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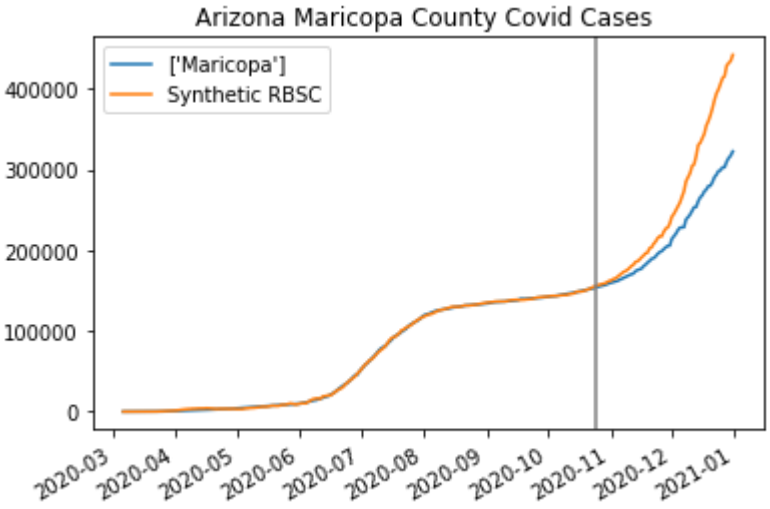
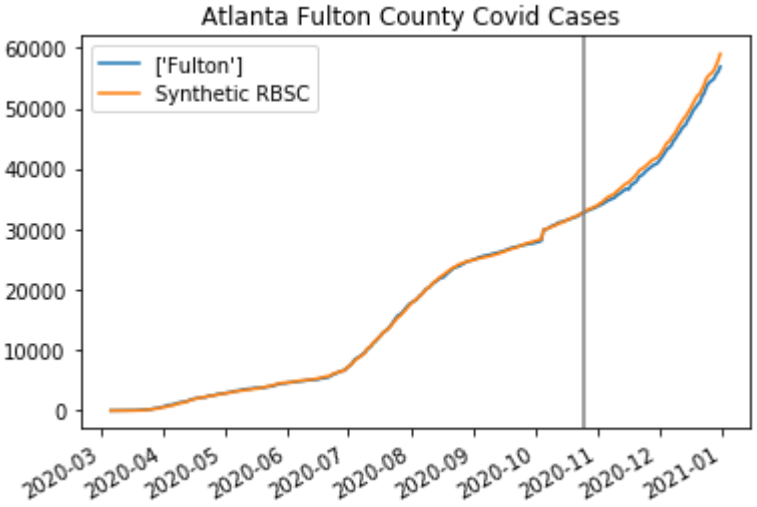

Arizona Maricopa County Covid Cases
['Maricopa']
Synthetic RBSC
400000
300000
200000
100000
0
2020-03
2020-04
2020-05
2020-06
2020-07
2020-08
2020-09
2020-10
2020-11
2020-12
2021-01

5


Atlanta Fulton County Covid Cases
['Fulton']
Synthetic RBSC
60000
50000
40000
30000
20000
10000
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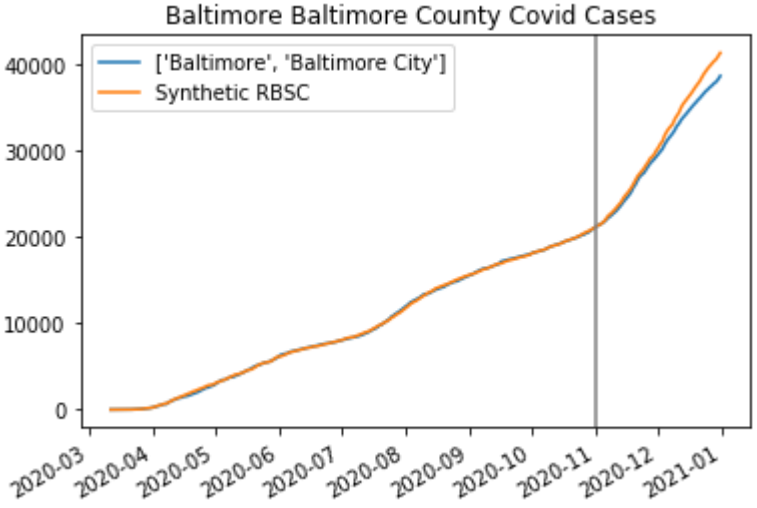
2020-03
2020-04
2020-05
2020-06
2020-07
2020-08
2020-09
2020-10
2020-11
2020-12
2021-01

4


Baltimore Baltimore County Covid Cases
['Baltimore', 'Baltimore City']
Synthetic RBSC
40000
30000
20000
10000
0
2020-03
2020-04
2020-05
2020-06
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2020-09
2020-10
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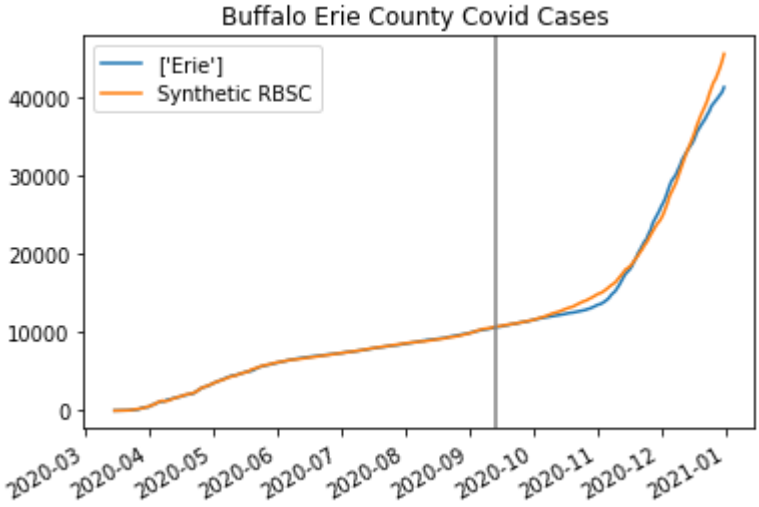
2020-12
2021-01

