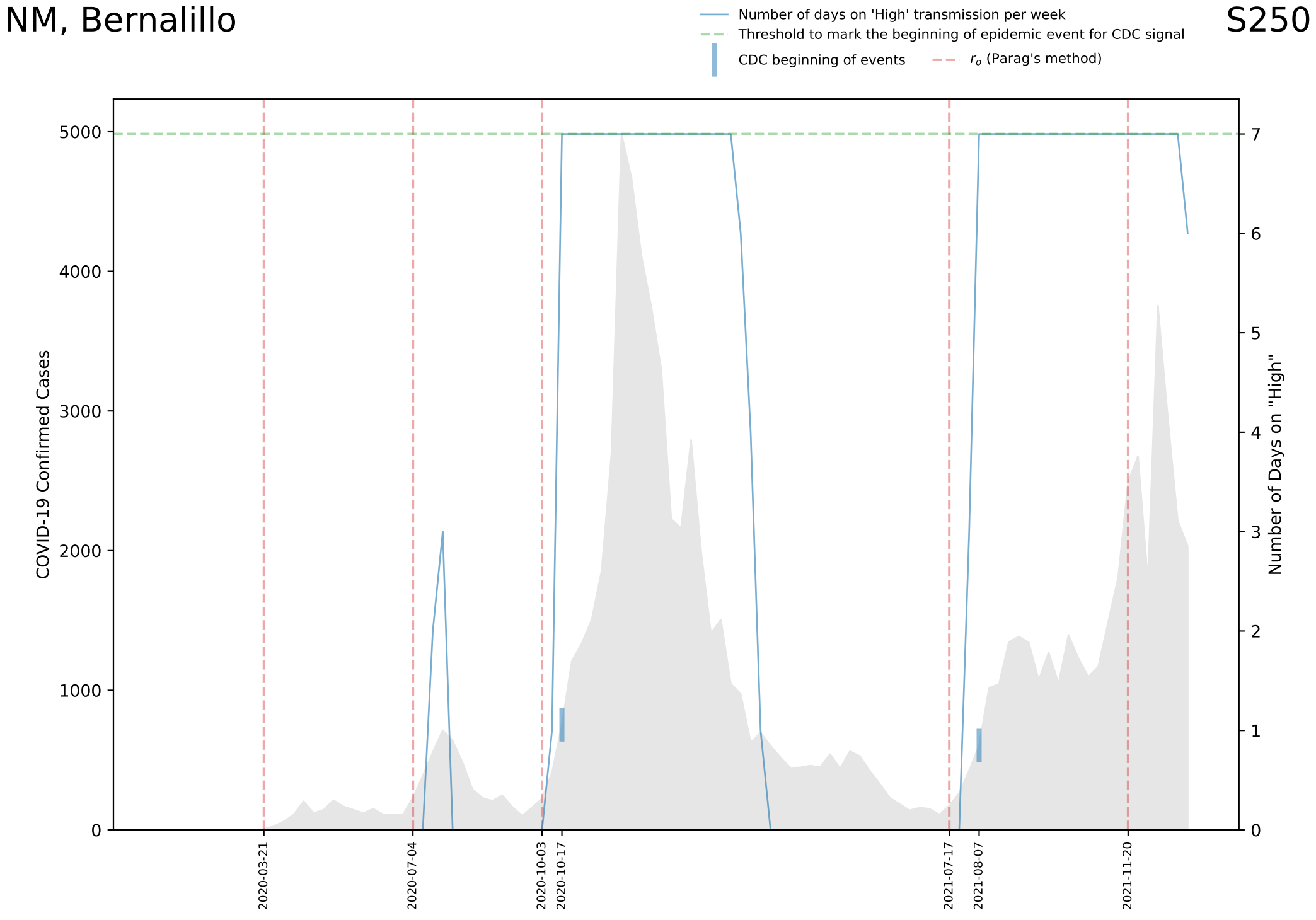

NC, Wake
S247
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
0
1
2
3
4
5
6
7
2020-03-21
2020-04-18
2020-06-20
2020-08-29
2020-10-17
2020-11-14
2021-07-17
2021-07-31
2021-12-11

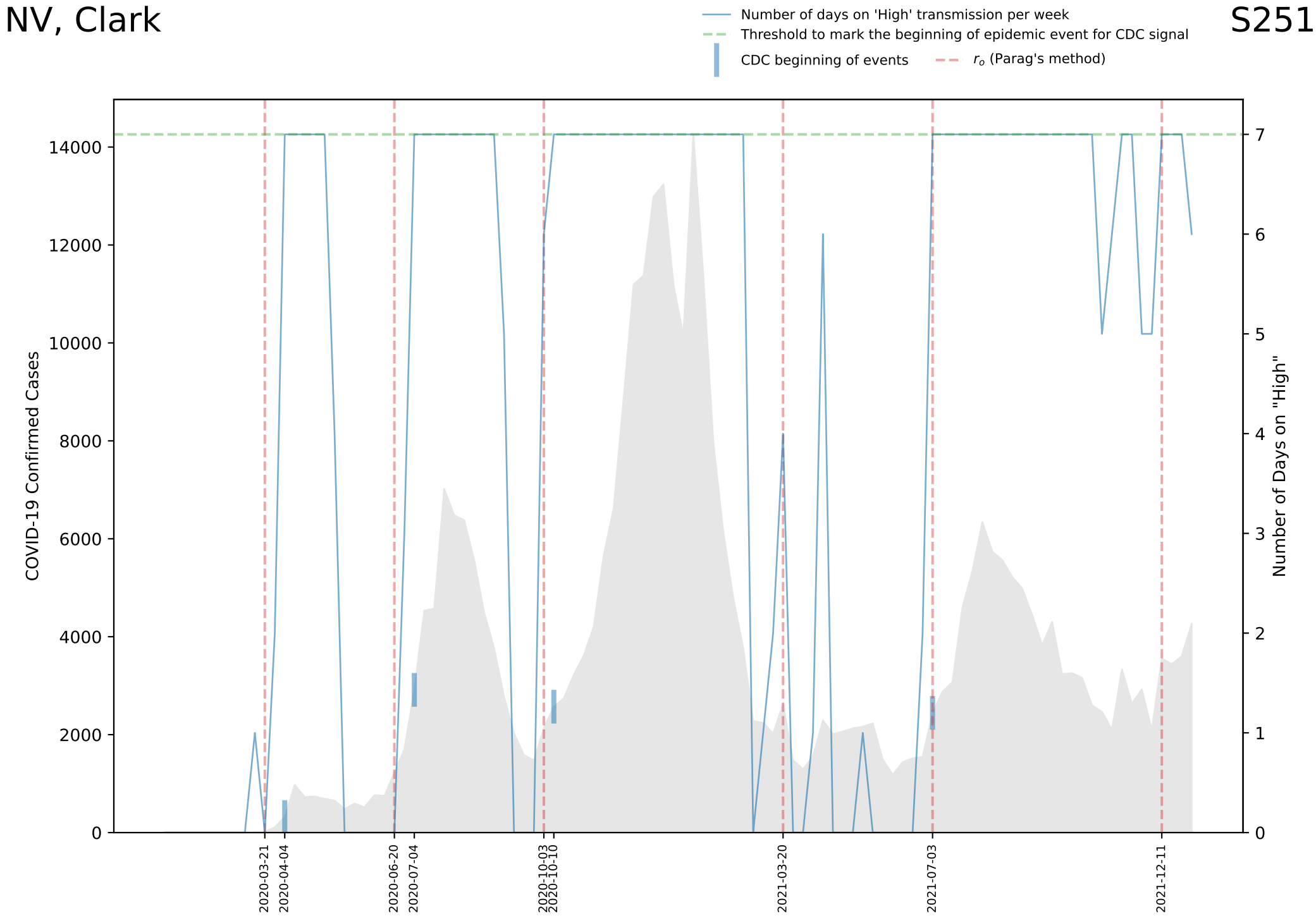

NJ, Essex
S248
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
16000
14000
12000
10000
8000
6000
4000
2000
0
7
6
5
4
3
2
1
0
2020-03-21
2020-03-28
2020-10-10
2020-10-24
2021-07-17
2021-08-21
2021-11-06
2021-11-27

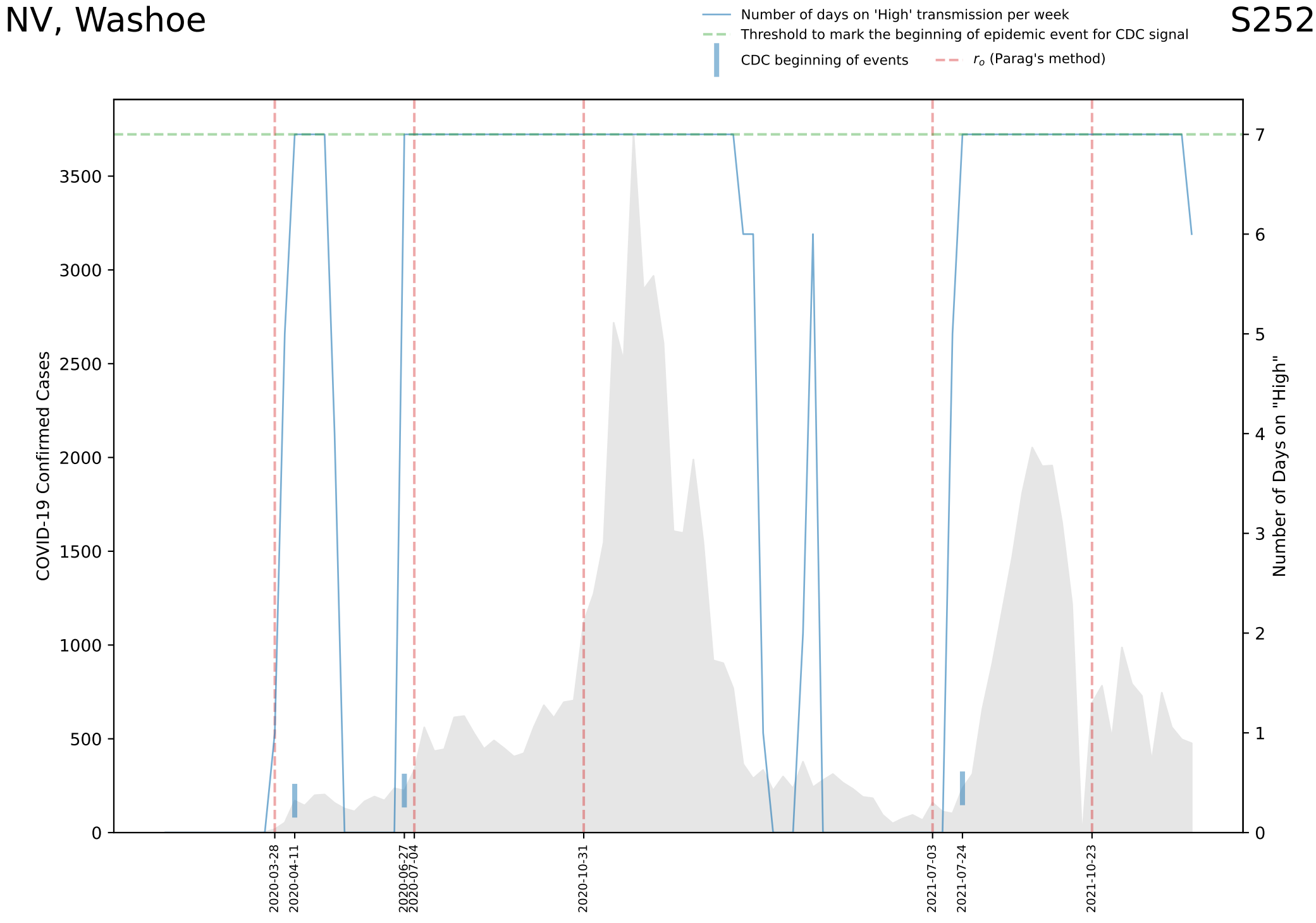
NJ, Middlesex

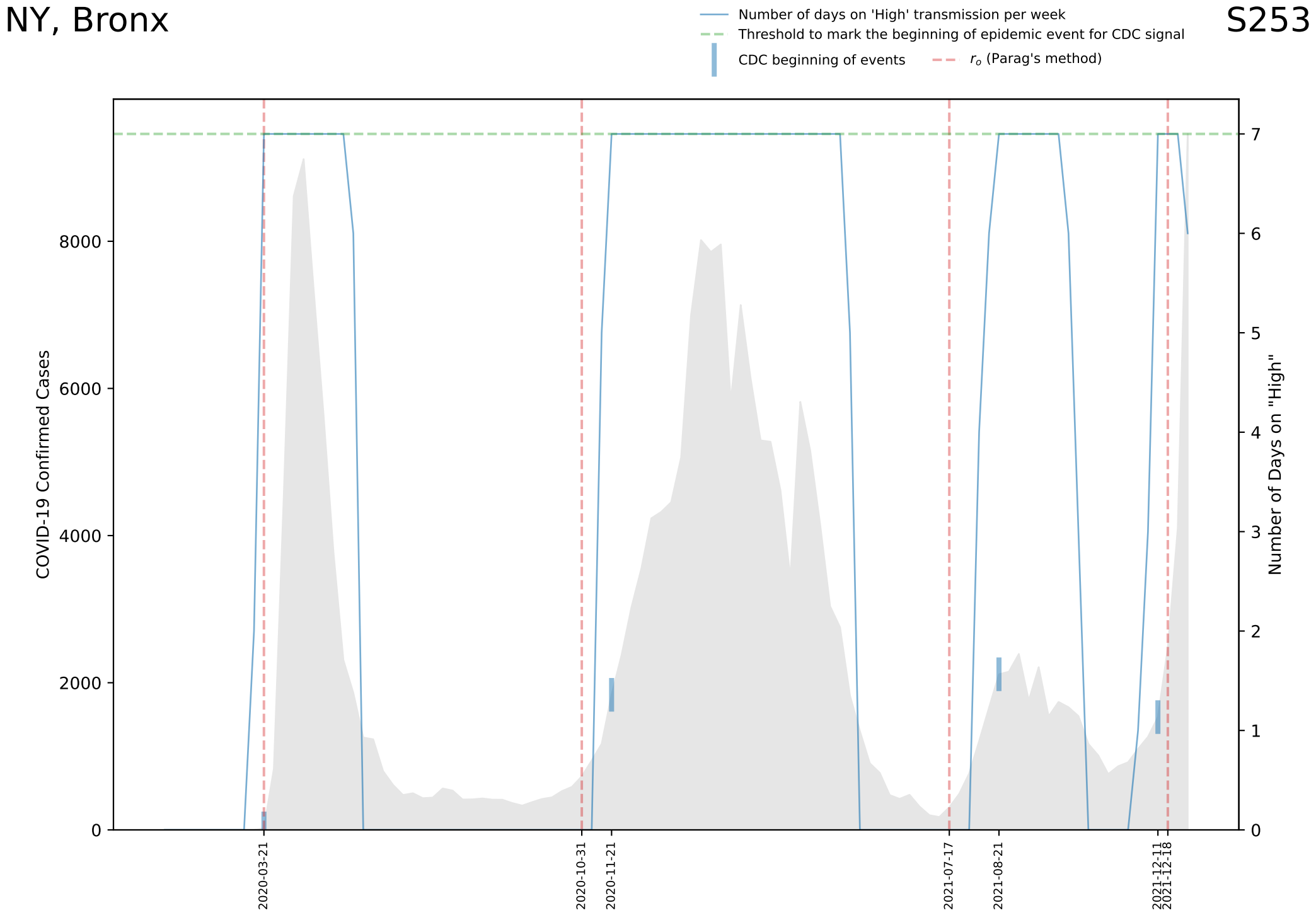
S249

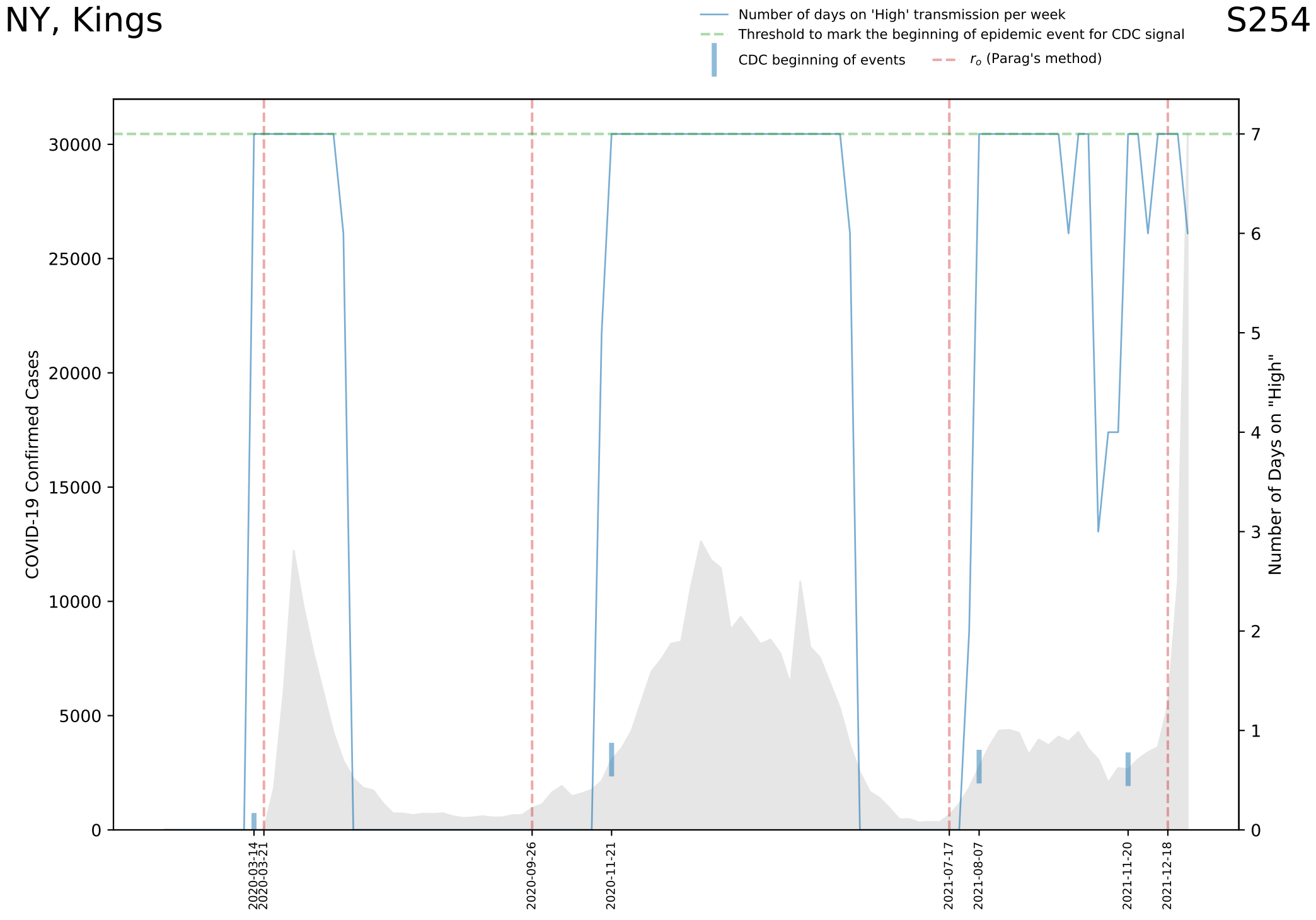


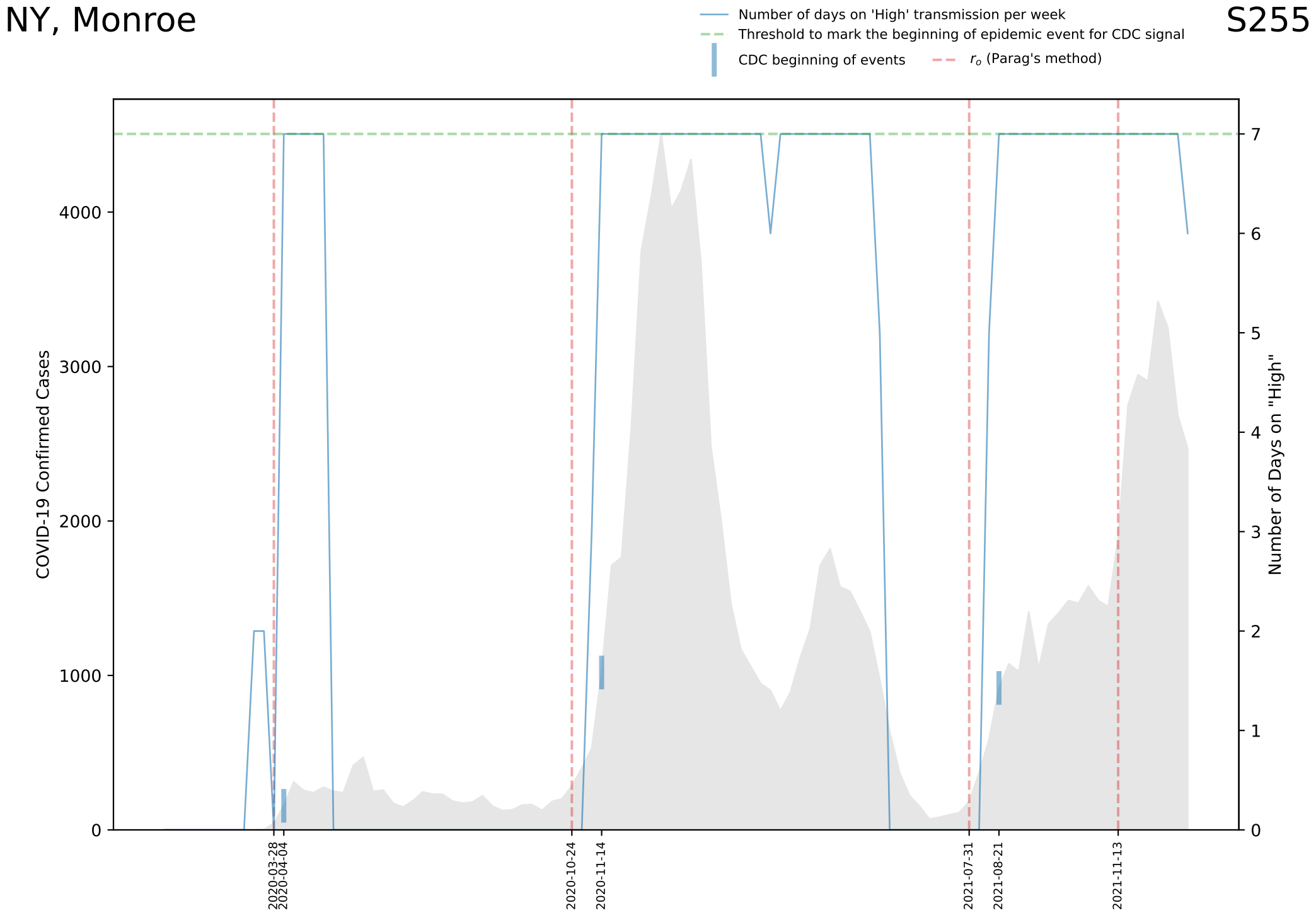

NM, Bernalillo
S250
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
0
1
2
3
4
5
6
7
2020-03-21
2020-07-04
2020-10-03
2020-10-17
2021-07-17
2021-08-07
2021-11-20