10


Buffalo Erie County Covid Cases
['Erie']
Synthetic RBSC
40000
30000
20000
10000
0
2020-03
2020-04
2020-05
2020-06
2020-07
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2020-10
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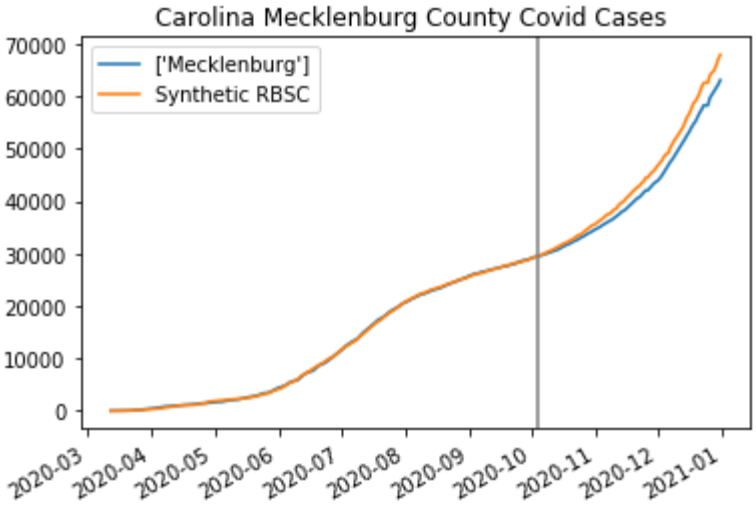
2020-12
2021-01

4


Carolina Mecklenburg County Covid Cases
['Mecklenburg']
Synthetic RBSC
70000
60000
50000
40000
30000
20000
10000
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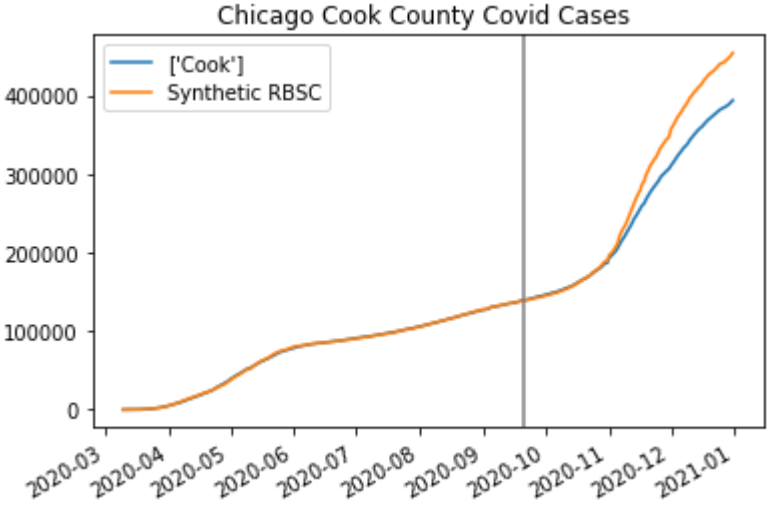
2020-12
2021-01

3


Chicago Cook County Covid Cases
['Cook']
Synthetic RBSC
400000
300000
200000
100000
0
2020-03
2020-04
2020-05
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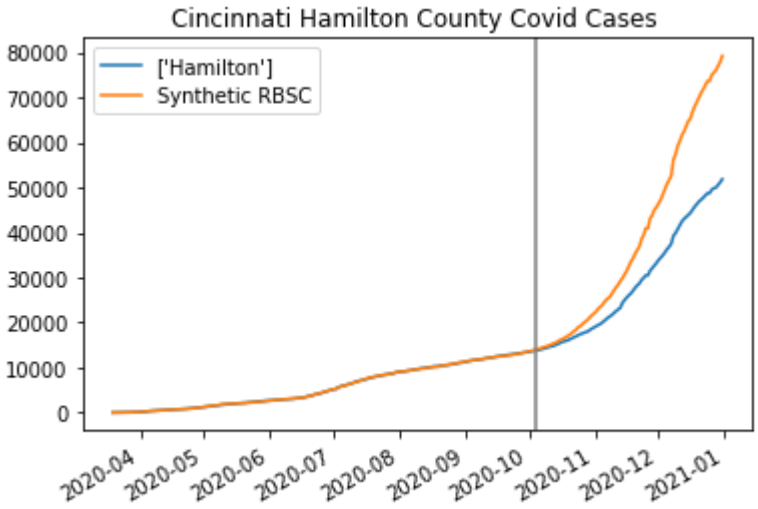
2020-12
2021-01

12


Cincinnati Hamilton County Covid Cases
['Hamilton']
Synthetic RBSC
80000
70000
60000
50000
40000
30000
20000
10000
0
2020-04
2020-05
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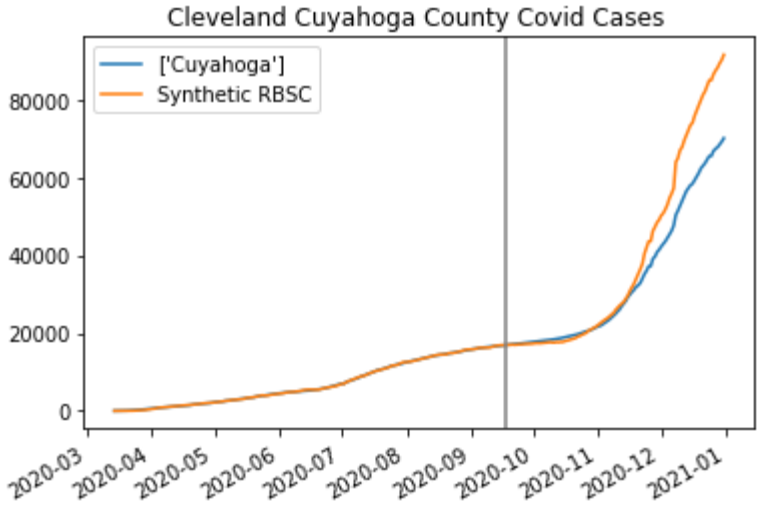
2021-01