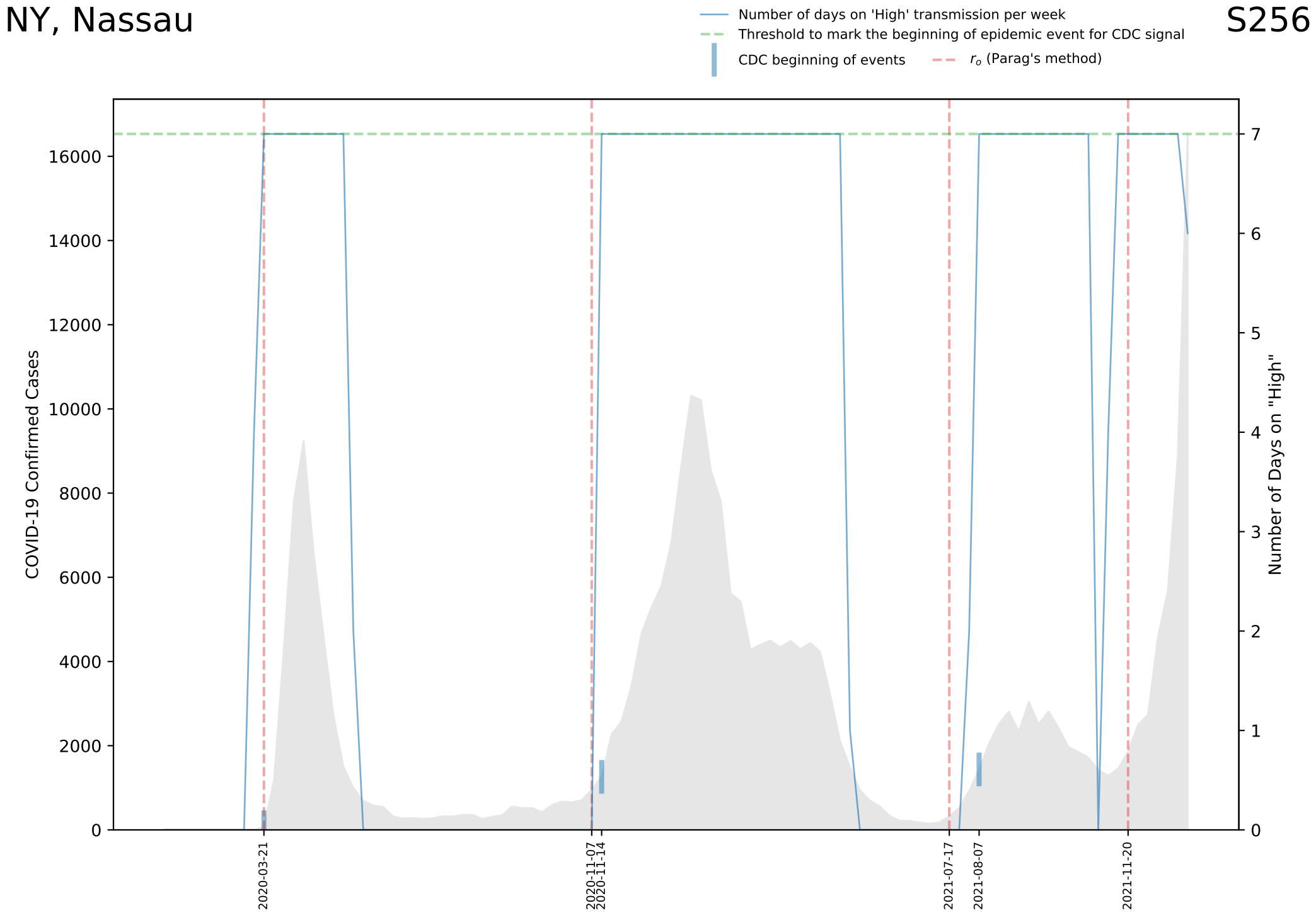

NV, Clark
S251
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2000
4000
6000
8000
10000
12000
14000
0
1
2
3
4
5
6
7
2020-03-21
2020-04-04
2020-06-20
2020-07-04
2020-10-03
2020-10-10
2021-03-20
2021-07-03
2021-12-11


NV, Washoe
S252
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
3000
3500
0
1
2
3
4
5
6
7
2020-03-28
2020-04-11
2020-06-27
2020-07-04
2020-10-31
2021-07-03
2021-07-24
2021-10-23


NY, Bronx
S253
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2000
4000
6000
8000
0
1
2
3
4
5
6
7
2020-03-21
2020-10-31
2020-11-21
2021-07-17
2021-08-21
2021-12-11
2021-12-18

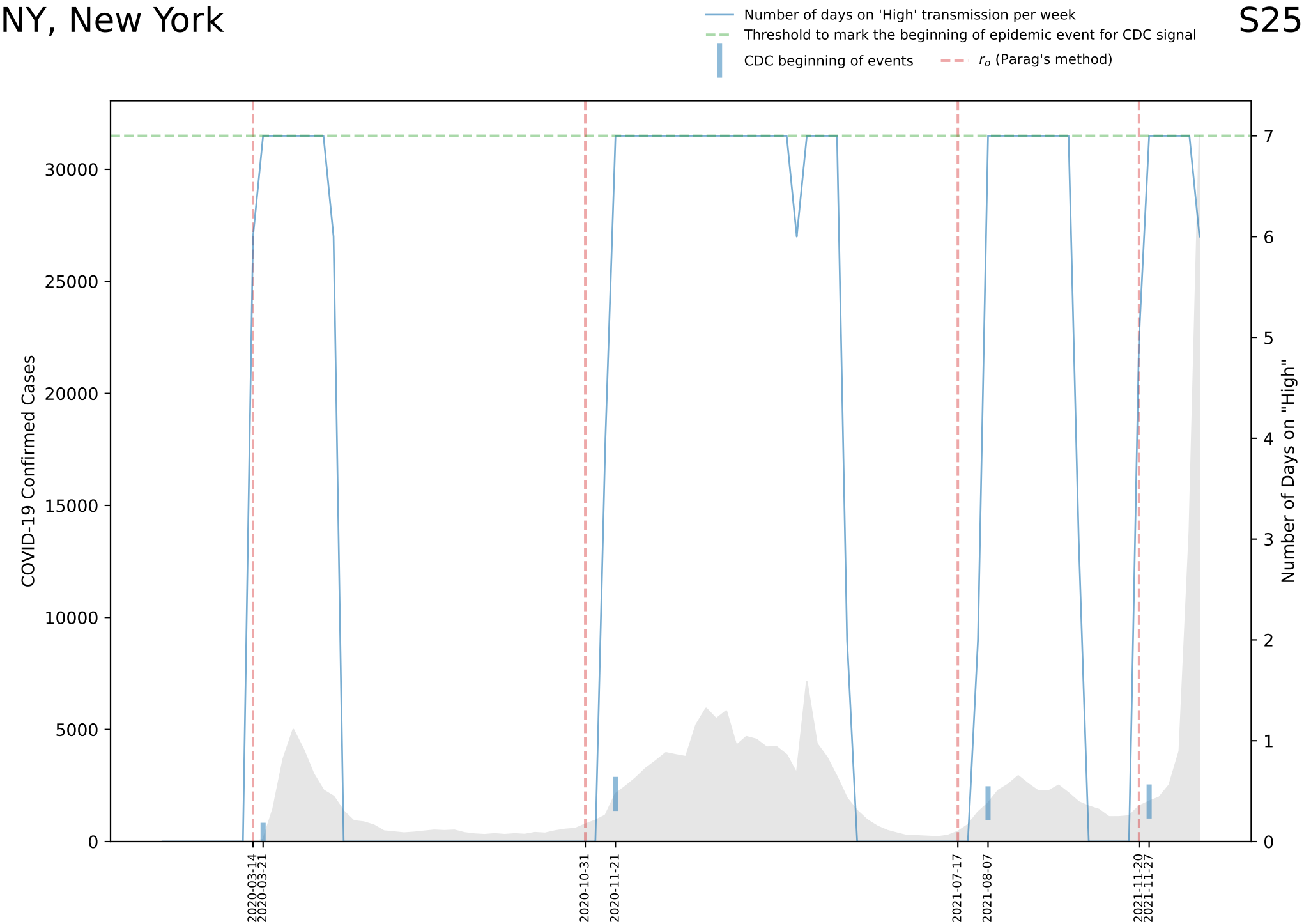

NY, Kings
S254
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
5000
10000
15000
20000
25000
30000
0
1
2
3
4
5
6
7
2020-03-14
2020-03-21
2020-09-26
2020-11-21
2021-07-17
2021-08-07
2021-11-20
2021-12-18

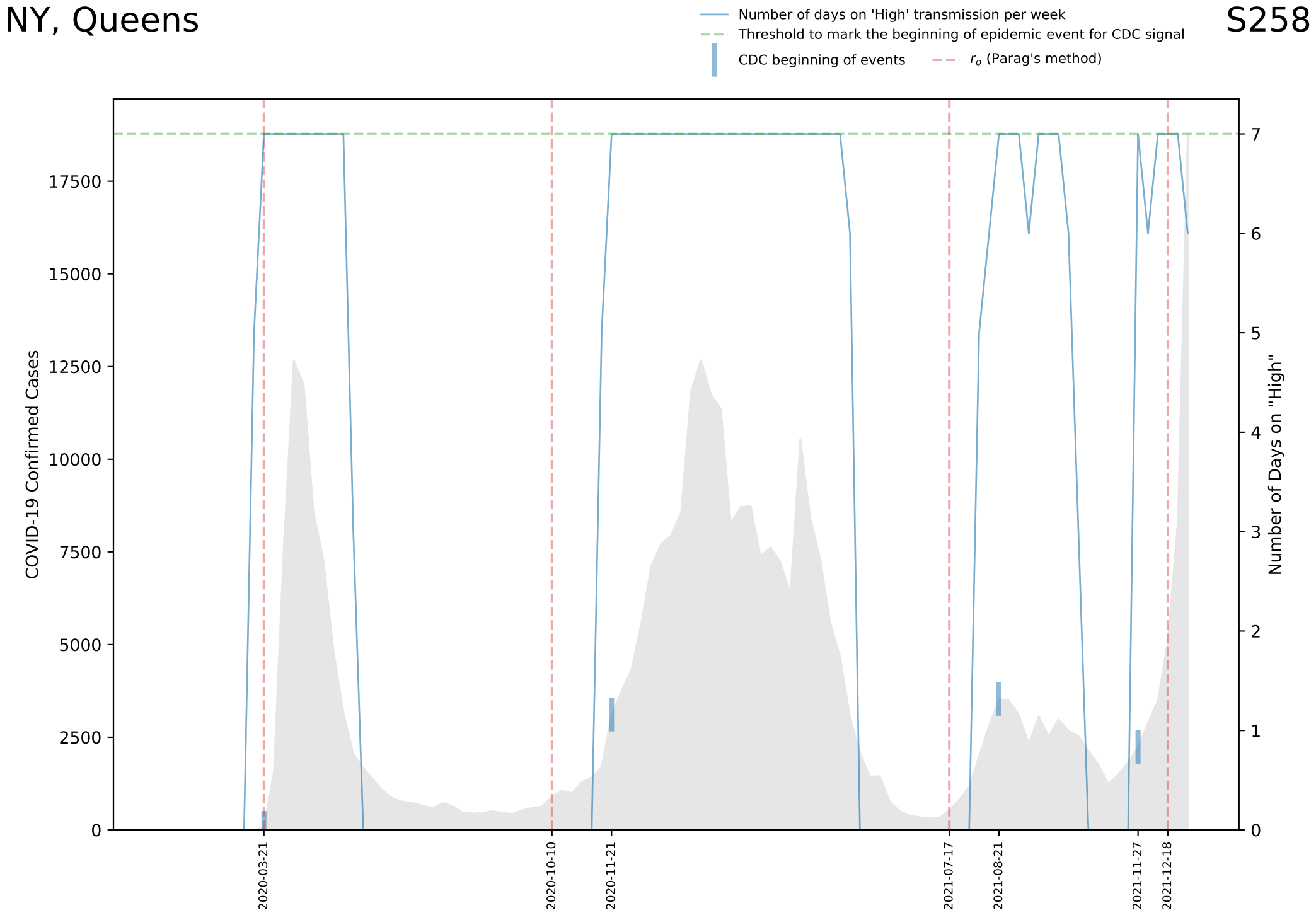

NY, Monroe
S255
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
0
1
2
3
4
5
6
7
2020-03-28
2020-04-04
2020-10-24
2020-11-14
2021-07-31
2021-08-21
2021-11-13


NY, Nassau
S256
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2000
4000
6000
8000
10000
12000
14000
16000
0
1
2
3
4
5
6
7
2020-03-21
2020-11-07
2020-11-14
2021-07-17
2021-08-07
2021-11-20

NY, New York

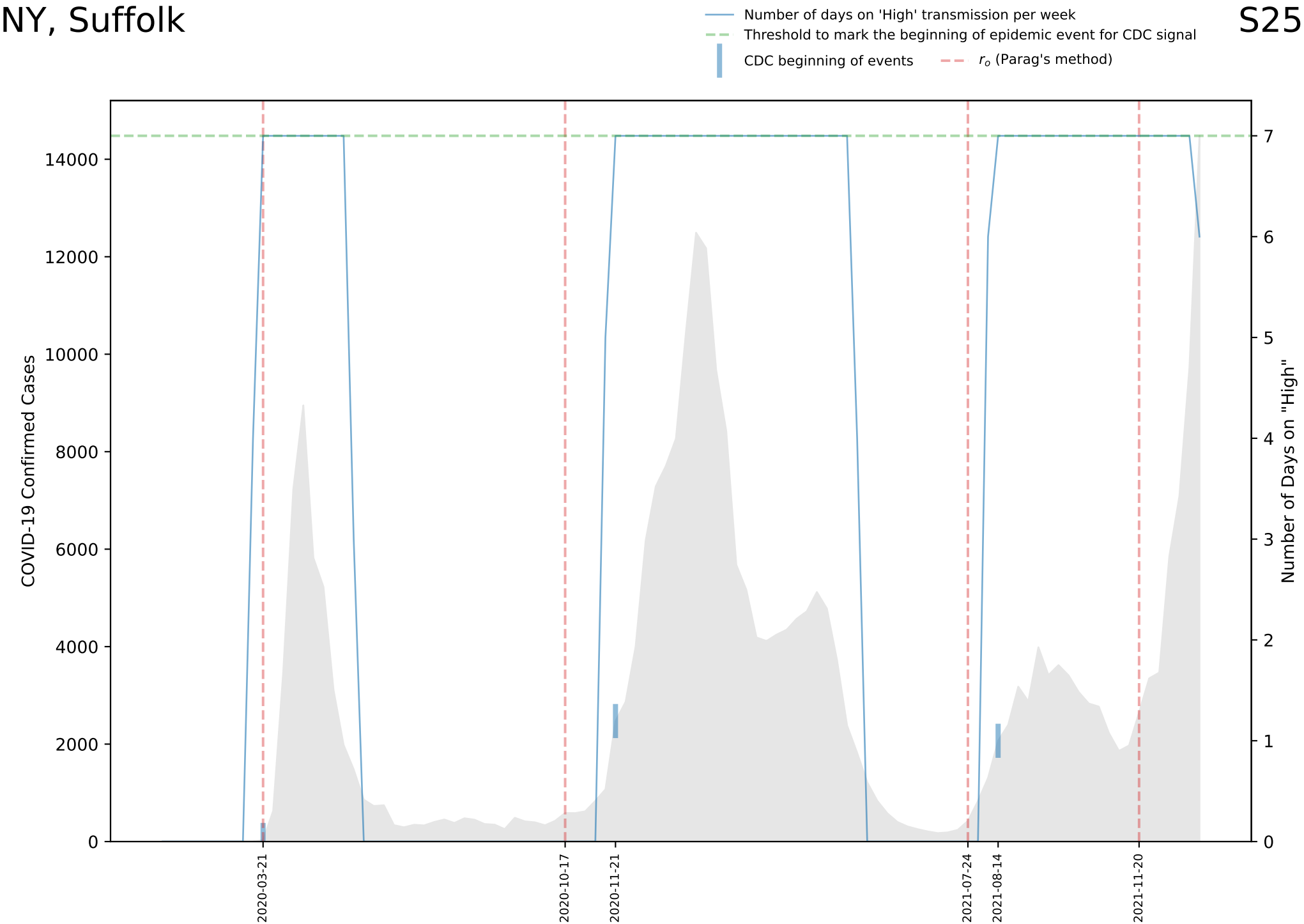
S257

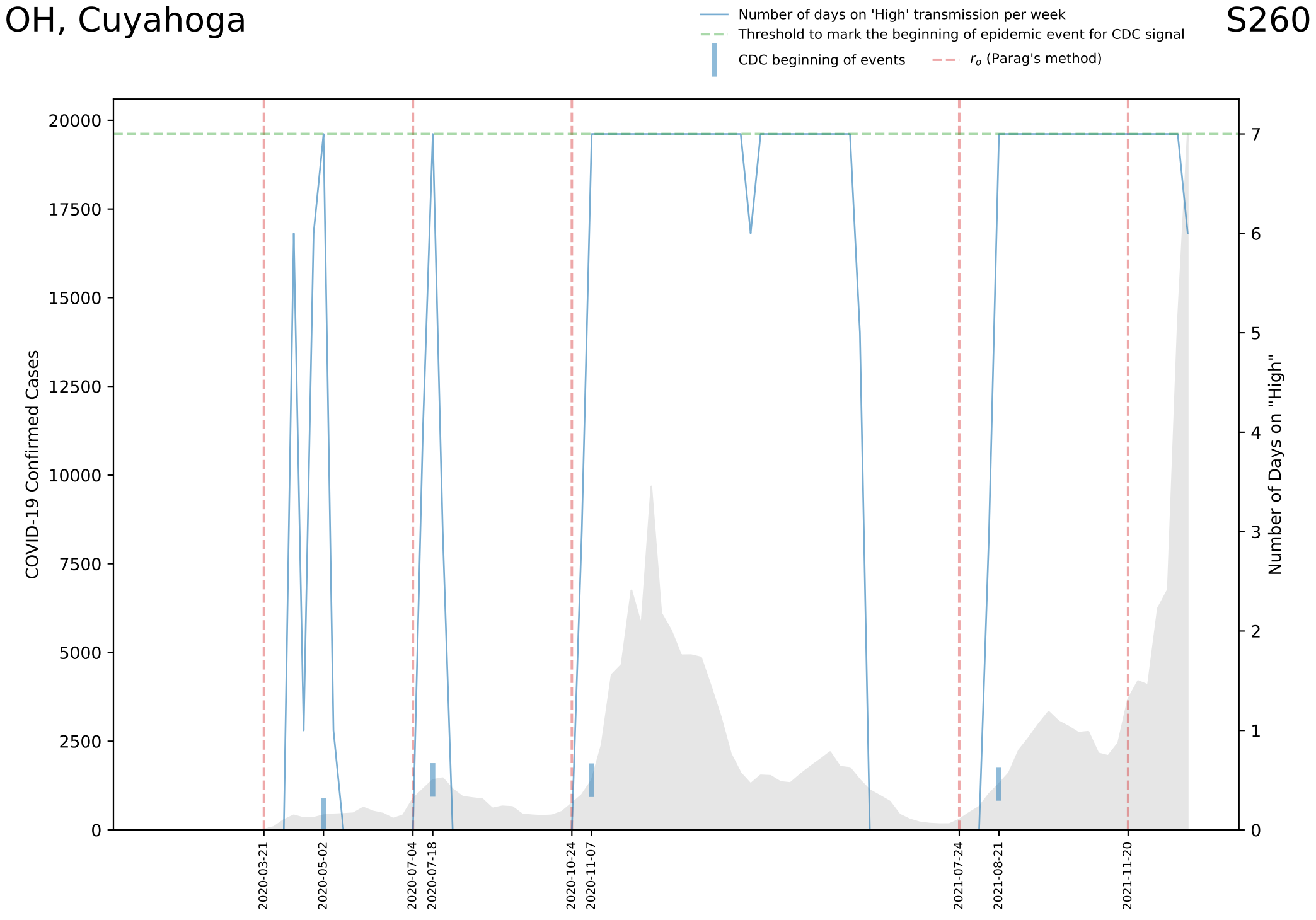



NY, Queens
S258
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2500
5000
7500
10000
12500
15000
17500
0
1
2
3
4
5
6
7
2020-03-21
2020-10-10
2020-11-21
2021-07-17
2021-08-21
2021-11-27
2021-12-18

NY, Suffolk

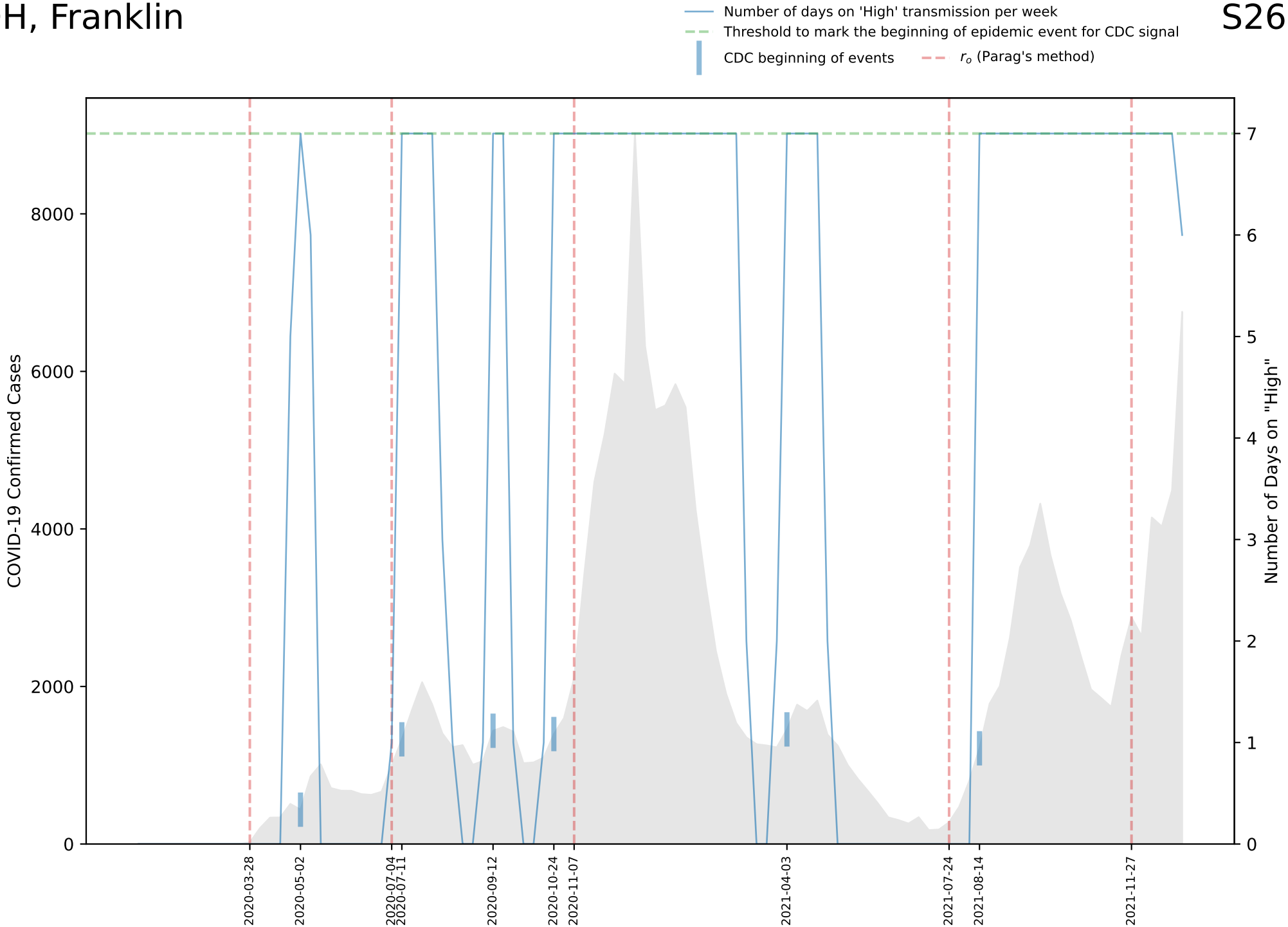
S259




OH, Cuyahoga
S260
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2500
5000
7500
10000
12500
15000
17500
20000
0
1
2
3
4
5
6
7
2020-03-21
2020-05-02
2020-07-04
2020-07-18
2020-10-24
2020-11-07
2021-07-24
2021-08-21
2021-11-20