15


Cleveland Cuyahoga County Covid Cases
['Cuyahoga']
Synthetic RBSC
80000
60000
40000
20000
0
2020-03
2020-04
2020-05
2020-06
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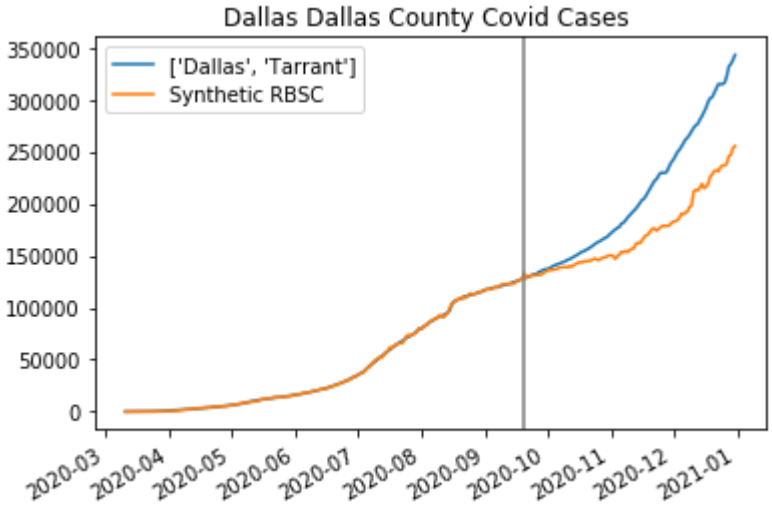
2021-01

37


Dallas Dallas County Covid Cases
['Dallas', 'Tarrant']
Synthetic RBSC
350000
300000
250000
200000
150000
100000
50000
0
2020-03
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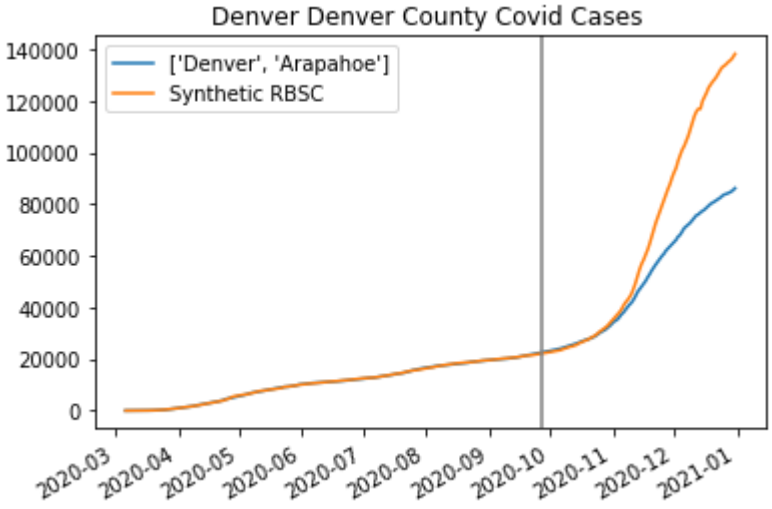
2021-01

6


Denver Denver County Covid Cases
['Denver', 'Arapahoe']
Synthetic RBSC
140000
120000
100000
80000
60000
40000
20000
0
2020-03
2020-04
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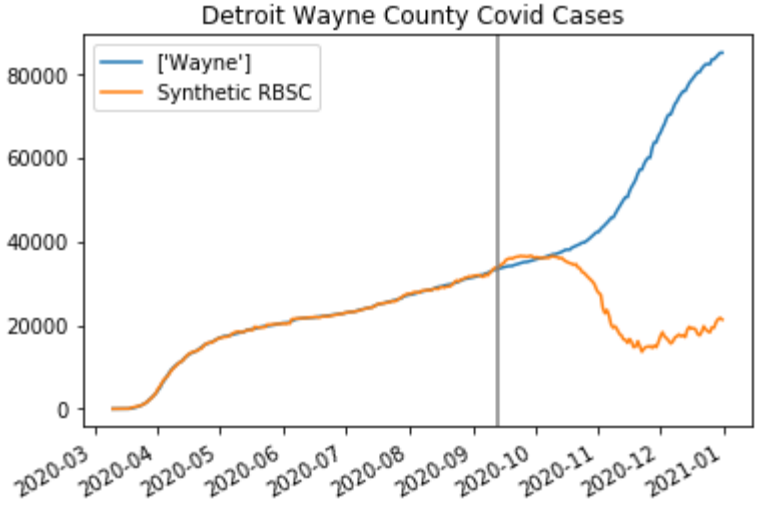
2020-12
2021-01

14


Detroit Wayne County Covid Cases
['Wayne']
Synthetic RBSC
80000
60000
40000
20000
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2020-03
2020-04
2020-05
2020-06
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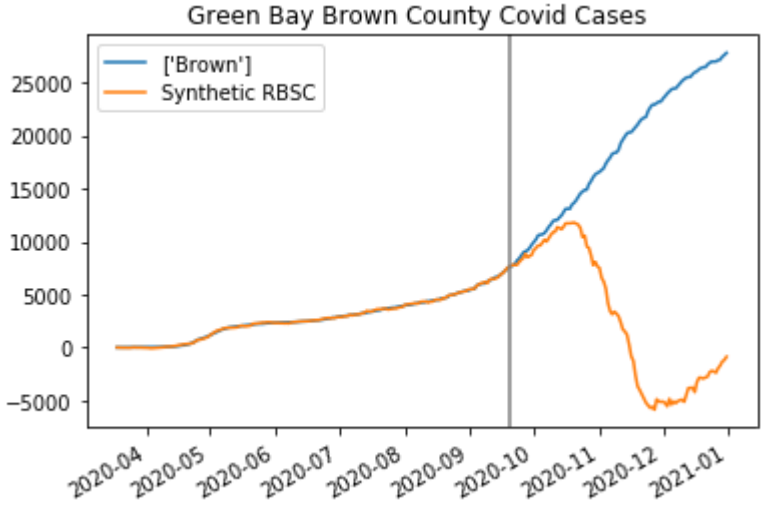
2021-01

14


Green Bay Brown County Covid Cases
['Brown']
Synthetic RBSC
25000
20000
15000
10000
5000
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2020-05
2020-06
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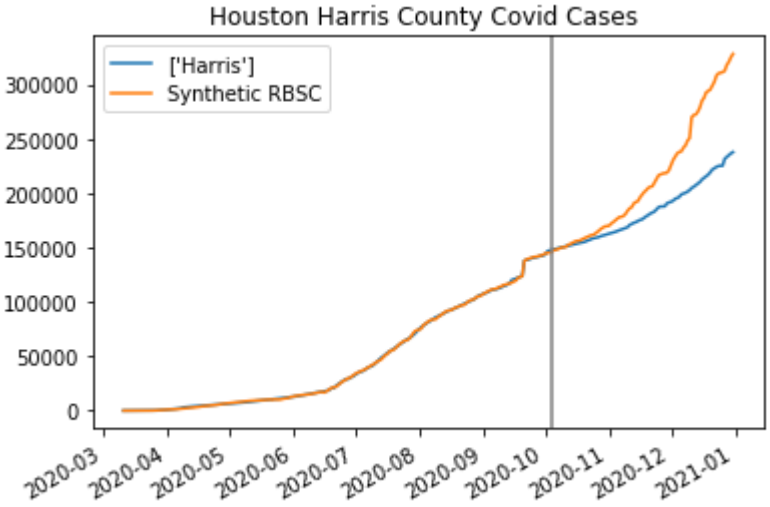
2021-01