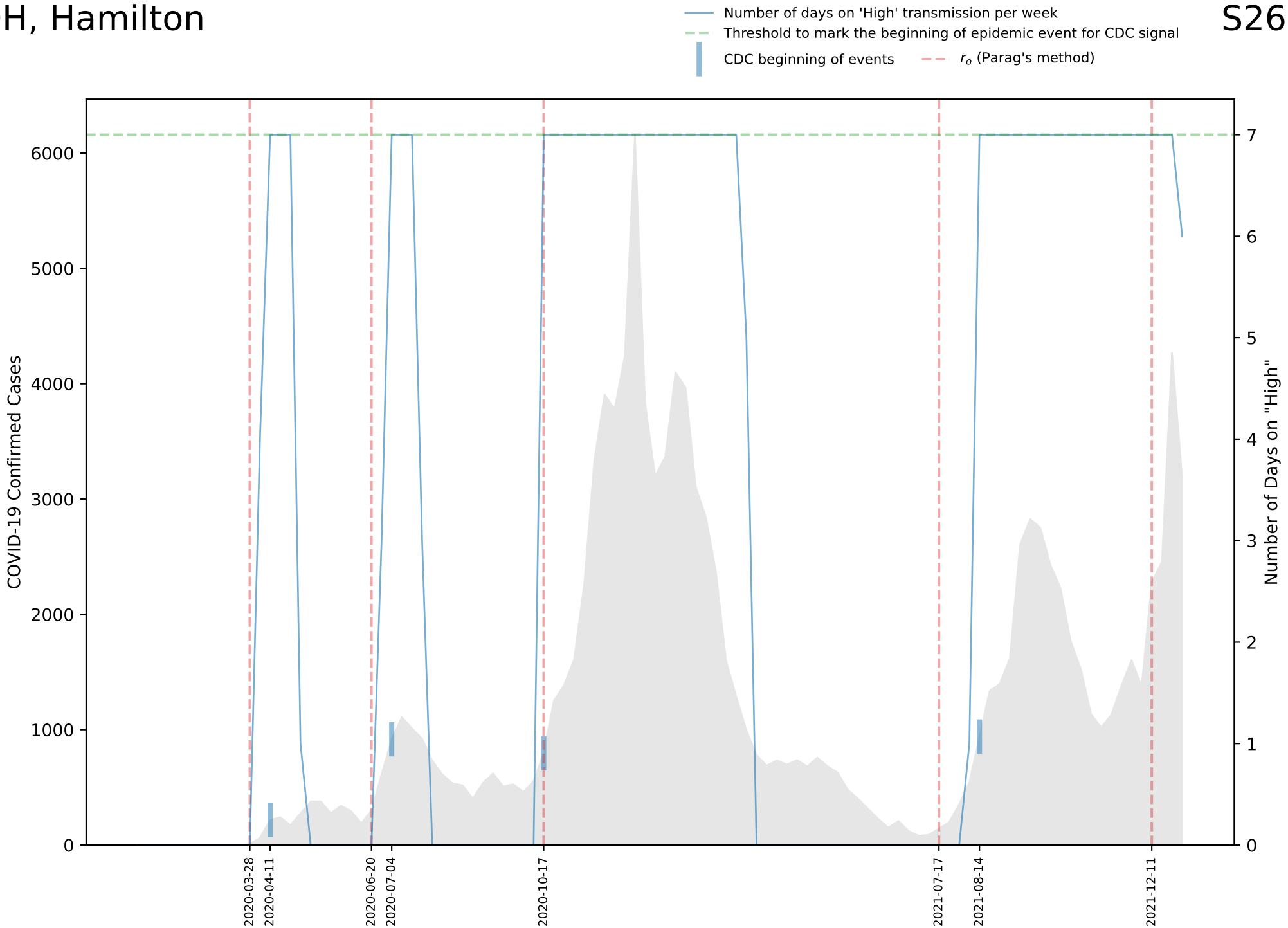
OH, Franklin

S261



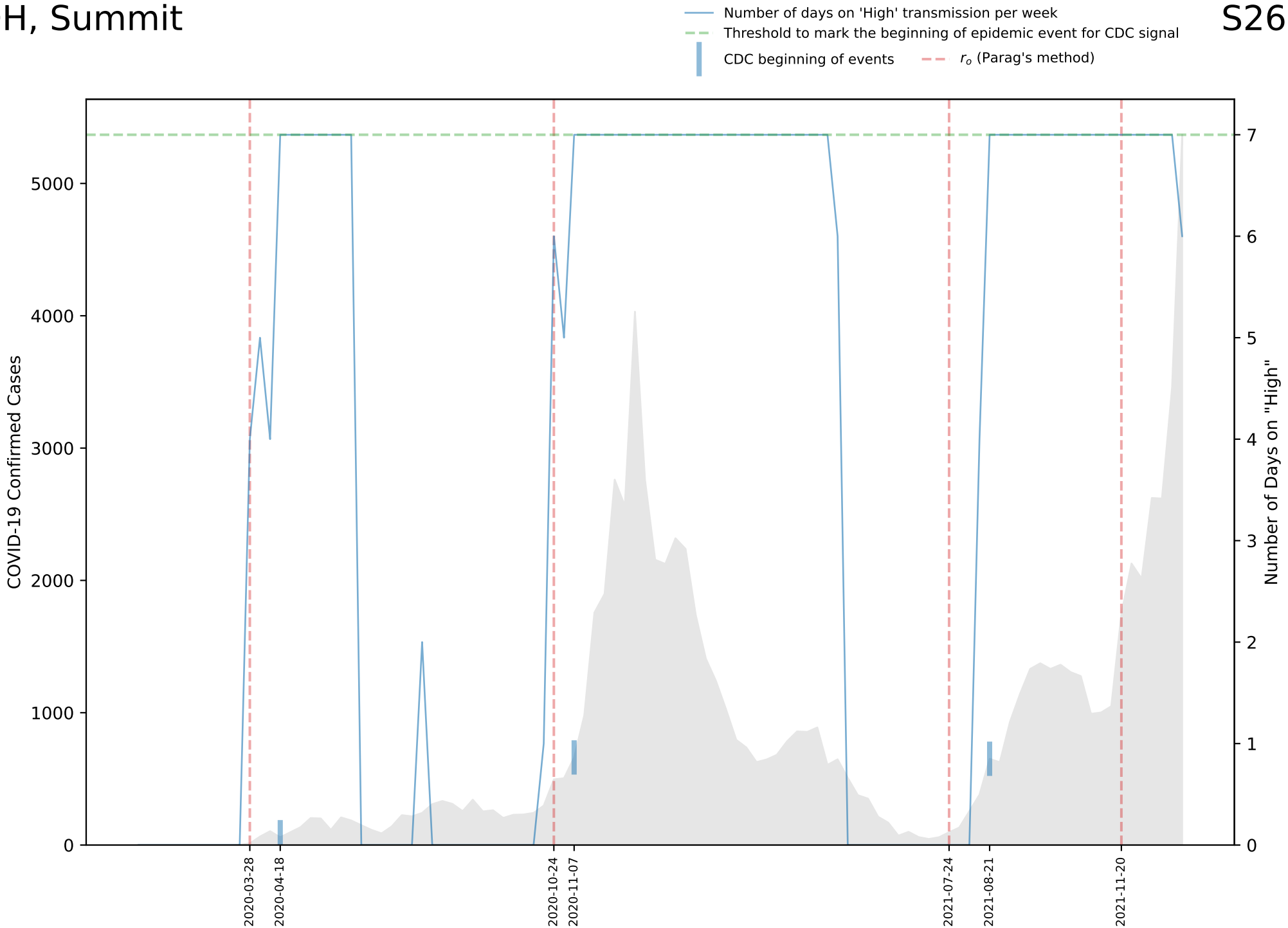
OH, Hamilton

S262



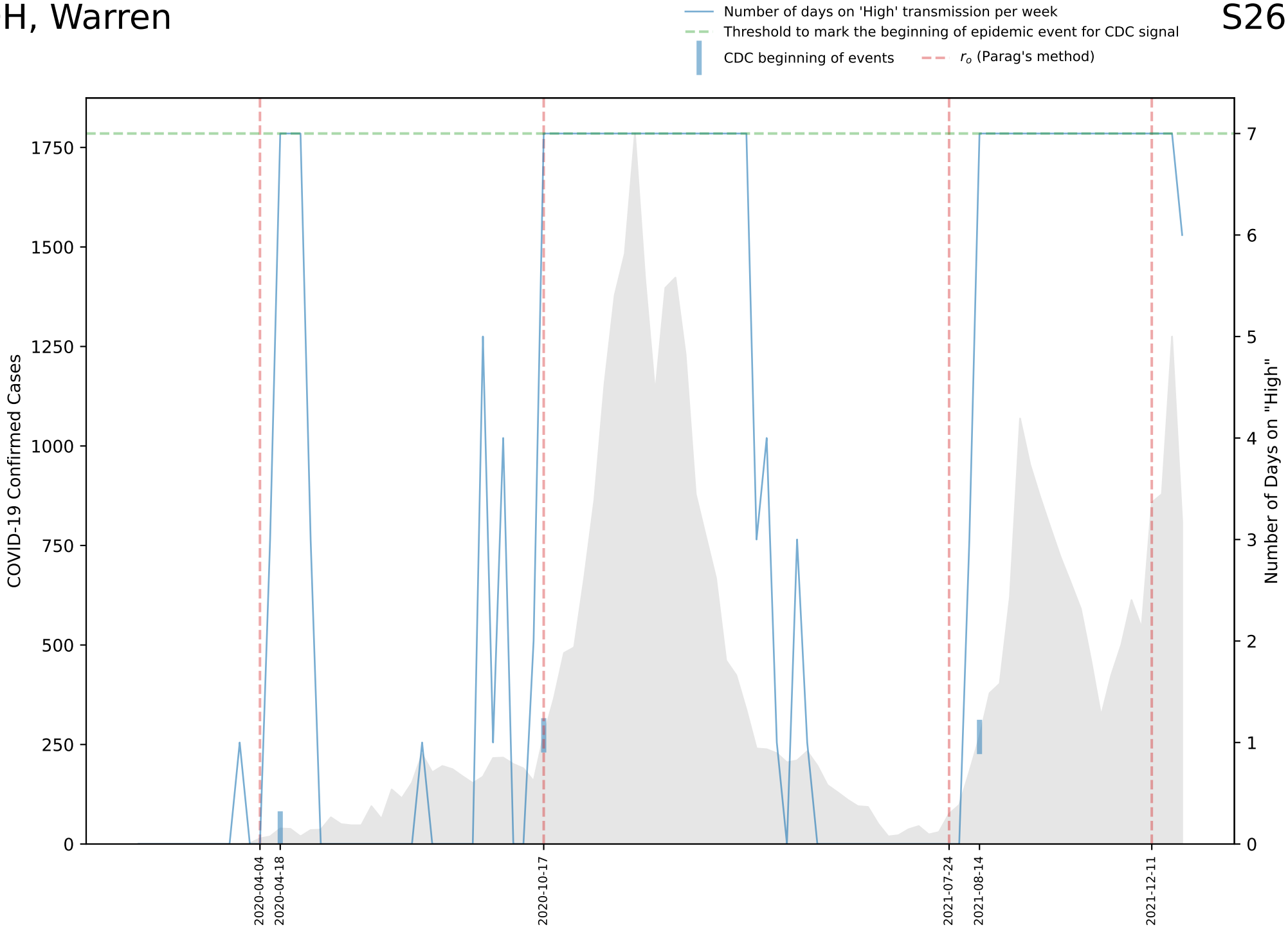
OH, Summit

S263



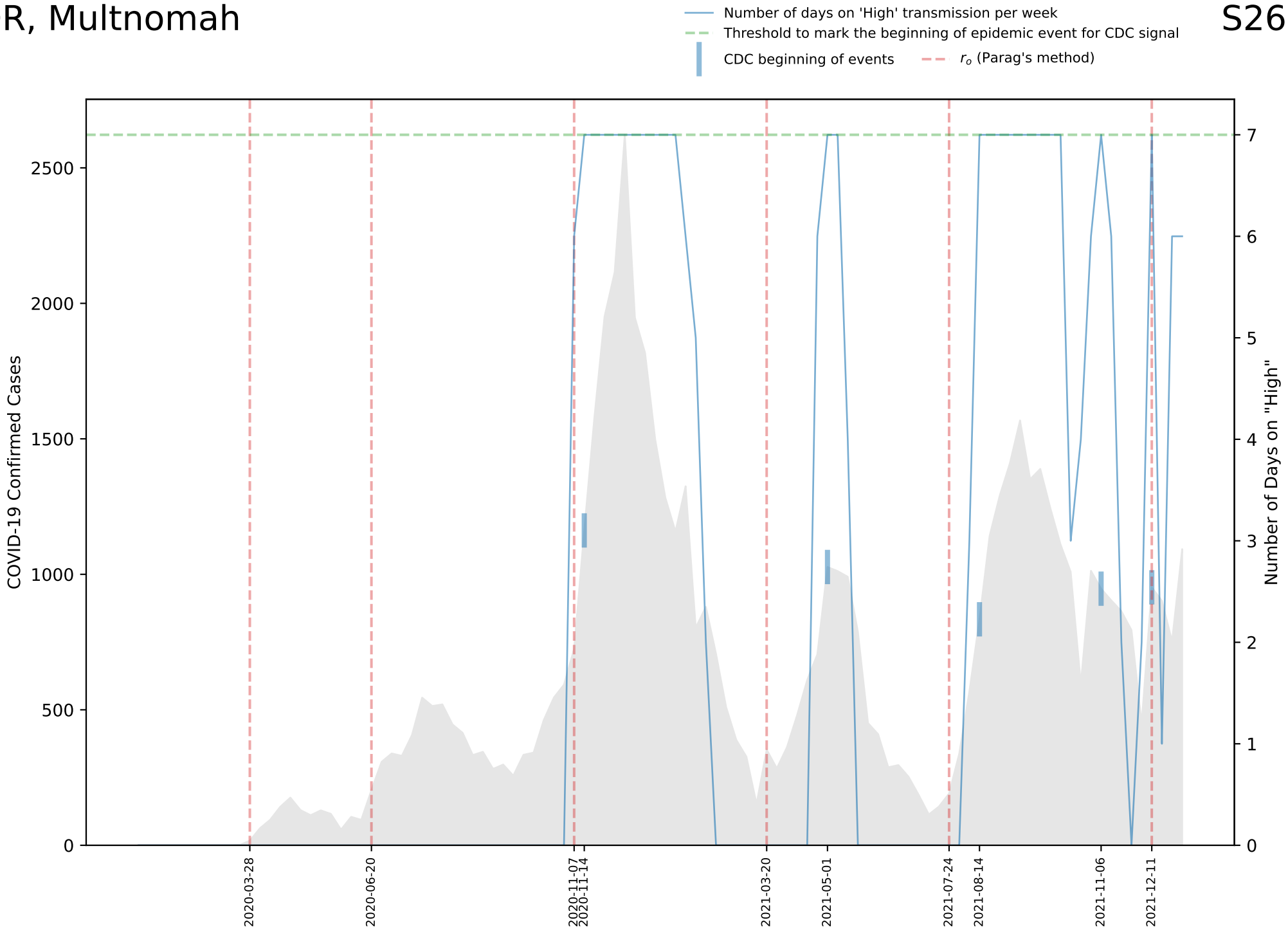
OH, Warren

S264



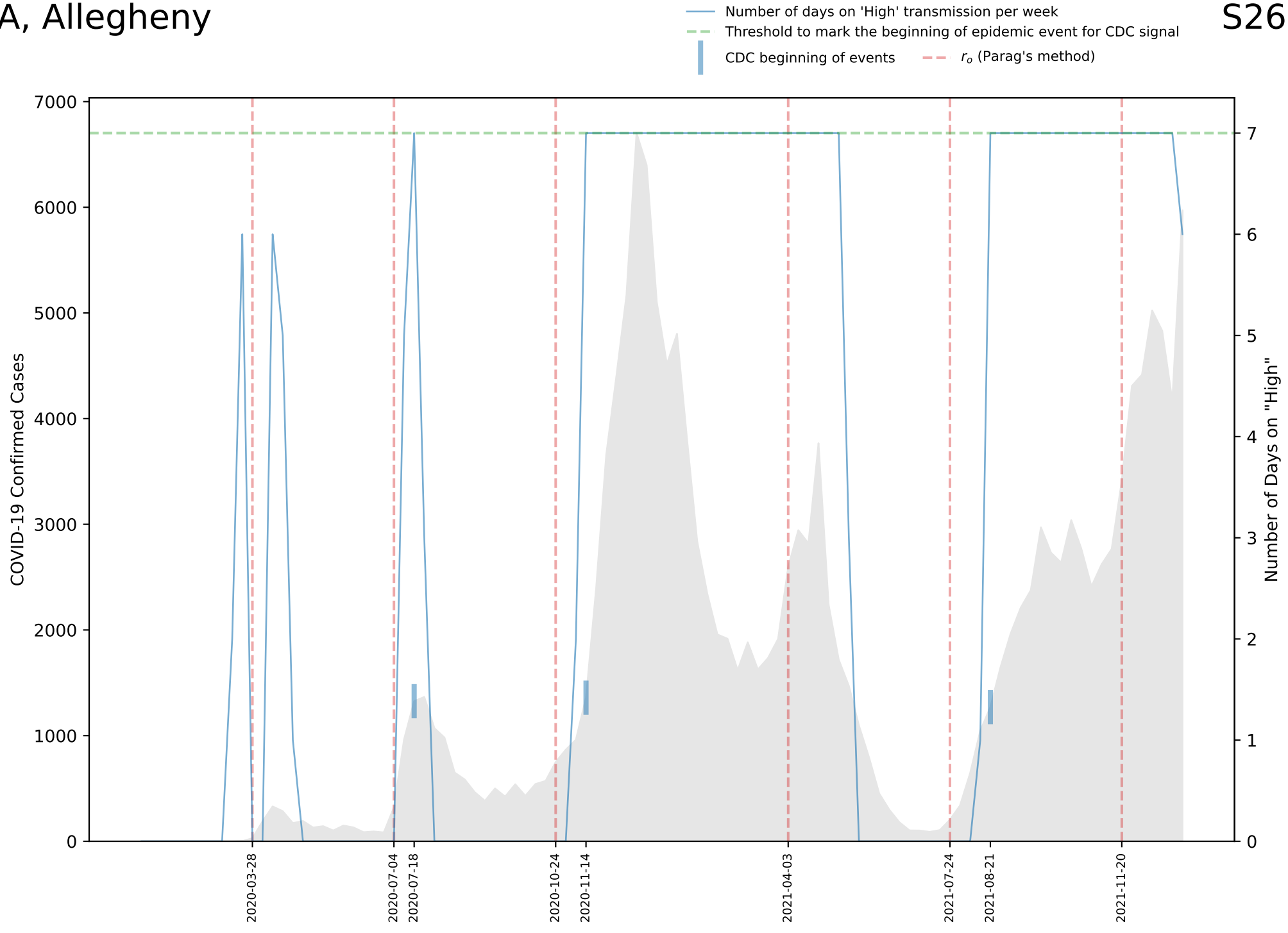
OR, Multnomah

S265



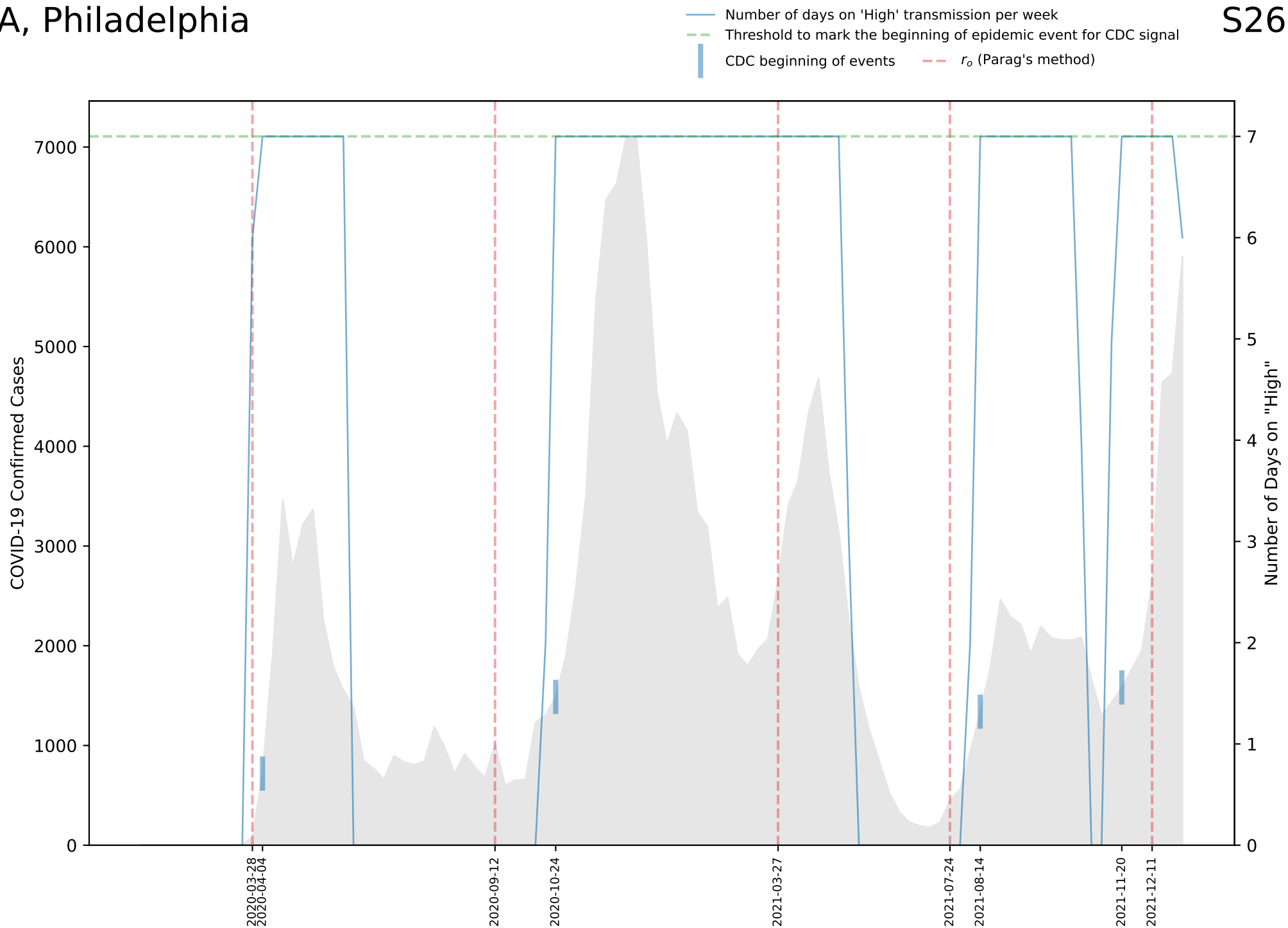
PA, Allegheny

S266



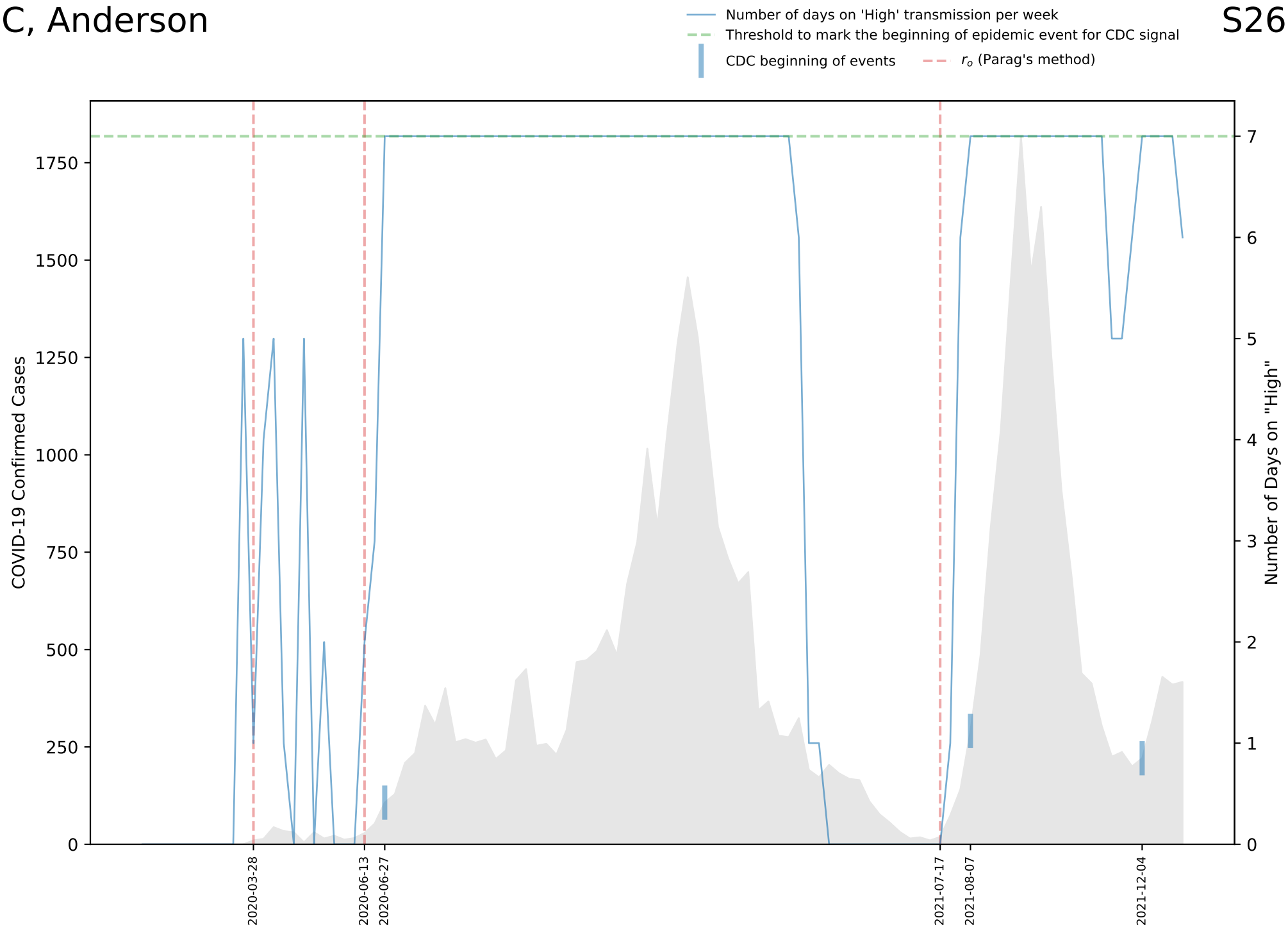
PA, Philadelphia

S267



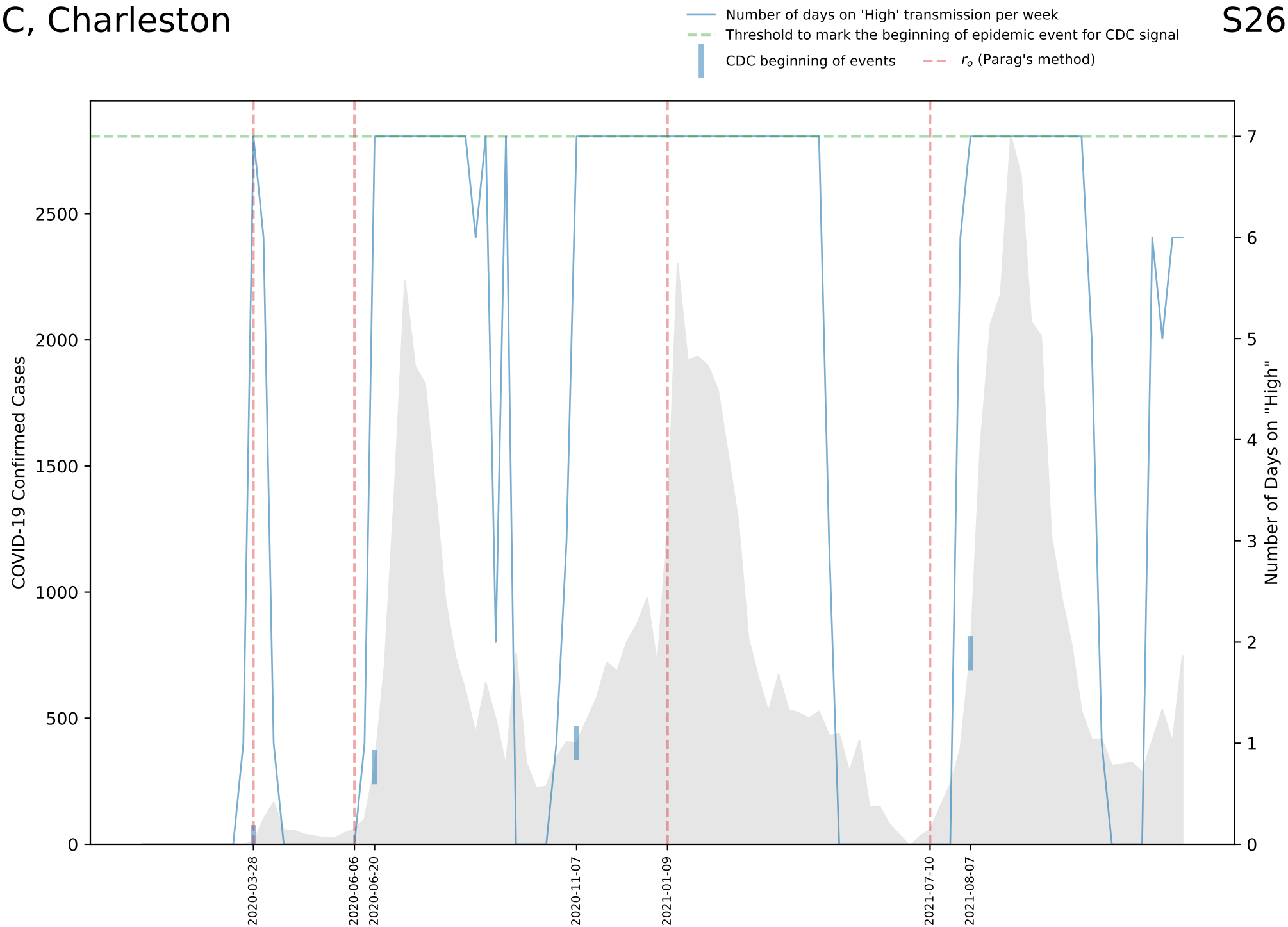
SC, Anderson

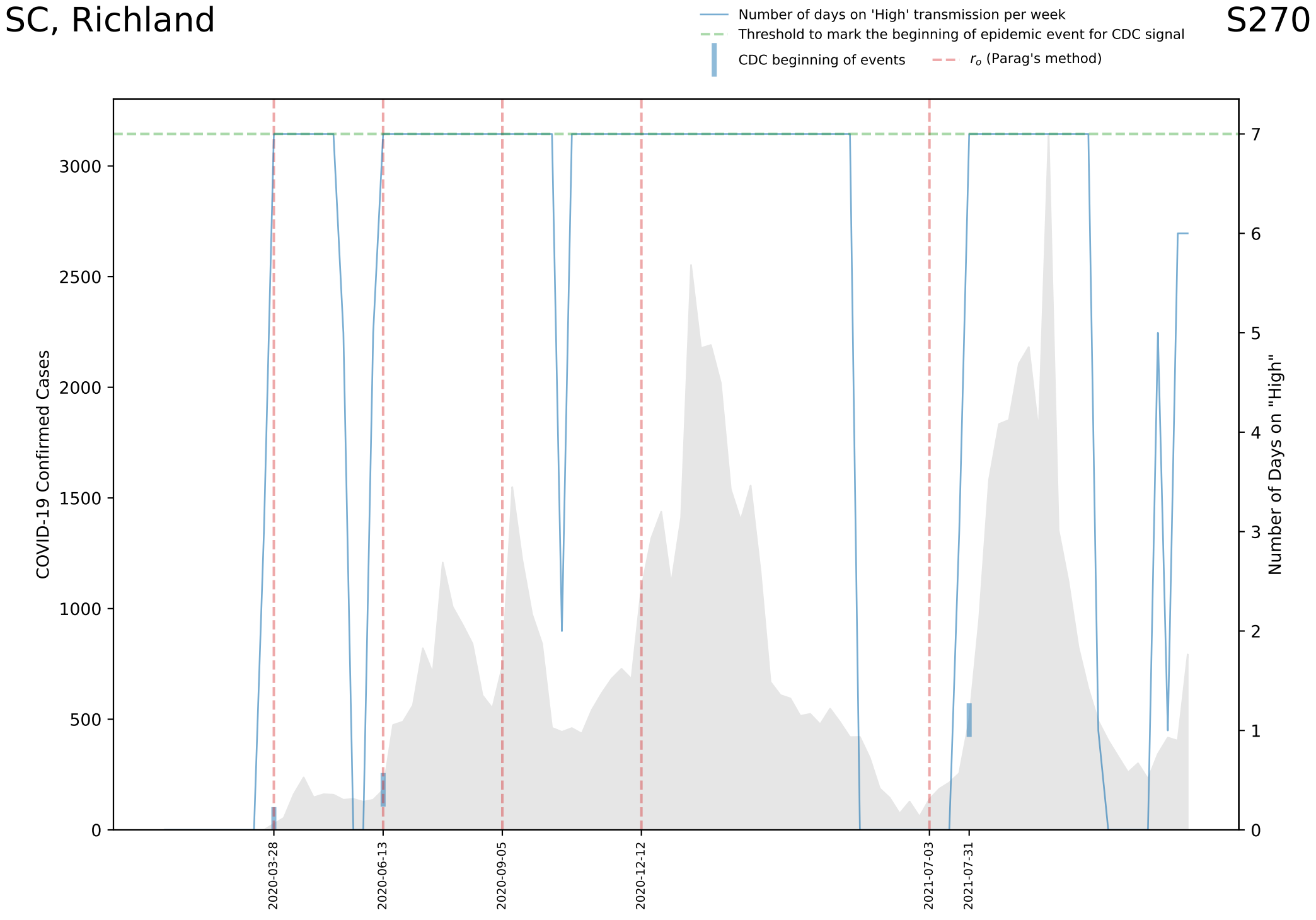
S268

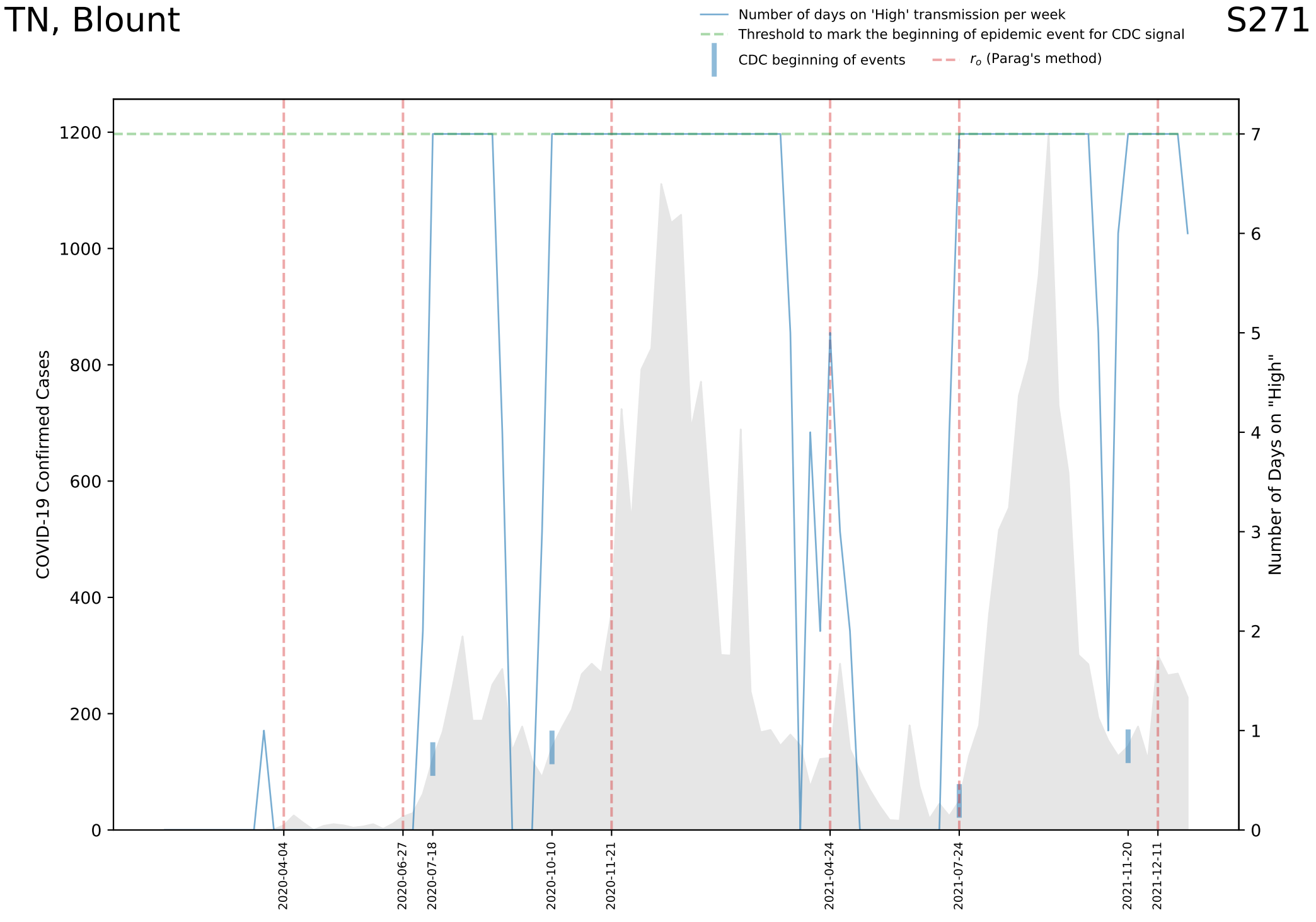


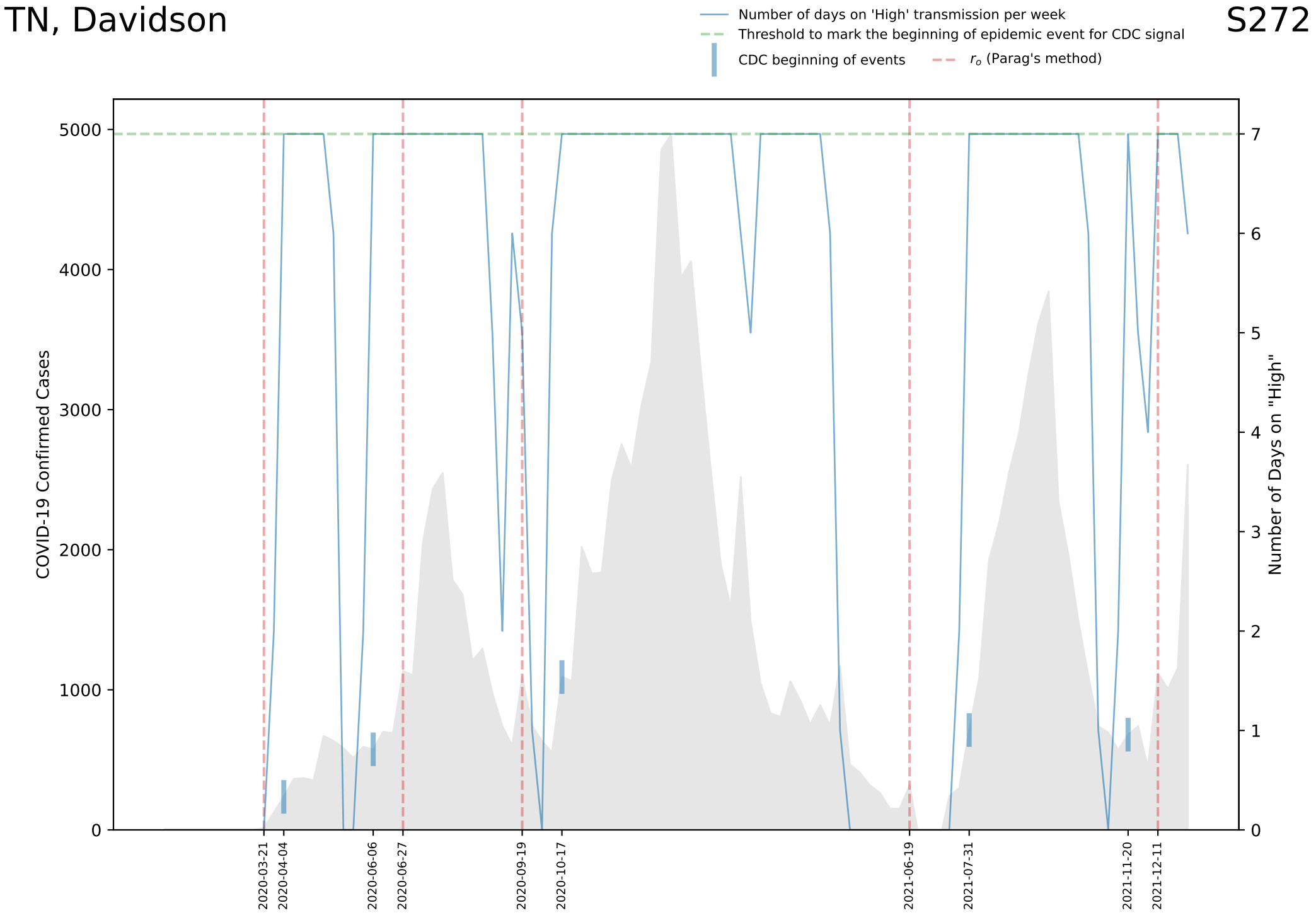
SC, Charleston

S269



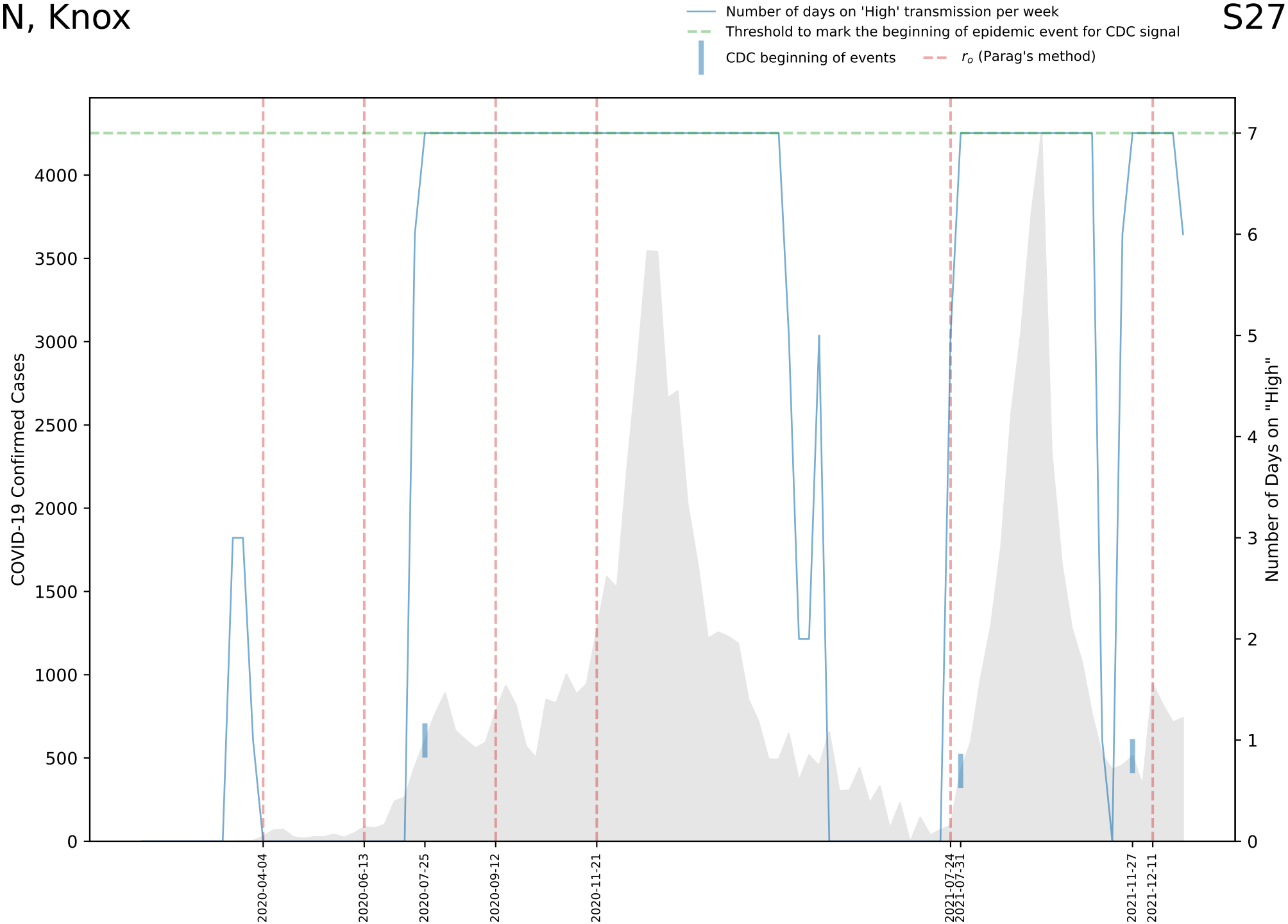

SC, Richland
S270
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
3000
0
1
2
3
4
5
6
7
2020-03-28
2020-06-13
2020-09-05
2020-12-12
2021-07-03
2021-07-31

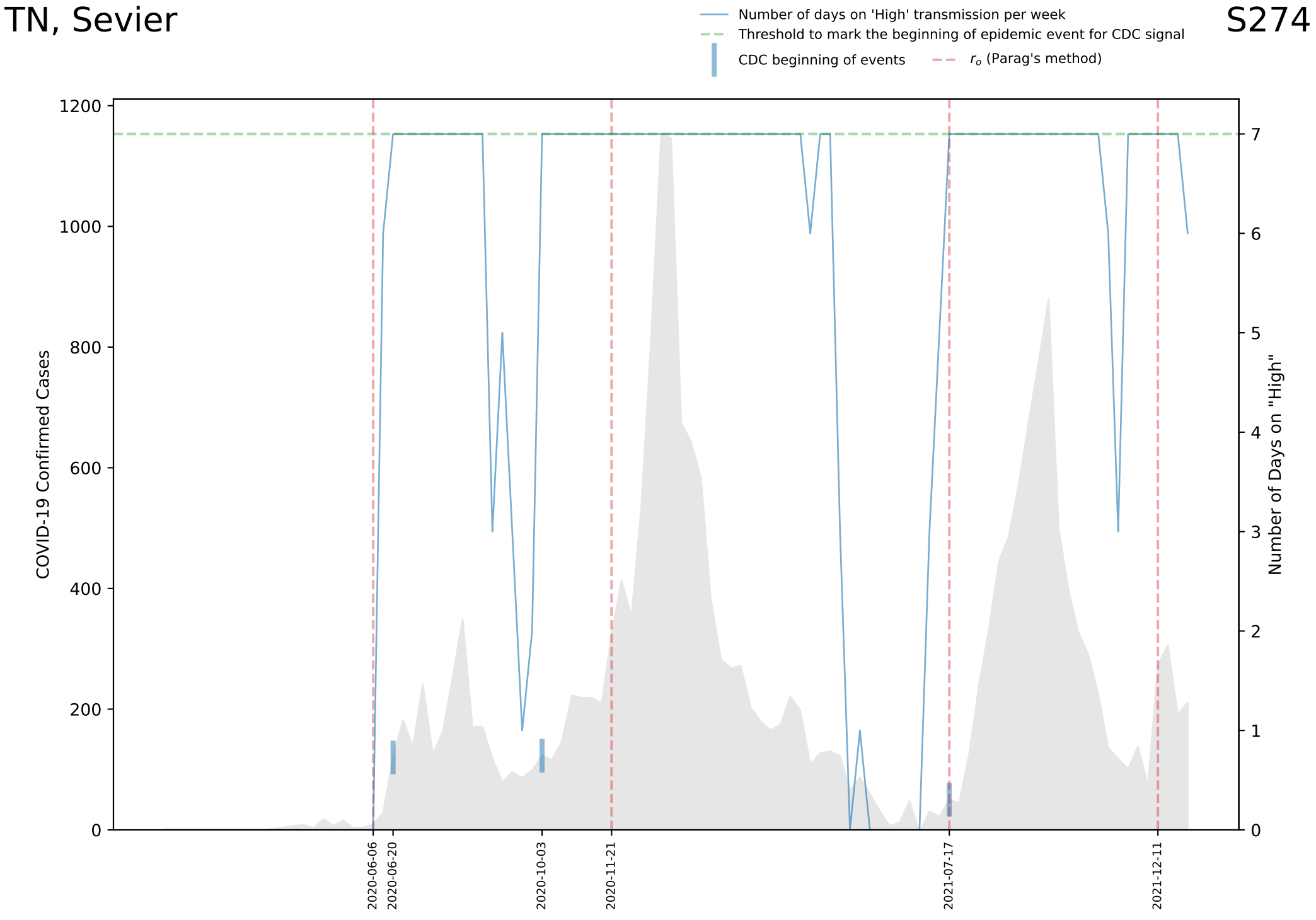

TN, Blount
S271
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
200
400
600
800
1000
1200
0
1
2
3
4
5
6
7
2020-04-04
2020-06-27
2020-07-18
2020-10-10
2020-11-21
2021-04-24
2021-07-24
2021-11-20
2021-12-11

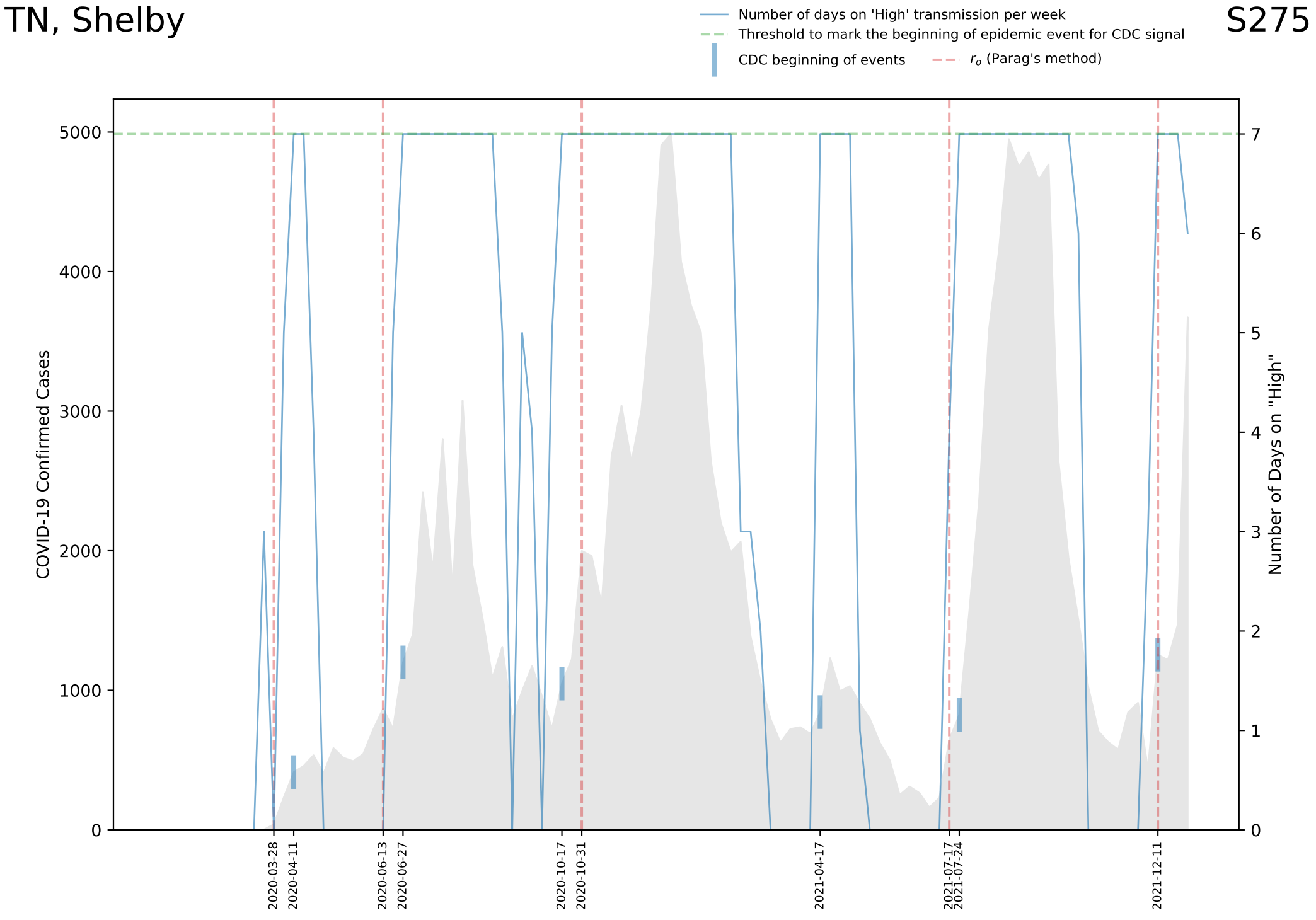

TN, Davidson
S272
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
0
1
2
3
4
5
6
7
2020-03-21
2020-04-04
2020-06-06
2020-06-27
2020-09-19
2020-10-17
2021-06-19
2021-07-31
2021-11-20
2021-12-11

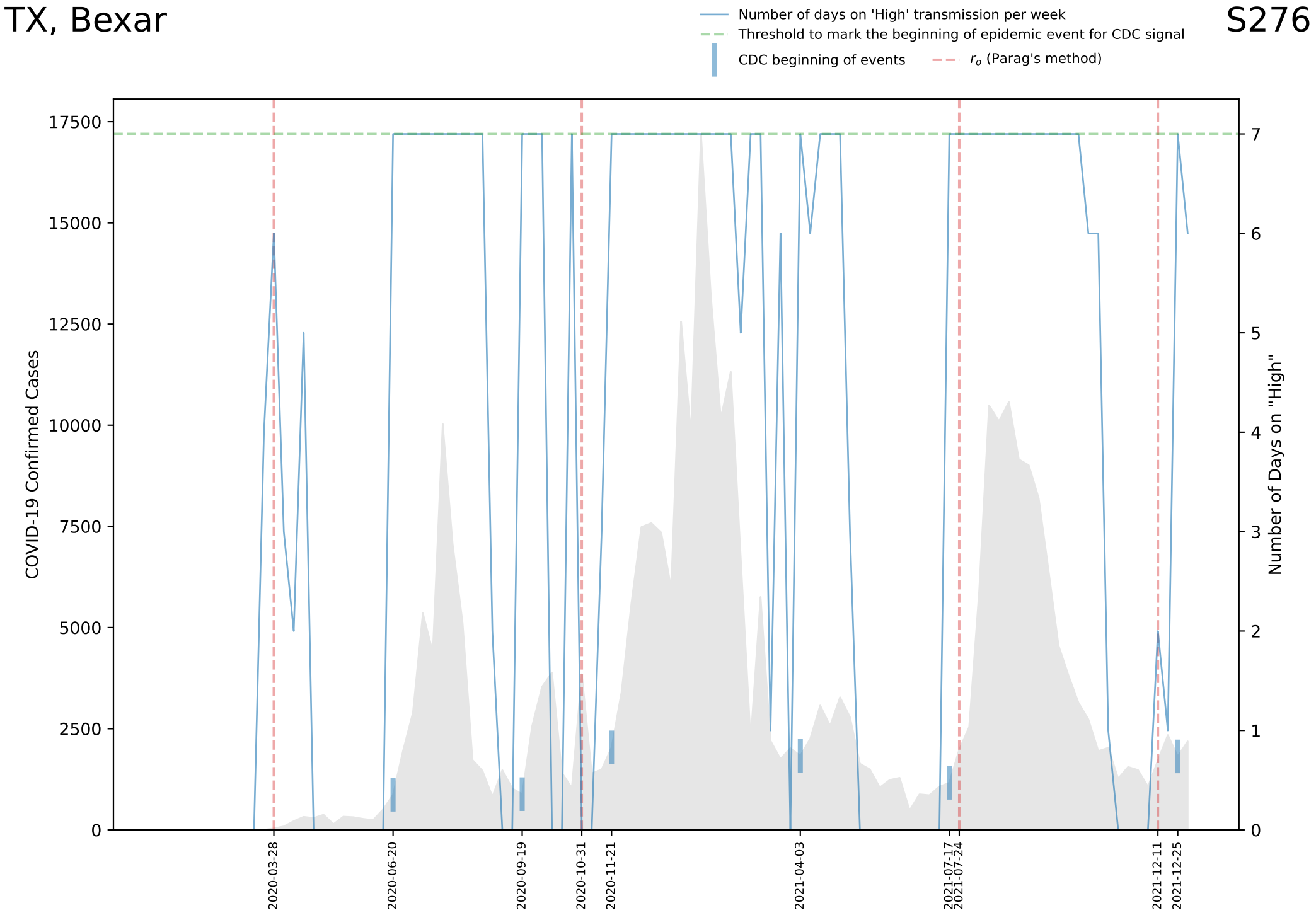
TN, Knox

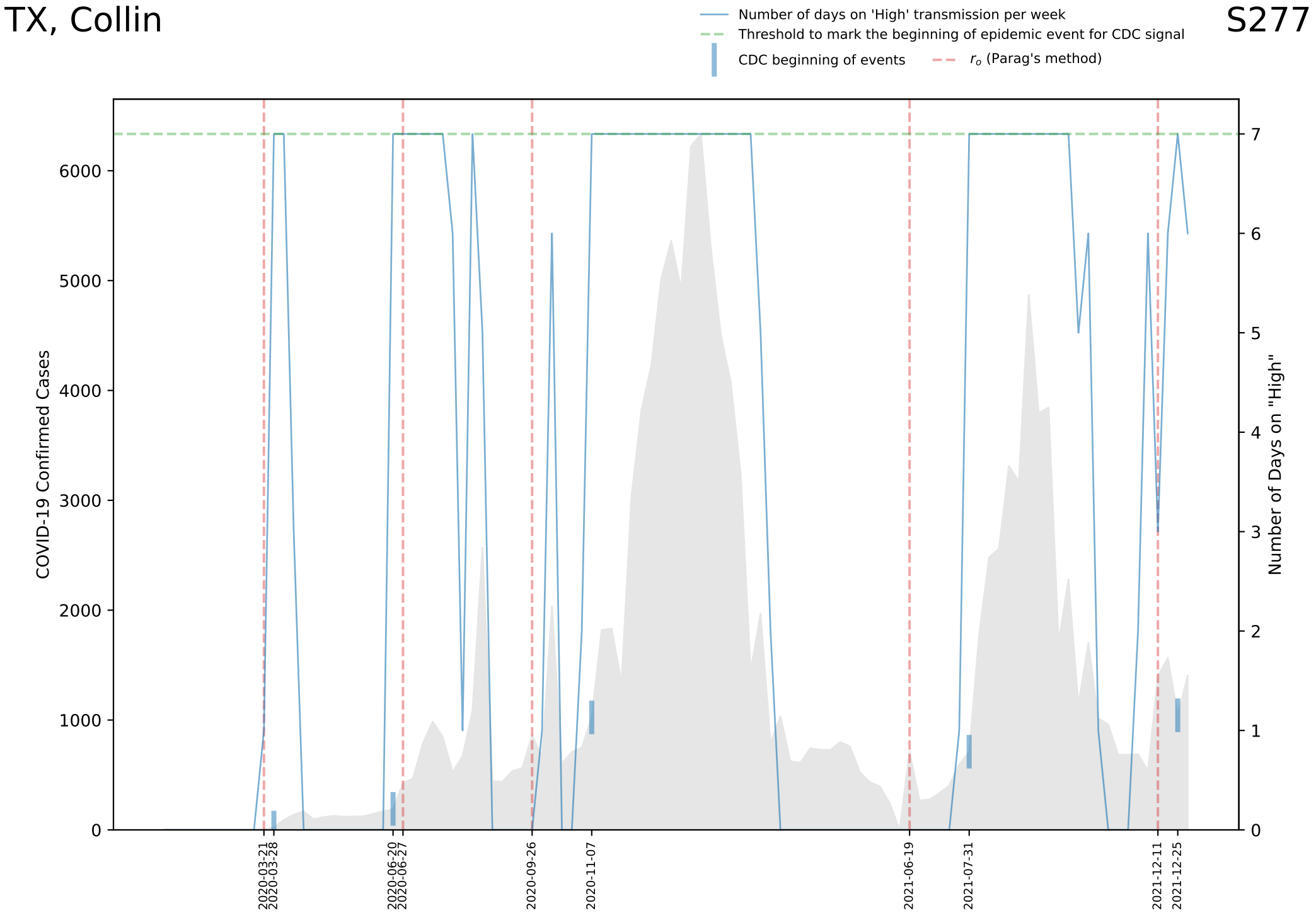
S273


Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
500
1000
1500
2000
2500
3000
3500
4000
0
1
2
3
4
5
6
7
2020-04-04
2020-06-13
2020-07-25
2020-09-12
2020-11-21
2021-07-24
2021-07-31
2021-11-27
2021-12-11