13


Houston Harris County Covid Cases
['Harris']
Synthetic RBSC
300000
250000
200000
150000
100000
50000
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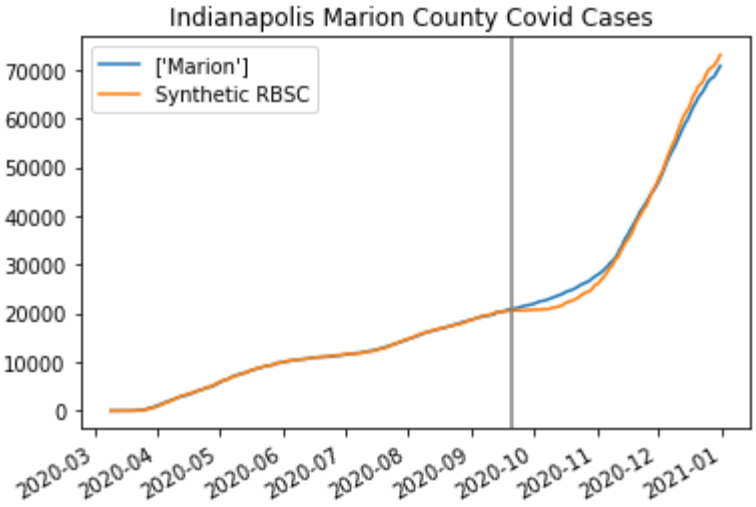
2021-01

9


Indianapolis Marion County Covid Cases
['Marion']
Synthetic RBSC
70000
60000
50000
40000
30000
20000
10000
0
2020-03
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2020-05
2020-06
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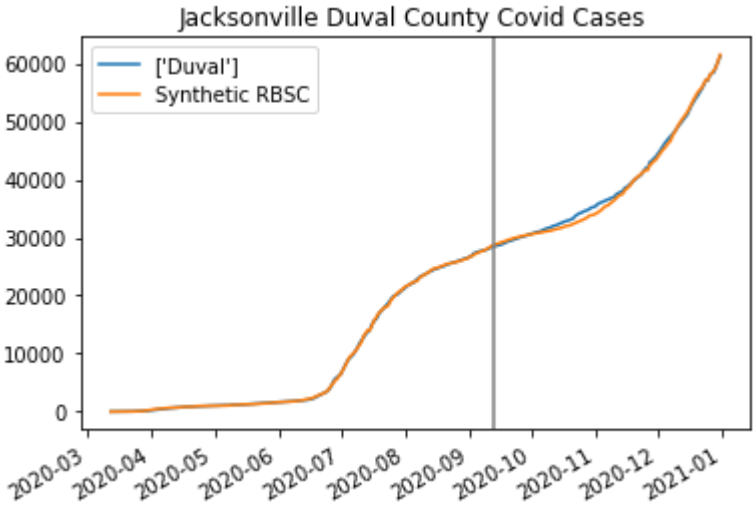
2021-01

9


Jacksonville Duval County Covid Cases
['Duval']
Synthetic RBSC
60000
50000
40000
30000
20000
10000
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2020-04
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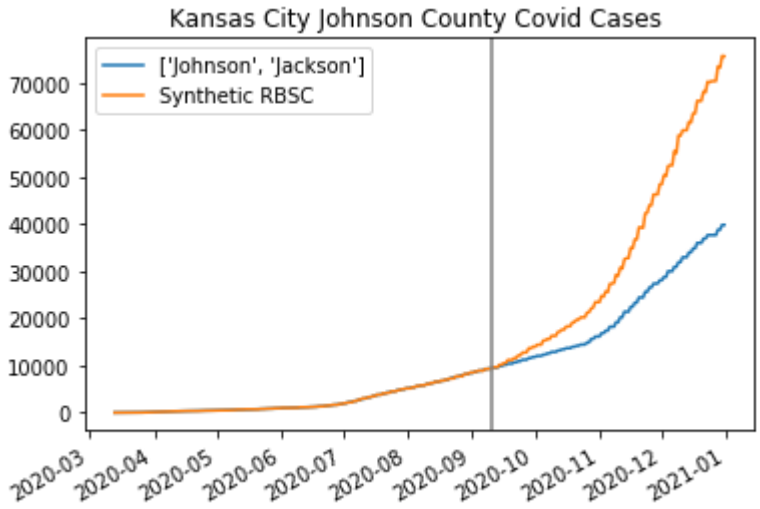
2021-01

24


Kansas City Johnson County Covid Cases
['Johnson', 'Jackson']
Synthetic RBSC
70000
60000
50000
40000
30000
20000
10000
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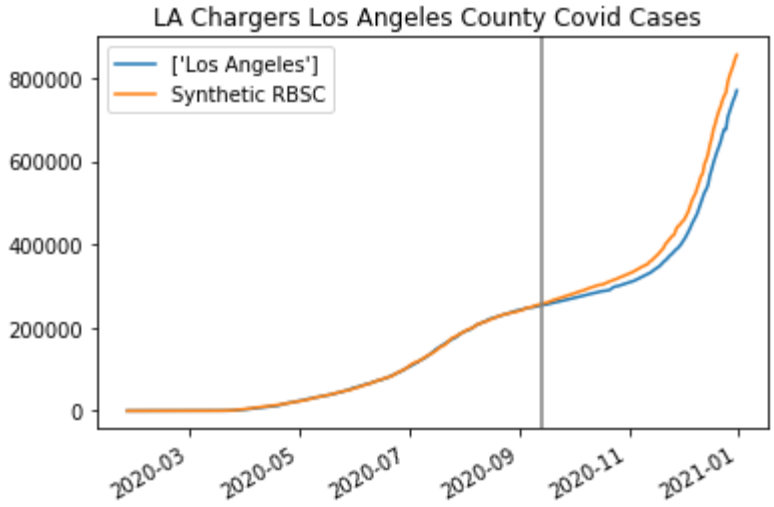
2021-01

6


LA Chargers Los Angeles County Covid Cases
['Los Angeles']
Synthetic RBSC
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600000
400000
200000
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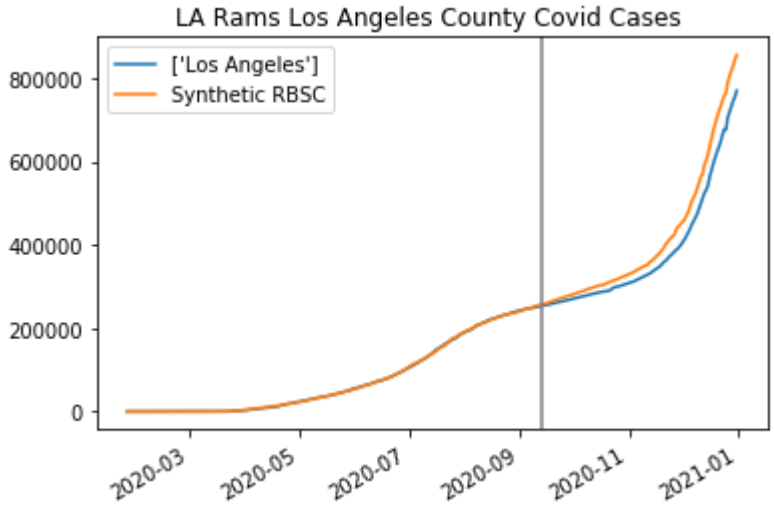
2020-03
2020-05
2020-07
2020-09
2020-11
2021-01

6


LA Rams Los Angeles County Covid Cases
['Los Angeles']
Synthetic RBSC
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2020-05
2020-07
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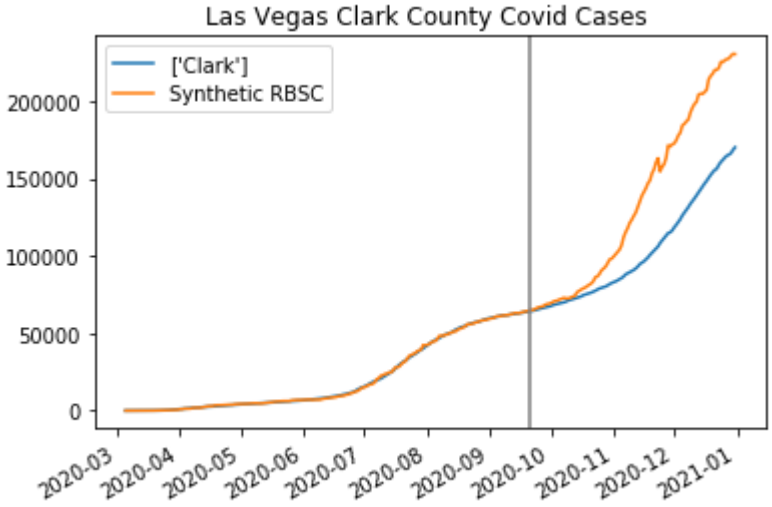
2020-11
2021-01

4


Las Vegas Clark County Covid Cases
['Clark']
Synthetic RBSC
200000
150000
100000
50000
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2020-04
2020-05
2020-06
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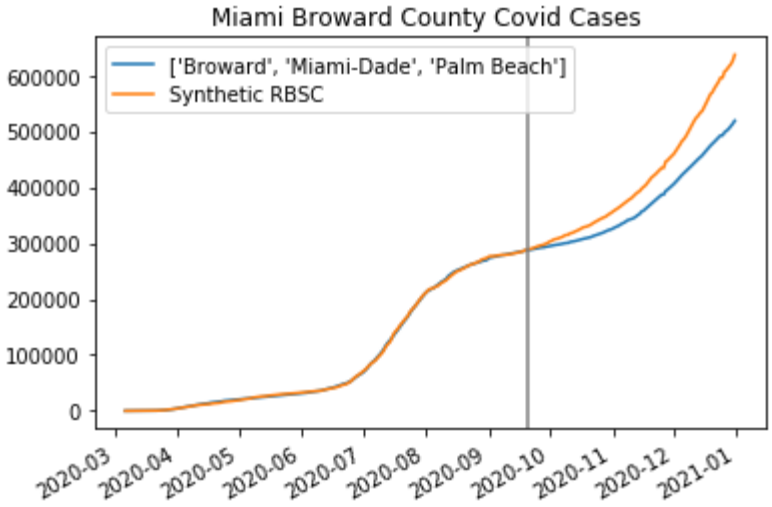
2021-01

7


Miami Broward County Covid Cases
['Broward', 'Miami-Dade', 'Palm Beach']
Synthetic RBSC
600000
500000
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300000
200000
100000
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2020-03
2020-04
2020-05
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2020-10
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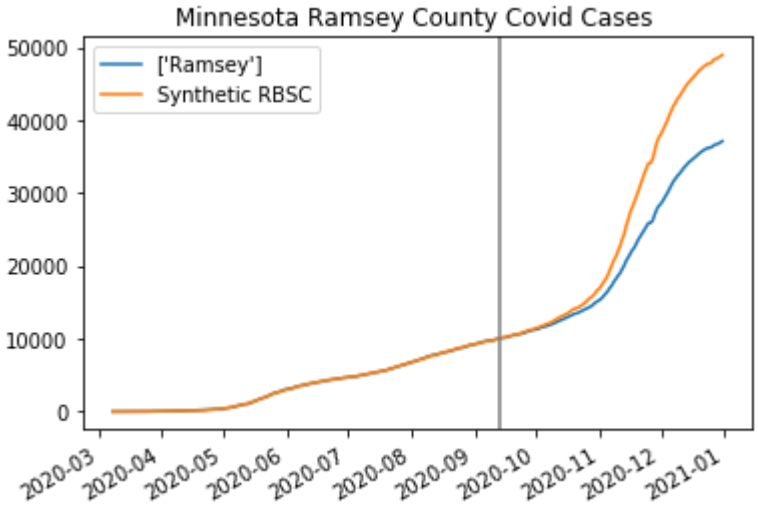
2021-01

6


Minnesota Ramsey County Covid Cases
['Ramsey']
Synthetic RBSC
50000
40000
30000
20000
10000
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2020-03
2020-04
2020-05
2020-06
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2020-12
2021-01