TN, Sevier
S274
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
200
400
600
800
1000
1200
0
1
2
3
4
5
6
7
2020-06-06
2020-06-20
2020-10-03
2020-11-21
2021-07-17
2021-12-11

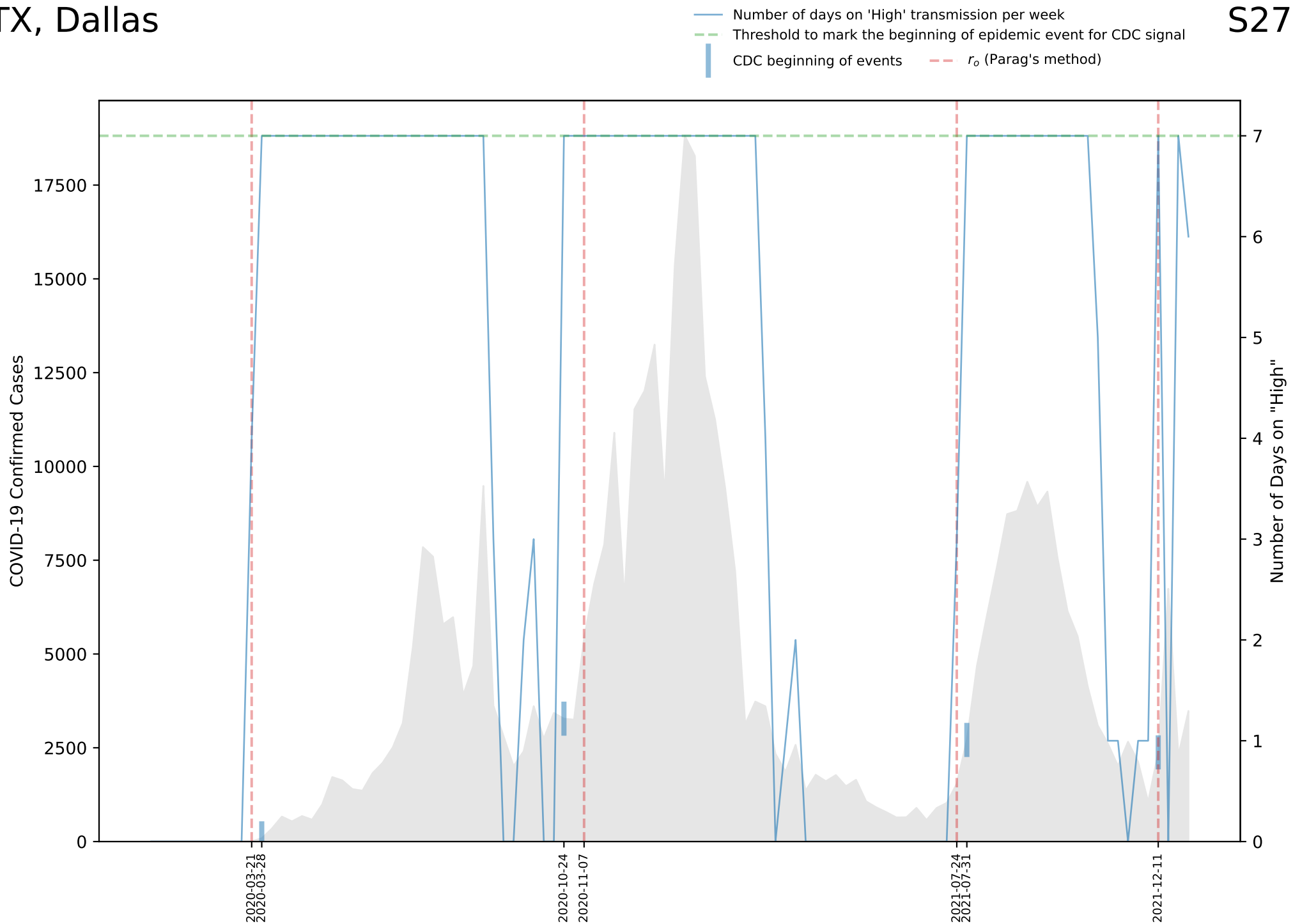

TN, Shelby
S275
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
0
1
2
3
4
5
6
7
2020-03-28
2020-04-11
2020-06-13
2020-06-27
2020-10-17
2020-10-31
2021-04-17
2021-07-17
2021-07-24
2021-12-11

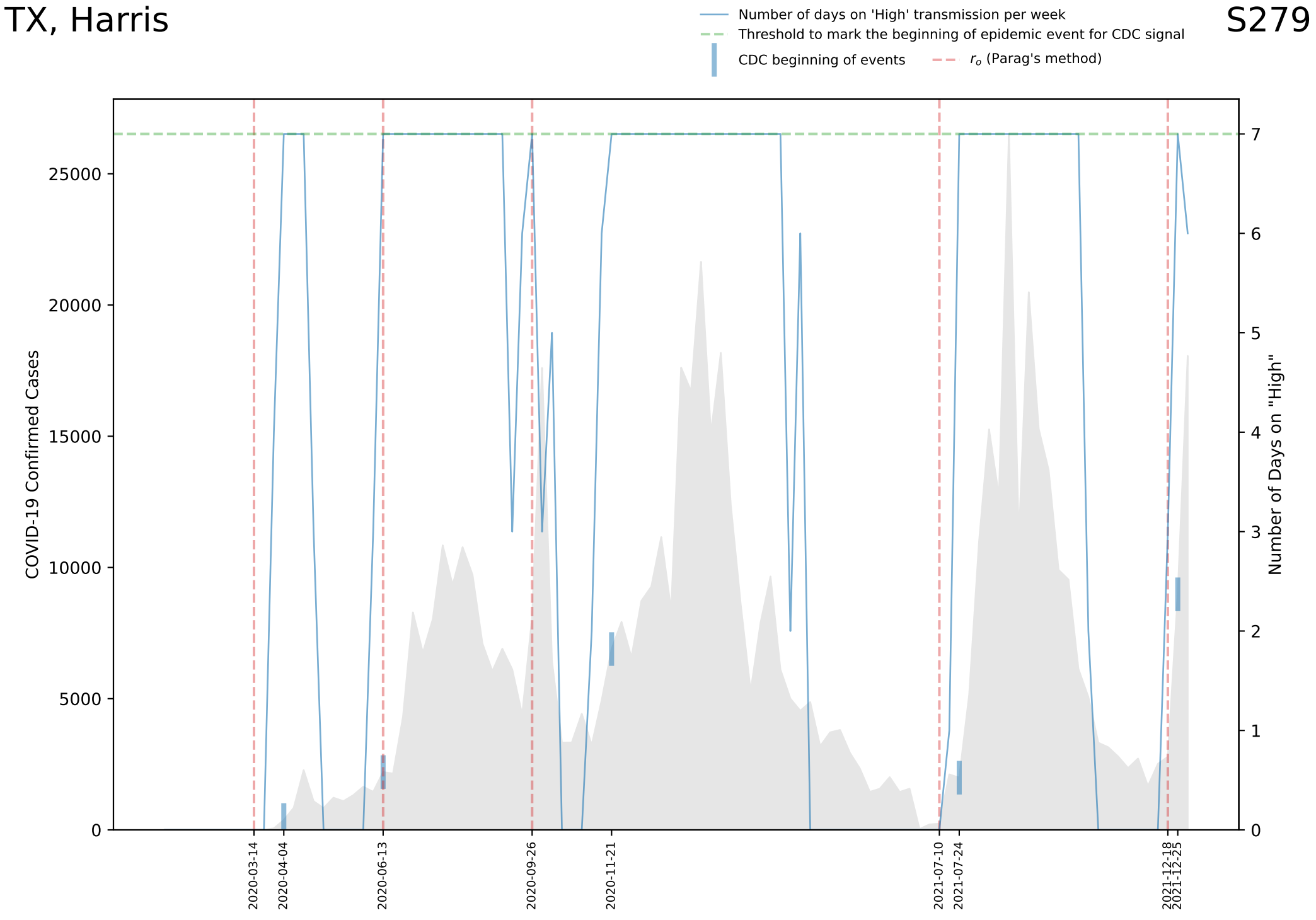

TX, Bexar
S276
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
17500
15000
12500
10000
7500
5000
2500
0
7
6
5
4
3
2
1
0
2020-03-28
2020-06-20
2020-09-19
2020-10-31
2020-11-21
2021-04-03
2021-07-17
2021-07-24
2021-12-11
2021-12-25

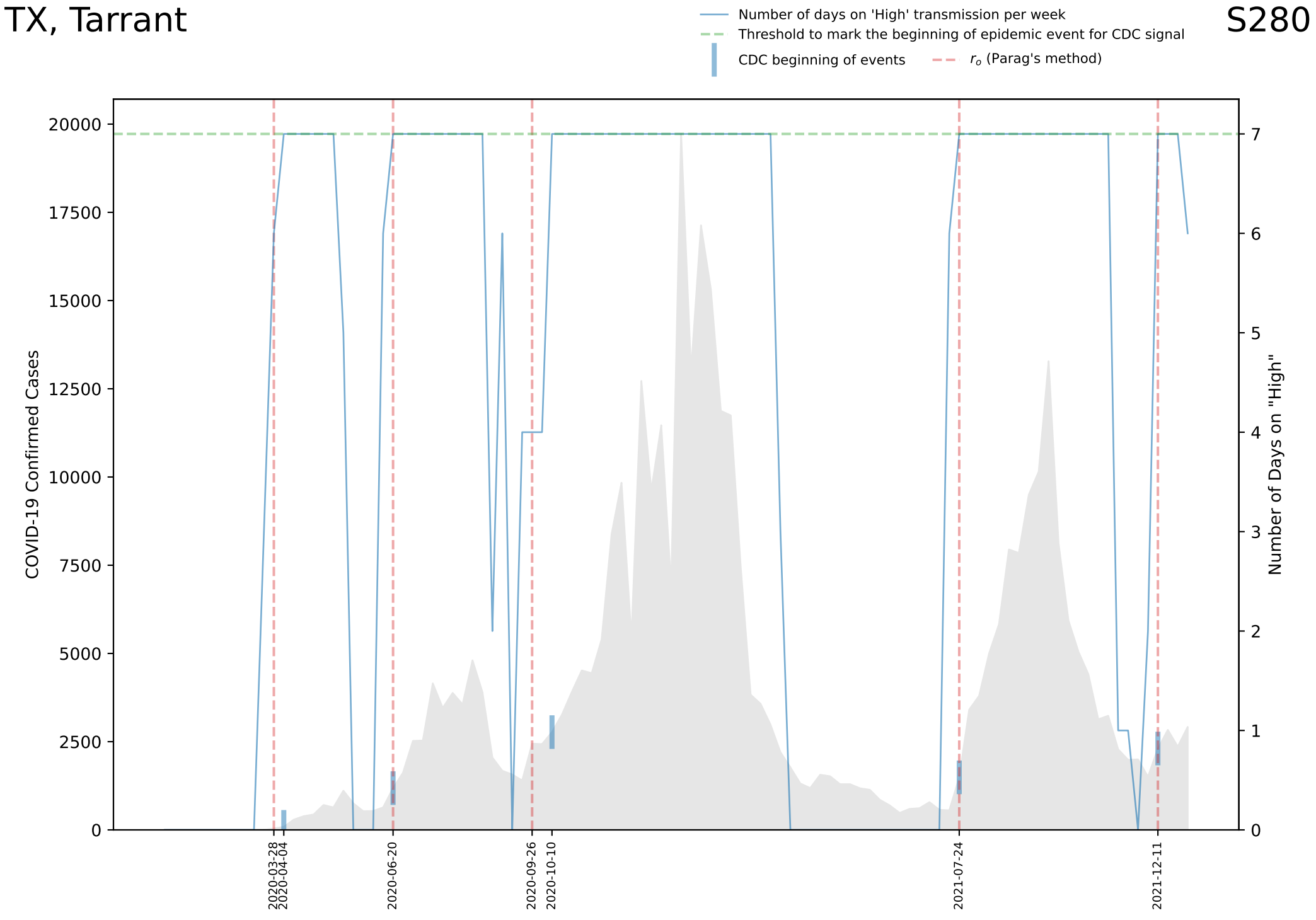

TX, Collin
S277
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
0
1
2
3
4
5
6
7
2020-03-21
2020-03-28
2020-06-20
2020-06-27
2020-09-26
2020-11-07
2021-06-19
2021-07-31
2021-12-11
2021-12-25

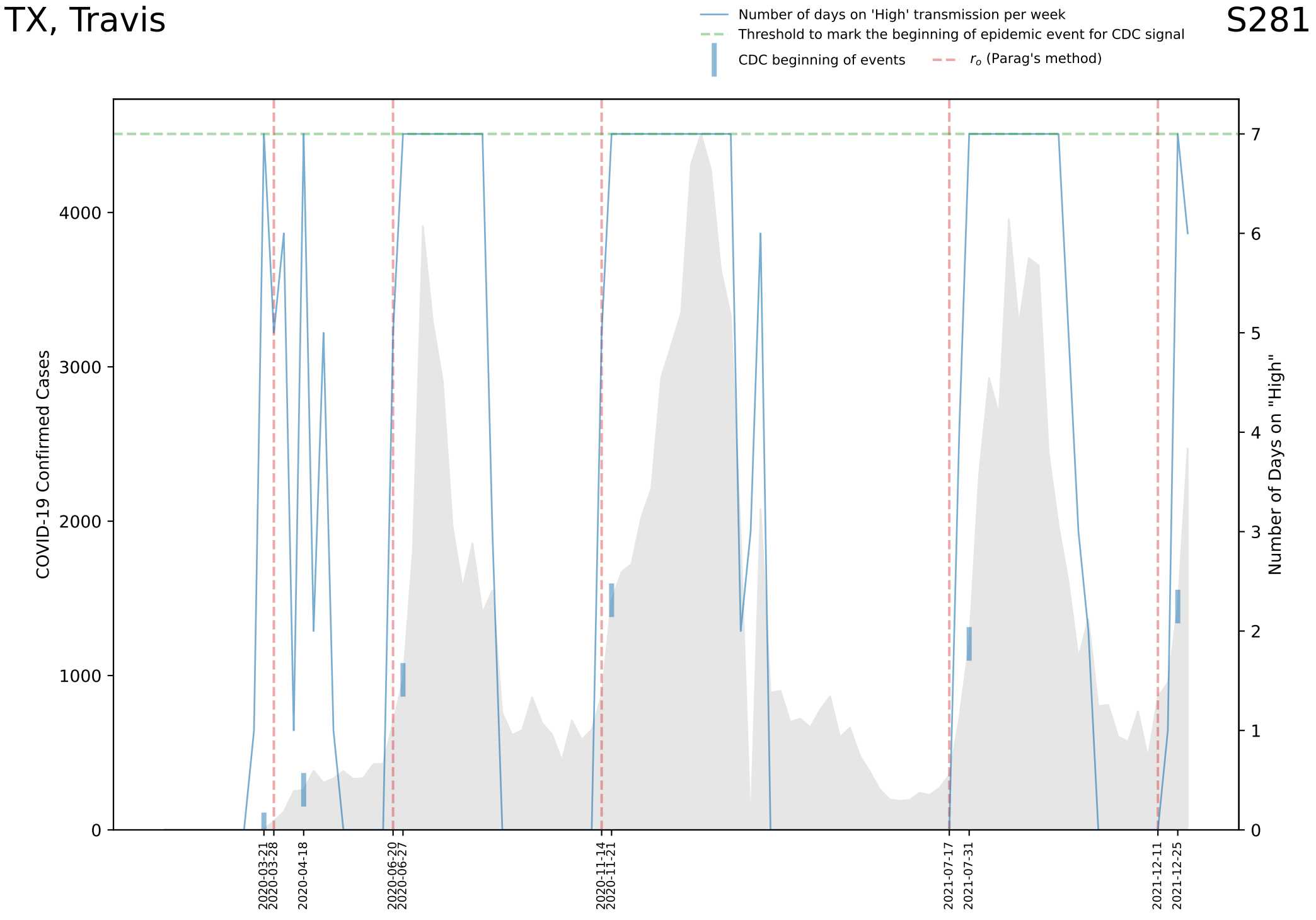
TX, Dallas

S278



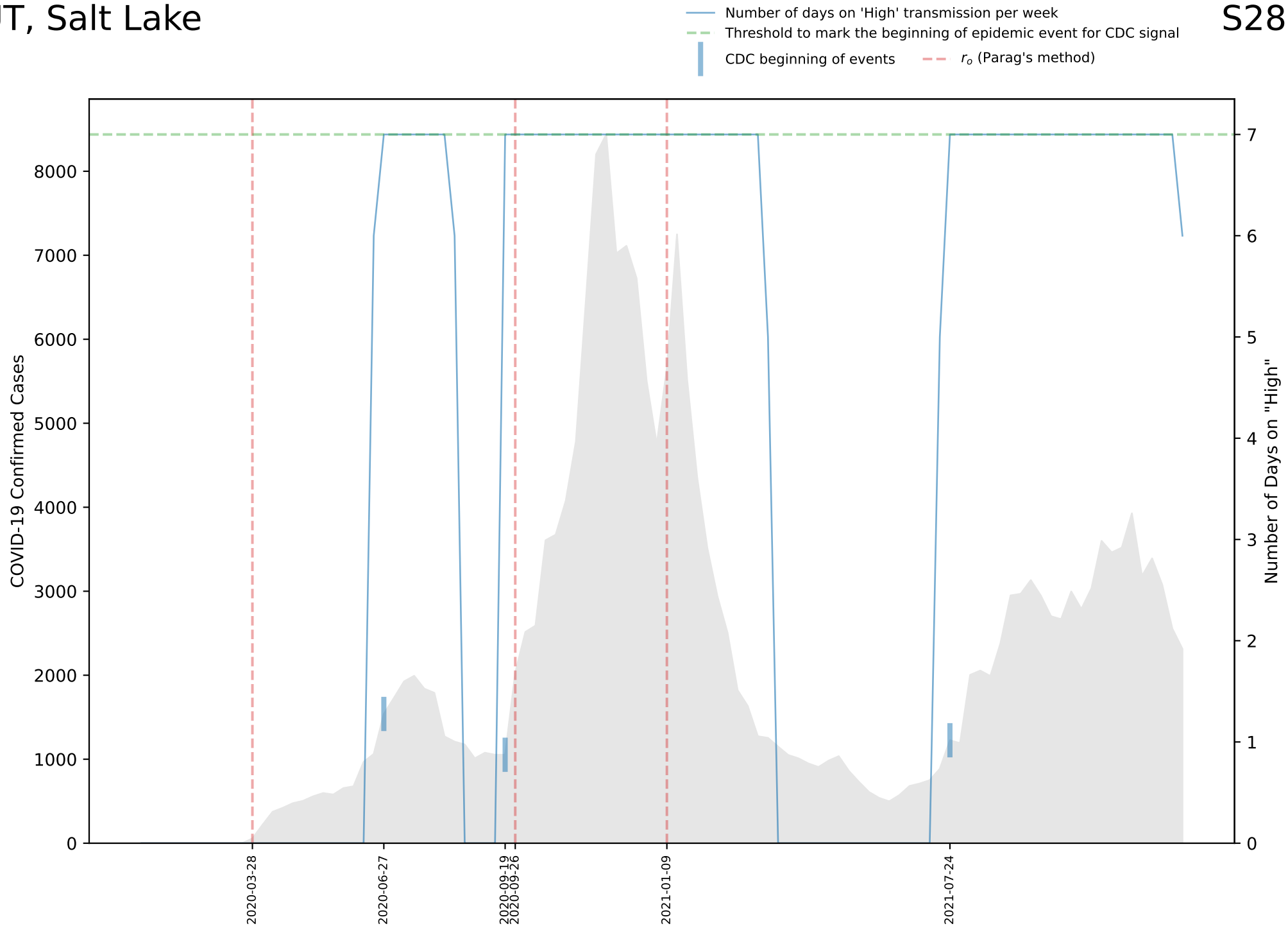

TX, Harris
S279
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
5000
10000
15000
20000
25000
0
1
2
3
4
5
6
7
2020-03-14
2020-04-04
2020-06-13
2020-09-26
2020-11-21
2021-07-10
2021-07-24
2021-12-18
2021-12-25