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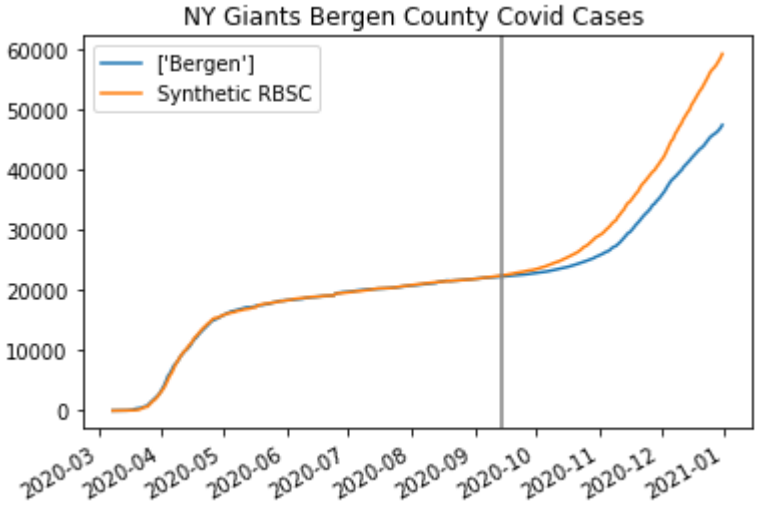
NY Giants Bergen County Covid Cases
['Bergen']
Synthetic RBSC
60000
50000
40000
30000
20000
10000
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2020-03
2020-04
2020-05
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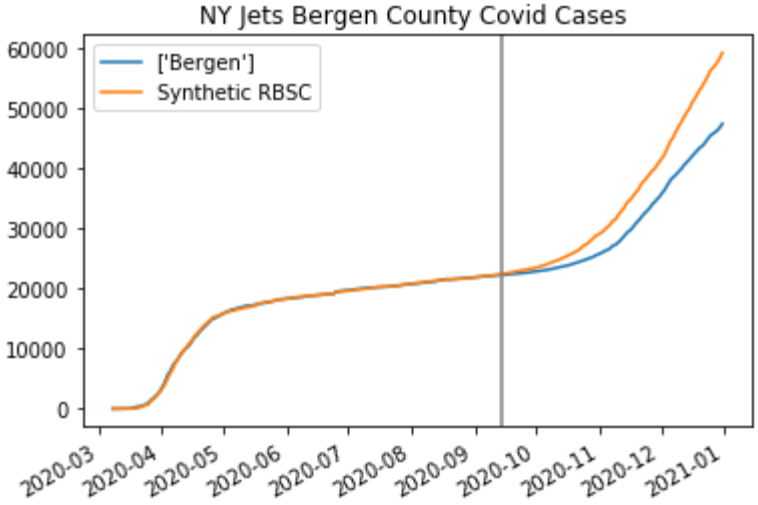
2020-12
2021-01

3


NY Jets Bergen County Covid Cases
['Bergen']
Synthetic RBSC
60000
50000
40000
30000
20000
10000
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2020-03
2020-04
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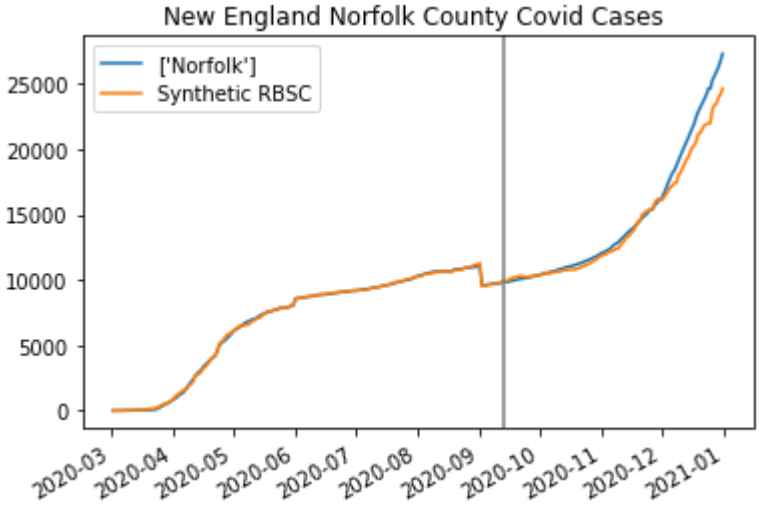
2020-12
2021-01

7


New England Norfolk County Covid Cases
['Norfolk']
Synthetic RBSC
25000
20000
15000
10000
5000
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2020-04
2020-05
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2020-10
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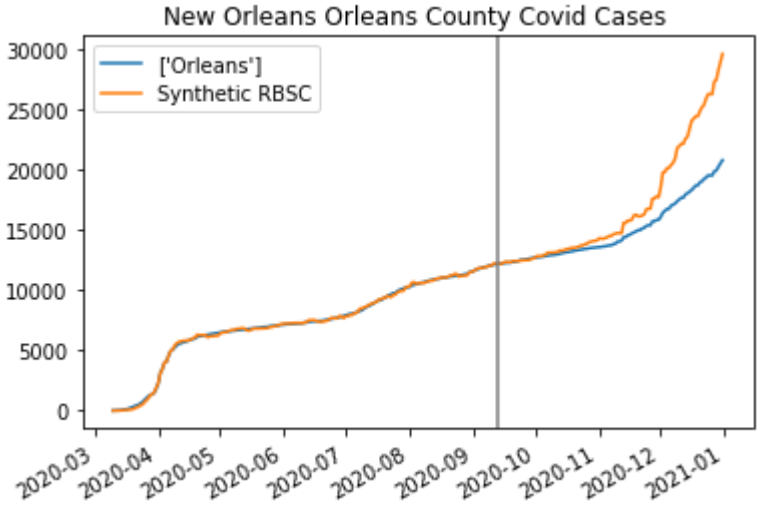
2020-12
2021-01

10


New Orleans Orleans County Covid Cases
['Orleans']
Synthetic RBSC
30000
25000
20000
15000
10000
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2020-03
2020-04
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2020-06
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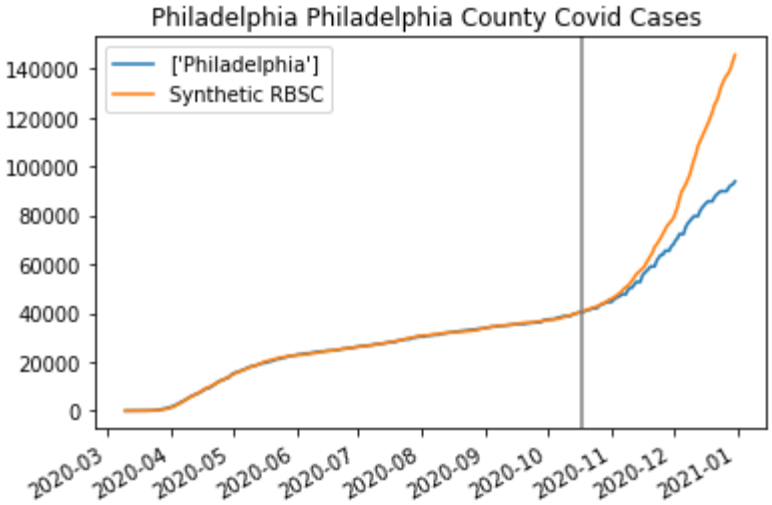
2020-12
2021-01

8


Philadelphia Philadelphia County Covid Cases
['Philadelphia']
Synthetic RBSC
140000
120000
100000
80000
60000
40000
20000
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2020-03
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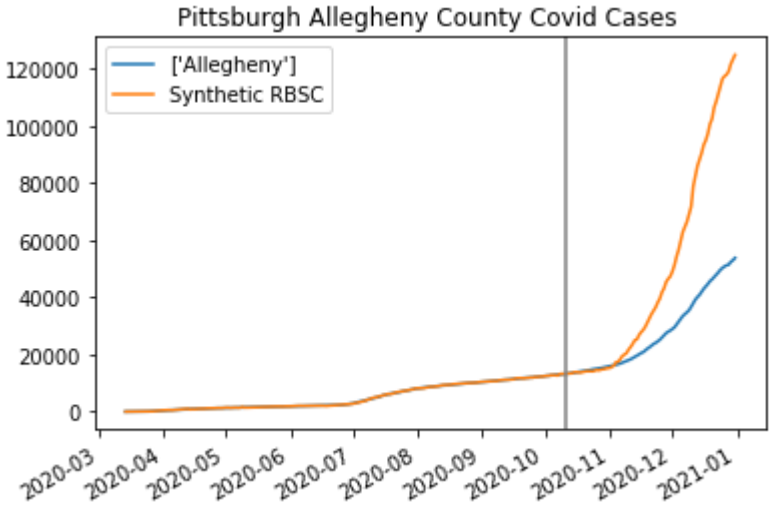
2021-01

22


Pittsburgh Allegheny County Covid Cases
['Allegheny']
Synthetic RBSC
120000
100000
80000
60000
40000
20000
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2020-03
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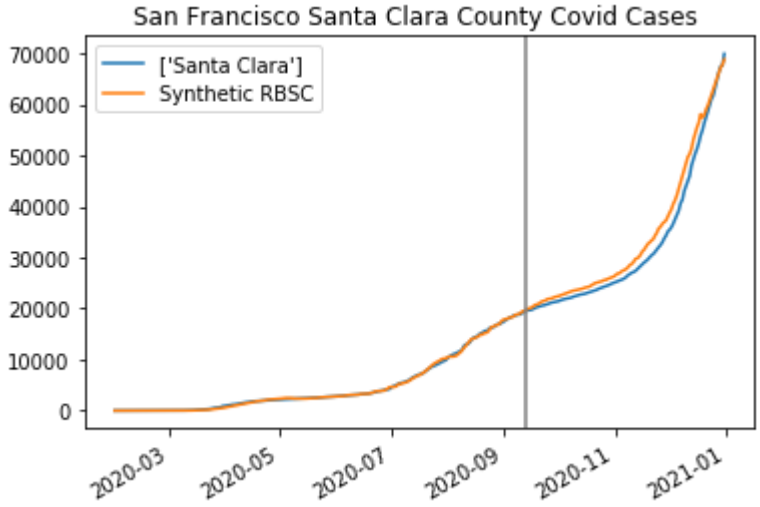
2021-01

12


San Francisco Santa Clara County Covid Cases
['Santa Clara']
Synthetic RBSC
70000
60000
50000
40000
30000
20000
10000
0
2020-03
2020-05
2020-07
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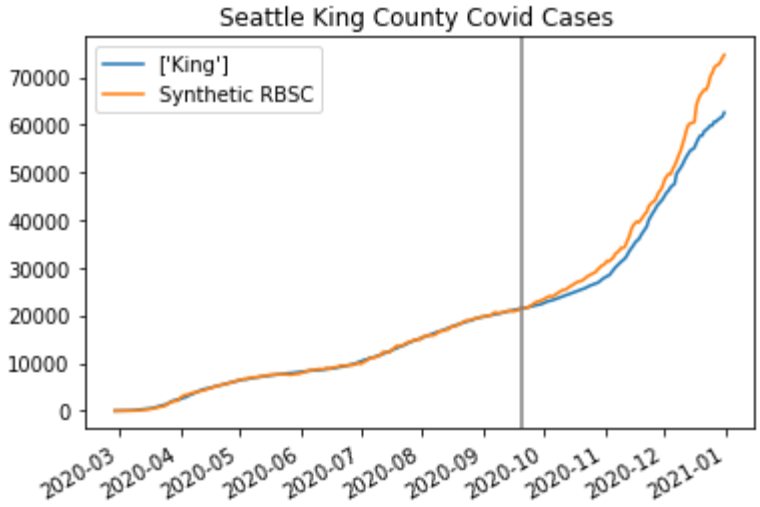
2020-11
2021-01

5


Seattle King County Covid Cases
['King']
Synthetic RBSC
70000
60000
50000
40000
30000
20000
10000
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2020-03
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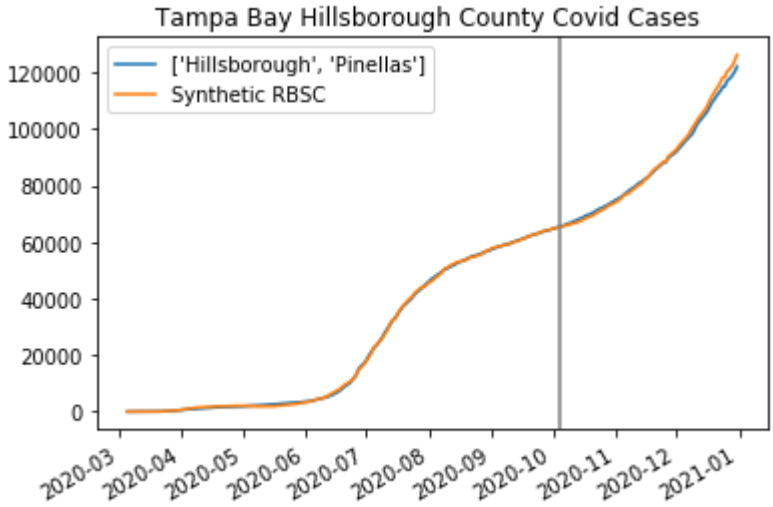
2021-01