TX, Tarrant
S280
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
2500
5000
7500
10000
12500
15000
17500
20000
0
1
2
3
4
5
6
7
2020-03-28
2020-04-04
2020-06-20
2020-09-26
2020-10-10
2021-07-24
2021-12-11


TX, Travis
S281
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
0
1
2
3
4
5
6
7
2020-03-21
2020-03-28
2020-04-18
2020-06-20
2020-06-27
2020-11-14
2020-11-21
2021-07-17
2021-07-31
2021-12-11
2021-12-25

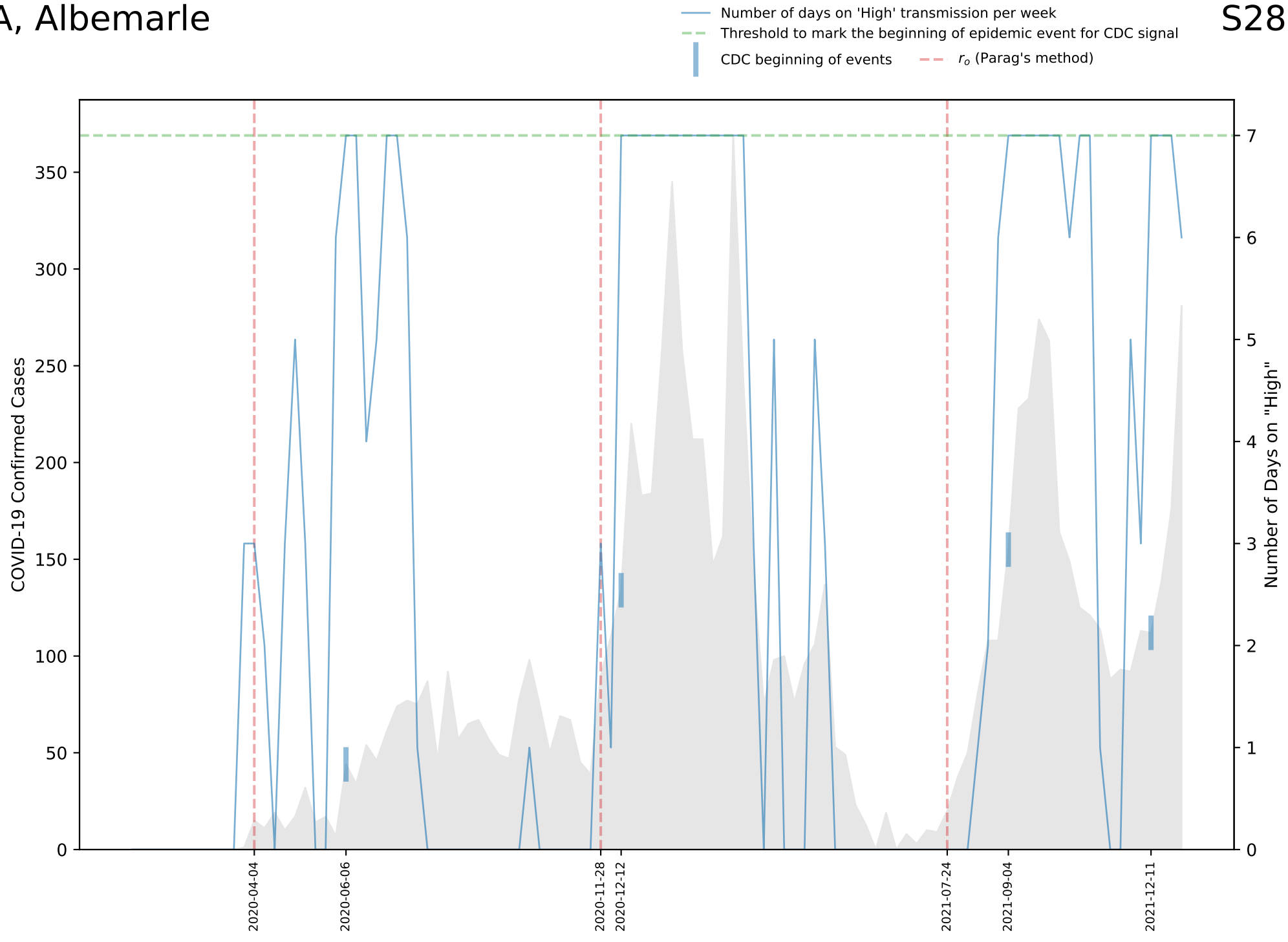
UT, Salt Lake

S282



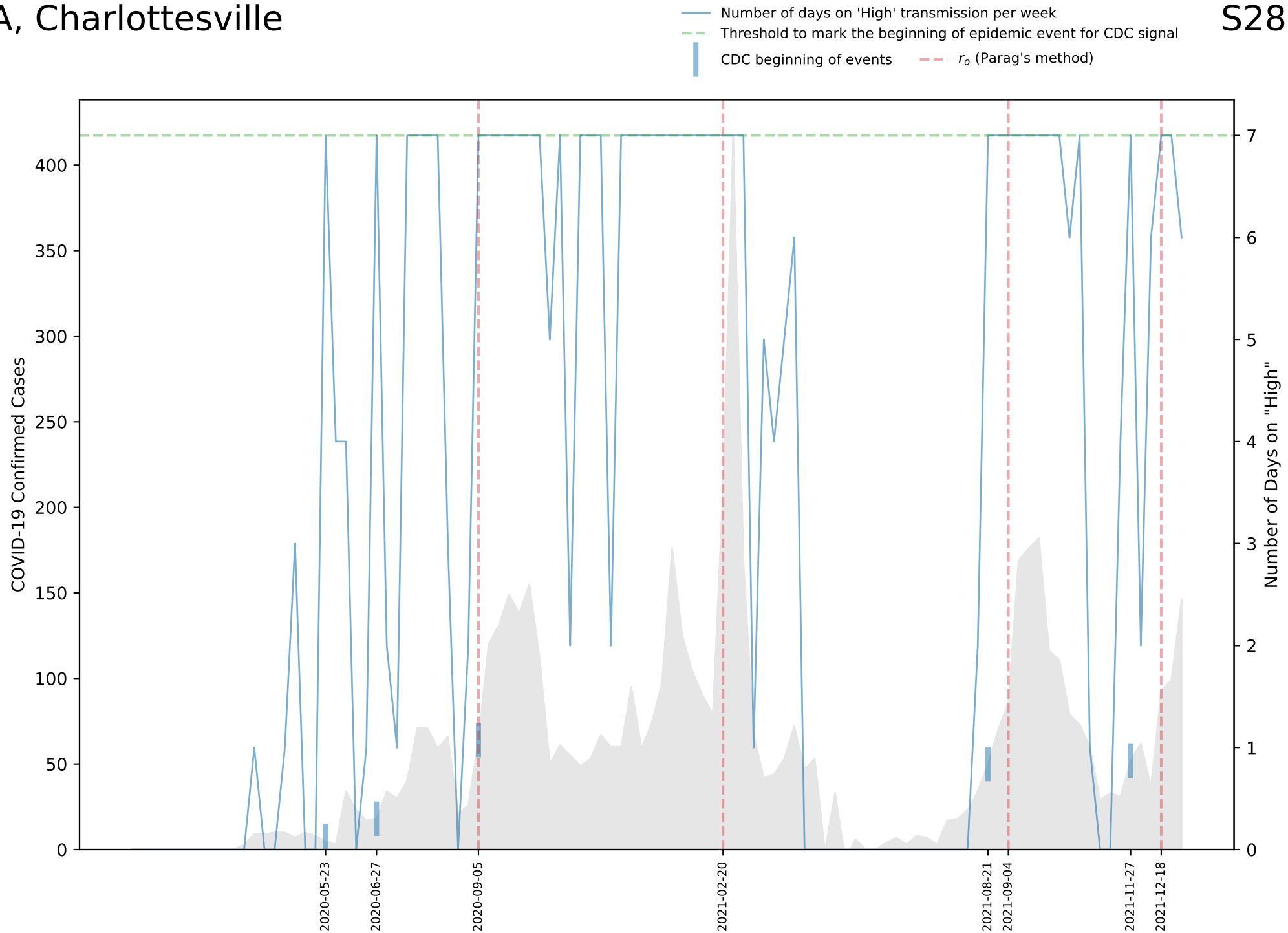
VA, Albemarle

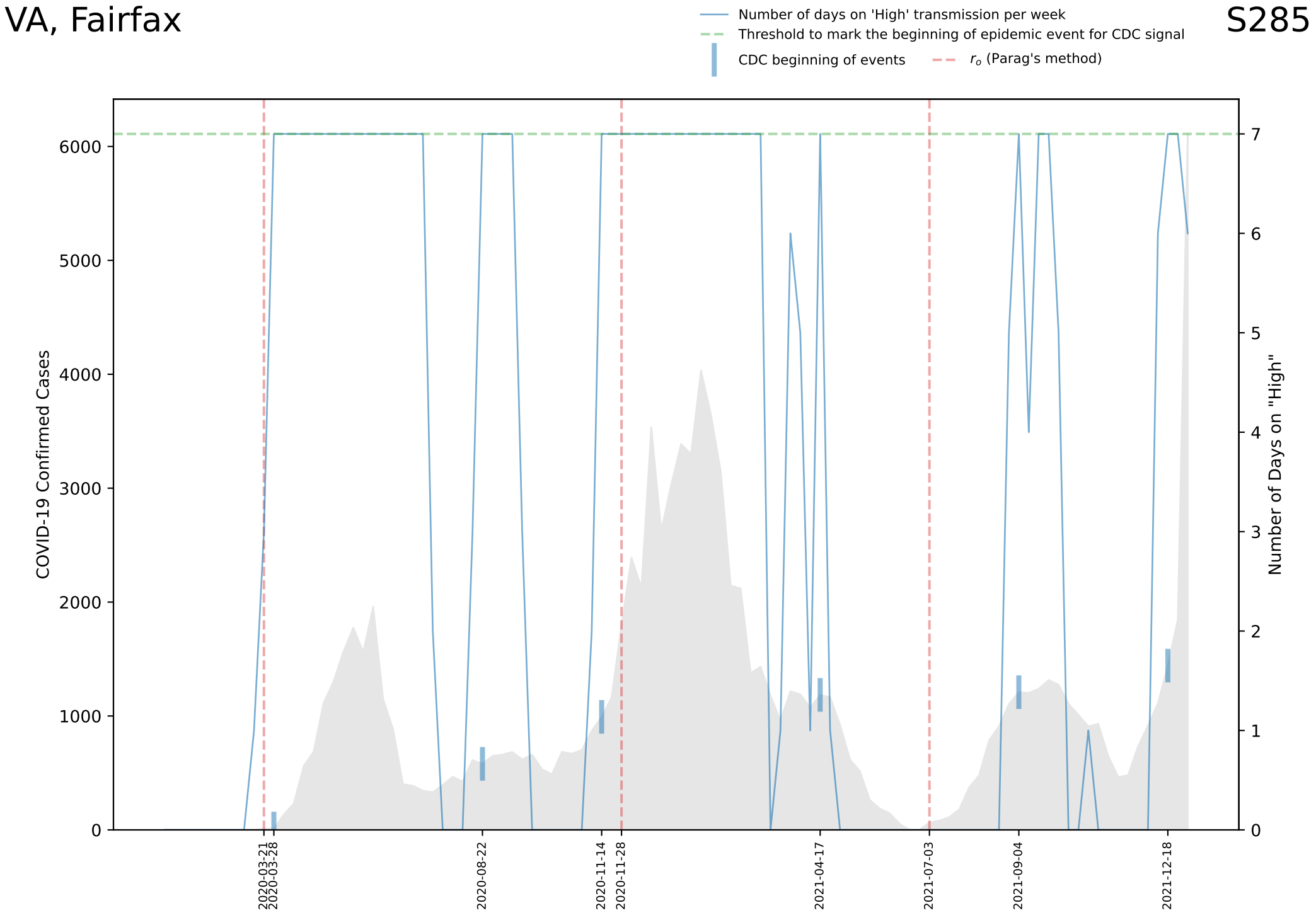
S283

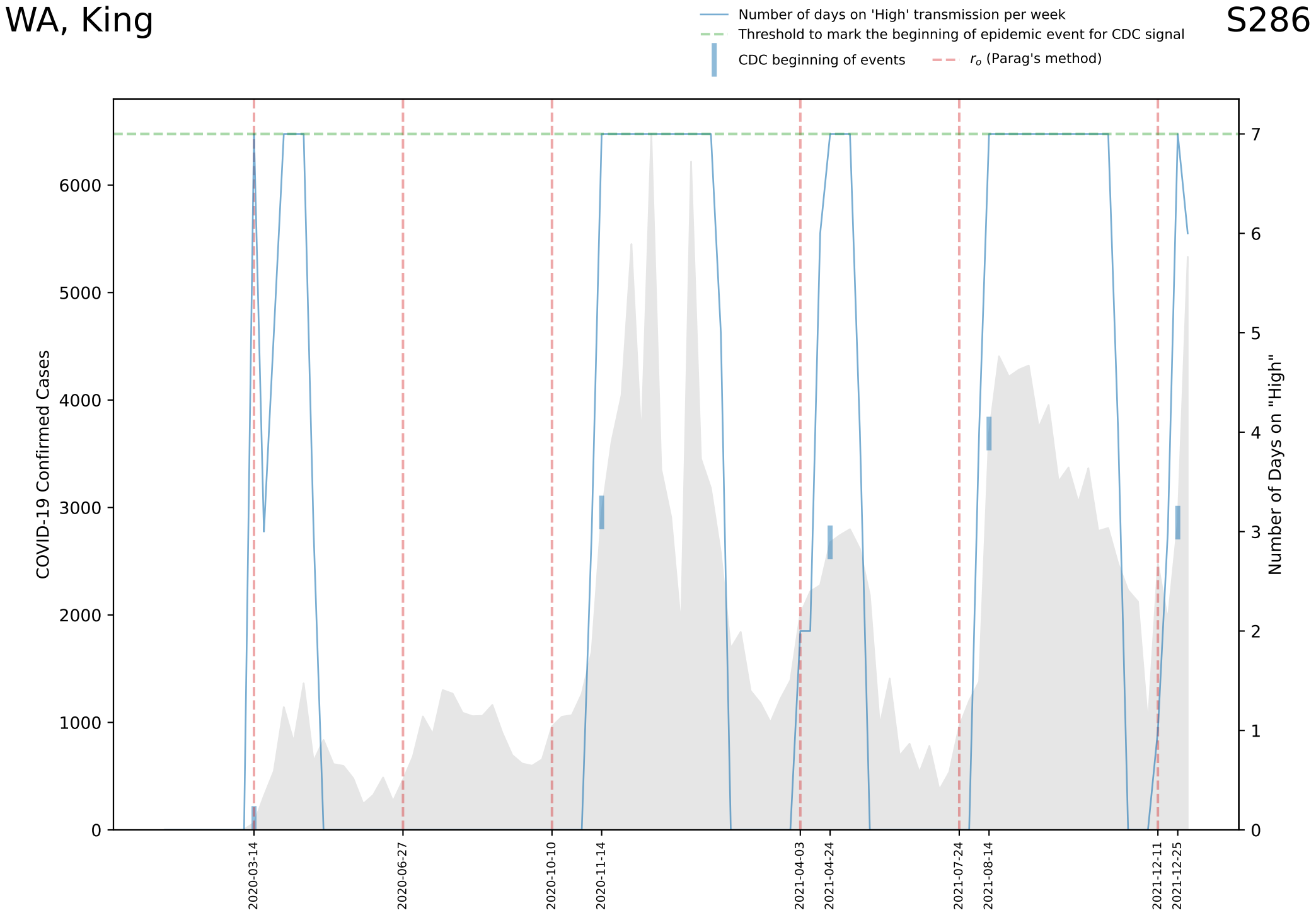


VA, Charlottesville

S284




VA, Fairfax
S285
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
0
1
2
3
4
5
6
7
2020-03-21
2020-03-28
2020-08-22
2020-11-14
2020-11-28
2021-04-17
2021-07-03
2021-09-04
2021-12-18


WA, King
S286
Number of days on 'High' transmission per week
Threshold to mark the beginning of epidemic event for CDC signal
CDC beginning of events
r_o (Parag's method)
COVID-19 Confirmed Cases
Number of Days on "High"
0
1000
2000
3000
4000
5000
6000
0
1
2
3
4
5
6
7
2020-03-14
2020-06-27
2020-10-10
2020-11-14
2021-04-03
2021-04-24
2021-07-24
2021-08-14
2021-12-11
2021-12-25

Model	Naive			Single Source ("How long does covid last?")			Single Source ("side effects of vaccine")			Multiple Sources		
Time	Before 2021-12-01	After 2021-12-01	Total	Before 2021-12-01	After 2021-12-01	Total	Before 2021-12-01	After 2021-12-01	Total	Before 2021-12-01	After 2021-12-01	Total
Total Events	305 (100%)	62 (100%)	367 (100%)	305 (100%)	62 (100%)	367 (100%)	305 (100%)	62 (100%)	367 (100%)	305 (100%)	62 (100%)	367 (100%)
Early Warning	279 (91%)	58 (94%)	337 (92%)	202 (66%)	35 (56%)	237 (65%)	184 (60%)	43 (69%)	227 (62%)	200 (66%)	54 (87%)	254 (69%)
Sync Warning	19 (6%)	4 (6%)	23 (6%)	23 (8%)	2 (3%)	25 (7%)	16 (5%)	3 (5%)	19 (5%)	30 (10%)	0 (0%)	30 (8%)
Late Warning	1 (0%)	0 (0%)	1 (0%)	26 (9%)	4 (6%)	30 (8%)	14 (5%)	1 (2%)	15 (4%)	26 (9%)	0 (0%)	26 (7%)
Soft Warning	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	39 (13%)	8 (13%)	47 (13%)
Missed Outbreaks	6 (2%)	0 (0%)	6 (2%)	54 (18%)	21 (34%)	75 (20%)	91 (30%)	15 (24%)	106 (29%)	10 (3%)	0 (0%)	10 (3%)
Warning, increase observed	224	28	252	122	17	139	148	23	171	35	1	36
False Alarm	502	110	612	280	47	327	374	105	479	95	15	110

Table S1: **A Summary of the results at the county-level.** Here *EWS* stands for Early Warning System.

Model	Naive			Single Source ("How long does covid last?")			Single Source ("chest pain")			Multiple Sources		
Time	Before 2021-12-01	After 2021-12-01	Total	Before 2021-12-01	After 2021-12-01	Total	Before 2021-12-01	After 2021-12-01	Total	Before 2021-12-01	After 2021-12-01	Total
Total Events	183 (100%)	19 (100%)	202 (100%)	183 (100%)	19 (100%)	202 (100%)	183 (100%)	19 (100%)	202 (100%)	183 (100%)	19 (100%)	202 (100%)
Early Warning	160 (87%)	18 (95%)	178 (88%)	115 (63%)	13 (68%)	128 (63%)	108 (59%)	12 (63%)	120 (59%)	101 (55%)	18 (95%)	119 (59%)
Sync Warning	22 (12%)	1 (5%)	23 (11%)	11 (6%)	2 (11%)	13 (6%)	12 (7%)	0 (0%)	12 (6%)	16 (9%)	0 (0%)	16 (8%)
Late Warning	1 (1%)	0 (0%)	1 (0%)	17 (9%)	1 (5%)	18 (9%)	12 (7%)	0 (0%)	12 (6%)	20 (11%)	0 (0%)	20 (10%)
Soft Warning	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	36 (20%)	1 (5%)	37 (18%)
Missed Outbreaks	0 (0%)	0 (0%)	0 (0%)	40 (22%)	3 (16%)	43 (21%)	51 (28%)	7 (37%)	58 (29%)	10 (5%)	0 (0%)	10 (5%)
Warning, increase observed	74	8	82	57	6	63	35	6	41	18	0	18
False Alarm	171	39	210	104	15	119	112	9	121	23	1	24

Table S2: **A Summary of the results at the state-level.** Here *EWS* stands for Early Warning System.

N = 367	Early Warning	Sync Warning	Late Warning	Missed Outbreaks	Warning, activity increases	False Alarm
(GT) how long does covid last	237 (65%)	25 (7%)	30 (8%)	74 (20%)	139	327
(GT) side effects of vaccine	227 (62%)	19 (5%)	15 (4%)	105 (29%)	171	479
(GT) chest pain	201 (55%)	19 (5%)	38 (10%)	108 (29%)	128	301
(GT) covid 19Who	169 (46%)	25 (7%)	20 (5%)	152 (41%)	87	269
COVID-19 confirmed deaths	147 (40%)	16 (4%)	31 (8%)	172 (47%)	93	249
(GT) covidSymptoms	145 (40%)	30 (8%)	50 (14%)	141 (38%)	58	122
(GT) after covid vaccine	141 (38%)	20 (5%)	29 (8%)	176 (48%)	182	463
COVID-19 confirmed cases	135 (37%)	59 (16%)	58 (16%)	114 (31%)	100	204
(GT) effects of covid vaccine	107 (29%)	14 (4%)	20 (5%)	225 (61%)	110	374
(GT) fever	85 (23%)	24 (7%)	21 (6%)	236 (64%)	40	107
(GT) covid 19	79 (22%)	22 (6%)	53 (14%)	212 (58%)	52	127
(gt) covid	51 (14%)	19 (5%)	65 (18%)	231 (63%)	10	54
Twitter	41 (11%)	14 (4%)	56 (15%)	255 (69%)	20	40
Up2Date	37 (10%)	7 (2%)	24 (7%)	298 (81%)	10	32

Table S3: **County-Level results for the Single Source Method**

N=202	Early Warning	Sync Warning	Late Warning	Missed Outbreaks	Warning, activity increases	False Alarm
(GT) how long does covid last	128 (63%)	13 (6%)	18 (9%)	42 (21%)	63	119
(GT) chest pain	120 (59%)	12 (6%)	12 (6%)	57 (28%)	41	121
(GT) covid 19Who	112 (55%)	11 (5%)	19 (9%)	59 (29%)	51	104
(GT) side effects of vaccine	96 (48%)	12 (6%)	18 (9%)	75 (37%)	56	165
(GT) covidSymptoms	88 (44%)	8 (4%)	15 (7%)	90 (45%)	28	45
COVID-19 confirmed cases	78 (39%)	22 (11%)	33 (16%)	68 (34%)	29	97
(GT) after covid vaccine	68 (34%)	8 (4%)	8 (4%)	117 (58%)	67	149
COVID-19 confirmed deaths	65 (32%)	13 (6%)	13 (6%)	110 (54%)	28	72
(GT) effects of covid vaccine	63 (31%)	6 (3%)	7 (3%)	125 (62%)	30	90
(GT) covid 19	46 (23%)	9 (4%)	30 (15%)	116 (57%)	21	54
(GT) fever	45 (22%)	5 (2%)	15 (7%)	136 (67%)	24	42
Twitter	27 (13%)	8 (4%)	28 (14%)	138 (68%)	10	11
(gt) covid	26 (13%)	5 (2%)	21 (10%)	149 (74%)	10	14
Up2Date	18 (9%)	5 (2%)	14 (7%)	164 (81%)	8	9

Table S4: **State-Level results for the Single Source Method**

Data Source(s) Used	Early Warning	Sync Warning	Late Warning	Soft Warning	Missed Outbreaks	Warning increase observed	False Alarm	Non-deployed
G, T, A	120 (59%)	13 (6%)	24 (12%)	37 (18%)	8 (4%)	16	32	0 (0%)
L, G, T	119 (59%)	16 (8%)	20 (10%)	37 (18%)	10 (5%)	18	24	0 (0%)
L, G	119 (59%)	16 (8%)	19 (9%)	39 (19%)	9 (4%)	19	24	0 (0%)
G, T	118 (58%)	12 (6%)	25 (12%)	39 (19%)	8 (4%)	16	26	0 (0%)
G, T, A, U	118 (58%)	13 (6%)	24 (12%)	39 (19%)	8 (4%)	16	32	0 (0%)
G, A	117 (58%)	15 (7%)	24 (12%)	38 (19%)	8 (4%)	17	31	0 (0%)
G,	117 (58%)	13 (6%)	24 (12%)	40 (20%)	8 (4%)	17	27	0 (0%)
G, T, U	116 (57%)	12 (6%)	27 (13%)	39 (19%)	8 (4%)	16	28	0 (0%)
G, A, U	116 (57%)	15 (7%)	23 (11%)	40 (20%)	8 (4%)	17	32	0 (0%)
L, G, U	116 (57%)	16 (8%)	20 (10%)	41 (20%)	9 (4%)	20	24	0 (0%)
L, G, T, U	116 (57%)	16 (8%)	21 (10%)	39 (19%)	10 (5%)	19	25	0 (0%)
L, G, T, A	115 (57%)	18 (9%)	20 (10%)	39 (19%)	10 (5%)	17	31	0 (0%)
G, U	115 (57%)	13 (6%)	26 (13%)	40 (20%)	8 (4%)	17	27	0 (0%)
L, G, A	114 (56%)	18 (9%)	20 (10%)	41 (20%)	9 (4%)	18	29	0 (0%)
L, G, T, A, U	114 (56%)	17 (8%)	19 (9%)	42 (21%)	10 (5%)	17	30	0 (0%)
L, G, A, U	113 (56%)	17 (8%)	19 (9%)	44 (22%)	9 (4%)	18	29	0 (0%)
G, N, T, A	110 (54%)	22 (11%)	24 (12%)	35 (17%)	11 (5%)	15	29	0 (0%)
G, N, T	109 (54%)	21 (10%)	25 (12%)	35 (17%)	12 (6%)	13	24	0 (0%)
G, N, A	109 (54%)	23 (11%)	23 (11%)	36 (18%)	11 (5%)	15	29	0 (0%)
G, N	108 (53%)	22 (11%)	24 (12%)	36 (18%)	12 (6%)	14	23	0 (0%)
G, N, T, A, U	108 (53%)	22 (11%)	24 (12%)	37 (18%)	11 (5%)	16	28	0 (0%)
G, N, T, U	107 (53%)	21 (10%)	25 (12%)	37 (18%)	12 (6%)	14	23	0 (0%)
L, G, N, T, A	107 (53%)	26 (13%)	21 (10%)	36 (18%)	12 (6%)	16	28	0 (0%)
G, N, A, U	107 (53%)	23 (11%)	23 (11%)	38 (19%)	11 (5%)	16	28	0 (0%)
L, G, N, A	106 (52%)	27 (13%)	20 (10%)	37 (18%)	12 (6%)	16	28	0 (0%)
G, N, U	106 (52%)	22 (11%)	24 (12%)	38 (19%)	12 (6%)	15	22	0 (0%)
L, G, N, T	104 (51%)	23 (11%)	24 (12%)	38 (19%)	13 (6%)	13	23	0 (0%)
L, G, N, T, A, U	104 (51%)	26 (13%)	21 (10%)	39 (19%)	12 (6%)	17	27	0 (0%)
L, G, N, A, U	103 (51%)	27 (13%)	20 (10%)	40 (20%)	12 (6%)	17	27	0 (0%)
L, G, N	103 (51%)	24 (12%)	23 (11%)	39 (19%)	13 (6%)	14	22	0 (0%)
L, G, N, T, U	101 (50%)	23 (11%)	24 (12%)	41 (20%)	13 (6%)	14	22	0 (0%)
L, G, N, U	100 (50%)	24 (12%)	23 (11%)	42 (21%)	13 (6%)	15	21	0 (0%)
L, T, A, U	86 (43%)	27 (13%)	18 (9%)	44 (22%)	21 (10%)	17	60	6 (3%)
L, A	85 (42%)	29 (14%)	8 (4%)	24 (12%)	38 (19%)	18	58	18 (9%)
L, T, A	84 (42%)	28 (14%)	17 (8%)	43 (21%)	22 (11%)	17	61	8 (4%)
L, A, U	81 (40%)	27 (13%)	8 (4%)	38 (19%)	36 (18%)	18	58	12 (6%)
T, A	80 (40%)	17 (8%)	15 (7%)	45 (22%)	32 (16%)	17	58	13 (6%)
T, A, U	80 (40%)	17 (8%)	16 (8%)	48 (24%)	30 (15%)	19	55	11 (5%)
L, N, A, U	79 (39%)	22 (11%)	21 (10%)	55 (27%)	24 (12%)	10	26	1 (0%)
N, A, U	79 (39%)	21 (10%)	17 (8%)	55 (27%)	29 (14%)	10	29	1 (0%)
N, T, A, U	79 (39%)	20 (10%)	16 (8%)	58 (29%)	28 (14%)	9	23	1 (0%)
L, T, U	79 (39%)	39 (19%)	27 (13%)	3 (1%)	26 (13%)	10	20	28 (14%)
N, T, A	77 (38%)	20 (10%)	15 (7%)	59 (29%)	28 (14%)	11	24	3 (1%)
N, A	77 (38%)	19 (9%)	16 (8%)	56 (28%)	30 (15%)	10	27	4 (2%)
L, N, A	76 (38%)	23 (11%)	21 (10%)	55 (27%)	23 (11%)	9	25	4 (2%)
L, N, T, A, U	76 (38%)	22 (11%)	21 (10%)	60 (30%)	22 (11%)	8	22	1 (0%)
A,	75 (37%)	14 (7%)	5 (2%)	21 (10%)	57 (28%)	16	56	30 (15%)
A, U	73 (36%)	14 (7%)	7 (3%)	32 (16%)	53 (26%)	18	58	23 (11%)
L, N, T, A	73 (36%)	24 (12%)	21 (10%)	58 (29%)	23 (11%)	9	23	3 (1%)
L, T	72 (36%)	40 (20%)	28 (14%)	0 (0%)	23 (11%)	8	22	39 (19%)
T, U	67 (33%)	18 (9%)	37 (18%)	0 (0%)	36 (18%)	9	21	44 (22%)
N, T, U	65 (32%)	23 (11%)	19 (9%)	50 (25%)	38 (19%)	6	16	7 (3%)
L, N, T, U	63 (31%)	24 (12%)	24 (12%)	56 (28%)	28 (14%)	5	15	7 (3%)
L, N, U	62 (31%)	26 (13%)	25 (12%)	52 (26%)	30 (15%)	7	15	7 (3%)
N, U	62 (31%)	25 (12%)	21 (10%)	47 (23%)	40 (20%)	7	17	7 (3%)
N, T	60 (30%)	27 (13%)	18 (9%)	48 (24%)	39 (19%)	6	15	10 (5%)
N,	59 (29%)	23 (11%)	19 (9%)	47 (23%)	43 (21%)	6	15	11 (5%)
L, N	58 (29%)	25 (12%)	24 (12%)	52 (26%)	32 (16%)	6	13	11 (5%)
T,	56 (28%)	17 (8%)	39 (19%)	0 (0%)	32 (16%)	7	19	58 (29%)
L, N, T	56 (28%)	29 (14%)	24 (12%)	53 (26%)	30 (15%)	5	13	10 (5%)
L, U	37 (18%)	48 (24%)	13 (6%)	0 (0%)	43 (21%)	8	9	61 (30%)
L,	23 (11%)	43 (21%)	10 (5%)	0 (0%)	21 (10%)	4	6	105 (52%)
U,	17 (8%)	6 (3%)	6 (3%)	0 (0%)	49 (24%)	5	3	124 (61%)

Table S5: **State-level performance (Jan 1st, 2020 – Jan 1st, 2022) of the Multiple Source method for different data sources used for the training step.** The source labeling is as follows: G = Google trends, T = Twitter, U = UpToDate, L = local epidemiological data, A = Human mobility from Apple, and N = Neighbor's epidemiological data. An additional column, 'Non-deployed,' indicates the number of outbreak events where our Multiple Source method did not find a reasonable set of proxies to fit a model. Thus, an early warning system was not deployed to forecast the out-of-sample period.

Data Source(s) Used	Early Warning	Sync Warning	Late Warning	Soft Warning	Missed Outbreaks	Warning increase observed	False Alarm	Non-deployed
G, T, U	258 (70%)	21 (6%)	27 (7%)	52 (14%)	9 (2%)	36	121	0 (0%)
G, U	257 (70%)	21 (6%)	27 (7%)	53 (14%)	9 (2%)	36	122	0 (0%)
G, T	257 (70%)	20 (5%)	27 (7%)	54 (15%)	9 (2%)	36	121	0 (0%)
G,	256 (70%)	20 (5%)	28 (8%)	54 (15%)	9 (2%)	36	121	0 (0%)
G, T, A, U	255 (69%)	23 (6%)	28 (8%)	55 (15%)	6 (2%)	36	121	0 (0%)
L, G, T, U	254 (69%)	30 (8%)	26 (7%)	47 (13%)	10 (3%)	36	110	0 (0%)
G, A, U	254 (69%)	23 (6%)	28 (8%)	56 (15%)	6 (2%)	36	122	0 (0%)
L, G, T, A, U	253 (69%)	30 (8%)	27 (7%)	49 (13%)	8 (2%)	36	113	0 (0%)
L, G, T	253 (69%)	29 (8%)	26 (7%)	49 (13%)	10 (3%)	36	111	0 (0%)
G, T, A	253 (69%)	23 (6%)	28 (8%)	57 (16%)	6 (2%)	36	120	0 (0%)
L, G, U	252 (69%)	30 (8%)	26 (7%)	49 (13%)	10 (3%)	36	111	0 (0%)
G, A	252 (69%)	23 (6%)	29 (8%)	57 (16%)	6 (2%)	36	120	0 (0%)
L, G	251 (68%)	29 (8%)	27 (7%)	50 (14%)	10 (3%)	36	111	0 (0%)
L, G, A, U	251 (68%)	30 (8%)	27 (7%)	51 (14%)	8 (2%)	36	114	0 (0%)
L, G, T, A	250 (68%)	30 (8%)	27 (7%)	52 (14%)	8 (2%)	36	112	0 (0%)
L, G, A	248 (68%)	30 (8%)	28 (8%)	53 (14%)	8 (2%)	36	112	0 (0%)
G, N, T, U	234 (64%)	38 (10%)	38 (10%)	44 (12%)	13 (4%)	37	94	0 (0%)
G, N, U	234 (64%)	38 (10%)	38 (10%)	44 (12%)	13 (4%)	37	95	0 (0%)
G, N, T	233 (63%)	38 (10%)	38 (10%)	45 (12%)	13 (4%)	37	93	0 (0%)
G, N	233 (63%)	38 (10%)	39 (11%)	44 (12%)	13 (4%)	37	93	0 (0%)
G, N, A, U	232 (63%)	38 (10%)	38 (10%)	47 (13%)	12 (3%)	37	96	0 (0%)
G, N, T, A, U	232 (63%)	38 (10%)	38 (10%)	47 (13%)	12 (3%)	37	95	0 (0%)
G, N, A	231 (63%)	38 (10%)	39 (11%)	47 (13%)	12 (3%)	37	94	0 (0%)
G, N, T, A	231 (63%)	38 (10%)	38 (10%)	48 (13%)	12 (3%)	37	94	0 (0%)
L, G, N, A, U	230 (63%)	47 (13%)	34 (9%)	42 (11%)	14 (4%)	37	93	0 (0%)
L, G, N, T, A, U	230 (63%)	47 (13%)	34 (9%)	42 (11%)	14 (4%)	37	92	0 (0%)
L, G, N, U	230 (63%)	47 (13%)	35 (10%)	40 (11%)	15 (4%)	37	91	0 (0%)
L, G, N, T, U	230 (63%)	47 (13%)	35 (10%)	40 (11%)	15 (4%)	37	90	0 (0%)
L, G, N, A	229 (62%)	47 (13%)	35 (10%)	42 (11%)	14 (4%)	37	91	0 (0%)
L, G, N	229 (62%)	47 (13%)	36 (10%)	40 (11%)	15 (4%)	37	89	0 (0%)
L, G, N, T, A	229 (62%)	47 (13%)	34 (9%)	43 (12%)	14 (4%)	37	91	0 (0%)
L, G, N, T	229 (62%)	47 (13%)	35 (10%)	41 (11%)	15 (4%)	37	89	0 (0%)
L, N, T, U	148 (40%)	64 (17%)	44 (12%)	47 (13%)	34 (9%)	33	67	30 (8%)
L, N, T	147 (40%)	64 (17%)	45 (12%)	47 (13%)	32 (9%)	33	67	32 (9%)
L, N, U	145 (40%)	63 (17%)	44 (12%)	46 (13%)	38 (10%)	32	65	31 (8%)
L, N, T, A, U	143 (39%)	65 (18%)	38 (10%)	62 (17%)	45 (12%)	33	69	14 (4%)
L, N, T, A	141 (38%)	64 (17%)	39 (11%)	65 (18%)	43 (12%)	33	70	15 (4%)
L, N, A, U	140 (38%)	63 (17%)	38 (10%)	64 (17%)	47 (13%)	32	68	15 (4%)
L, N	140 (38%)	62 (17%)	43 (12%)	46 (13%)	31 (8%)	31	63	45 (12%)
N, T, U	138 (38%)	59 (16%)	43 (12%)	51 (14%)	36 (10%)	34	68	40 (11%)
N, T	137 (37%)	60 (16%)	44 (12%)	50 (14%)	33 (9%)	34	68	43 (12%)
N, U	135 (37%)	59 (16%)	43 (12%)	49 (13%)	40 (11%)	33	66	41 (11%)
L, N, A	135 (37%)	63 (17%)	38 (10%)	61 (17%)	50 (14%)	31	66	20 (5%)
N, T, A, U	133 (36%)	60 (16%)	37 (10%)	66 (18%)	51 (14%)	37	69	20 (5%)
N, T, A	132 (36%)	59 (16%)	38 (10%)	68 (19%)	48 (13%)	37	70	22 (6%)
N, A, U	131 (36%)	58 (16%)	37 (10%)	67 (18%)	53 (14%)	36	68	21 (6%)
L, T, A, U	130 (35%)	40 (11%)	17 (5%)	36 (10%)	82 (22%)	17	50	62 (17%)
N,	130 (35%)	58 (16%)	42 (11%)	49 (13%)	32 (9%)	32	64	56 (15%)
N, A	126 (34%)	58 (16%)	37 (10%)	64 (17%)	55 (15%)	35	66	27 (7%)
L, T, A	125 (34%)	41 (11%)	19 (5%)	33 (9%)	84 (23%)	22	61	65 (18%)
L, T, U	125 (34%)	51 (14%)	23 (6%)	3 (1%)	49 (13%)	16	40	116 (32%)
L, T	122 (33%)	51 (14%)	22 (6%)	1 (0%)	44 (12%)	19	50	127 (35%)
L, A, U	92 (25%)	44 (12%)	21 (6%)	37 (10%)	93 (25%)	17	44	80 (22%)
L, U	85 (23%)	56 (15%)	26 (7%)	1 (0%)	62 (17%)	14	33	137 (37%)
T, A, U	84 (23%)	9 (2%)	2 (1%)	21 (6%)	105 (29%)	14	36	146 (40%)
L, A	82 (22%)	46 (13%)	21 (6%)	29 (8%)	91 (25%)	16	46	98 (27%)
T, A	80 (22%)	7 (2%)	5 (1%)	19 (5%)	104 (28%)	14	36	152 (41%)
L,	75 (20%)	54 (15%)	24 (7%)	0 (0%)	42 (11%)	11	32	172 (47%)
T, U	69 (19%)	6 (2%)	7 (2%)	0 (0%)	27 (7%)	11	19	258 (70%)
T,	62 (17%)	6 (2%)	8 (2%)	0 (0%)	10 (3%)	10	15	281 (77%)
A, U	27 (7%)	3 (1%)	1 (0%)	24 (7%)	125 (34%)	7	20	187 (51%)
A,	20 (5%)	3 (1%)	1 (0%)	15 (4%)	106 (29%)	6	21	222 (60%)
U,	9 (2%)	2 (1%)	4 (1%)	0 (0%)	49 (13%)	2	2	303 (83%)

Table S6: **County-level performance (Jan 1st, 2020 – Jan 1st, 2022) of the Multiple Sources method as a function of the data sources used as input** . The source labeling is as follows: G = Google trends, T = Twitter, U = UpToDate, L = local epidemiological data, A = Human mobility from Apple, and N = Neighbor's epidemiological data. An additional column, 'Non-deployed,' indicates the number of outbreak events where our Multiple Source method did not find a reasonable set of proxies to fit a model. Thus, an early warning system was not deployed to forecast the out-of-sample period.

	Naive	Single Source "How long does covid last?"	Single Source "side effects of vaccine"	Multiple Sources
Early	0.64	0.58	0.68	0.30
Early + Sync	0.63	0.56	0.66	0.28
Early + Sync + Late	0.63	0.56	0.66	0.28

Table S7: False Discovery Rates (FDR) for each methodology at the county-level. Each row shows the FDR with the inclusion of different warning signals (early, sync, or late).

	Naive	Single Source "How long does covid last?"	Single Source "chest pain"	Multiple Sources
Early	0.54	0.48	0.50	0.17
Early + Sync	0.51	0.46	0.48	0.15
Early + Sync + Late	0.51	0.46	0.48	0.15

Table S8: False Discovery Rates (FDR) for each methodology at the state-level. Each row shows the FDR with the inclusion of different warning signals (early, sync, or late).

Abdominal pain	Acute bronchitis	Ageusia	Anosmia	Anxiety
Asphyxia	Asthma	Bronchitis	Burning Chest Pain	Cardiac arrest
Chest pain	Chills	Chronic pain	Cough	Diarrhea
Dizziness	Dysgeusia Ear pain	Fatigue	Fever	Hyperventilation
Nasal congestion	Otitis	Phlegm	Pneumonia	Shortness of breath
Sore throat	Throat irritation	Vertigo	Viral pneumonia	Vomiting
Wheeze	after covid vaccine	anosmia	chest pain	chest tightness
covid	covid nhs	covid symptoms	covid-19	covid-19 who
effects of covid vaccine	feeling exhausted	feeling tired	fever	how long does covid last
joints aching	loss of smell	loss smell	loss taste	nose bleed
quarantine	sars-cov 2	sars-cov-2	side effects of vaccine	

Table S9: Google Search term list used in the Multiple Source method