8


Tampa Bay Hillsborough County Covid Cases
['Hillsborough', 'Pinellas']
Synthetic RBSC
120000
100000
80000
60000
40000
20000
0
2020-03
2020-04
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2020-06
2020-07
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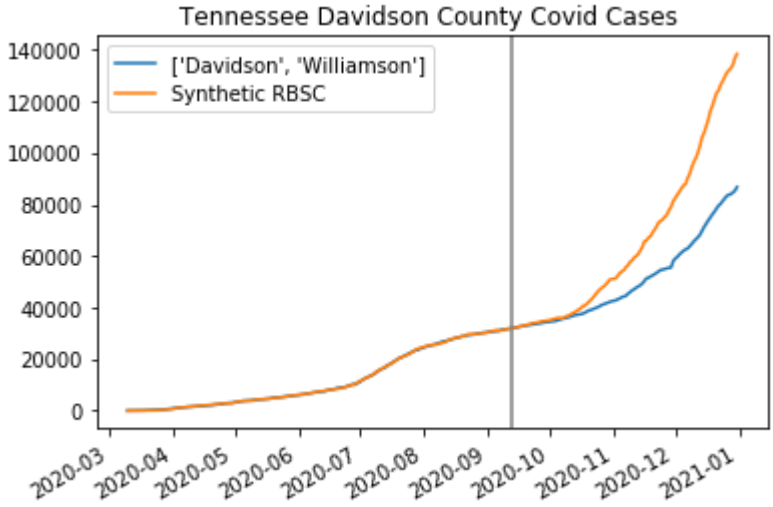
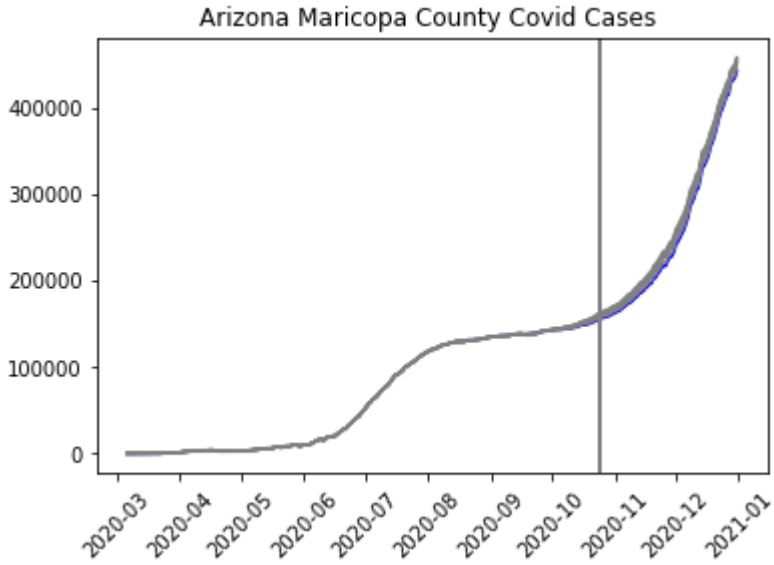
2020-10
2020-11
2020-12
2021-01

16

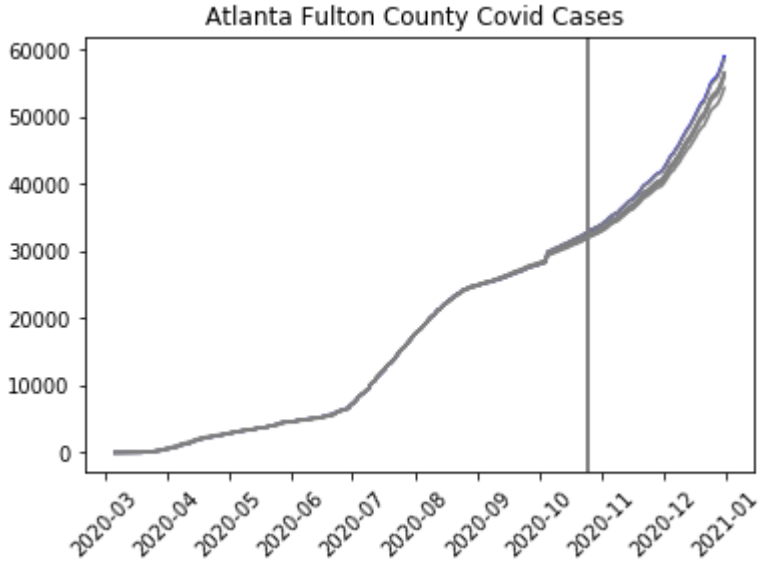


In [312]:
```
#Make earlier function to be able to graph weeks 1-6 before the int
ervention.
no_fans_list = ['Buffalo', 'Chicago', 'Detroit', 'Green Bay', 'Las
Vegas', 'LA Chargers','LA Rams', 'Minnesota', 'New England', 'New O
rleans', 'NY Giants','NY Jets', 'San Francisco', 'Seattle', 'Washin
gton']

def create_synthetic_lines(team_name_str, stadium_county_str, state
_str, intervention_date):
    intervention_date = [x for x in intervention_date if x != ""]

    for s in intervention_date:
        if any(c.isdigit() for c in s):
            intervention_date = s

    intervention_date = pd.to_datetime(intervention_date)
    intervention_array = [intervention_date - datetime.timedelta(we
eks=i) for i in range(0, 7)]
    print(team_name_str)
    count = 0
    for intervention in intervention_array:

        intervention = intervention.strftime('%m/%d/%Y')
        l = []
        l.append(intervention)
        l.append("")

        create_synthetic_graph(team_name_str, stadium_county_str, s
tate_str, l, False, count)

        count += 1
    plt.show()

    return
```

```
Arizona
7
7
6
6
6
6
6
```




```
Atlanta
5
5
5
4
4
4
4
```



```
Baltimore
4
4
4
4
4
4
6
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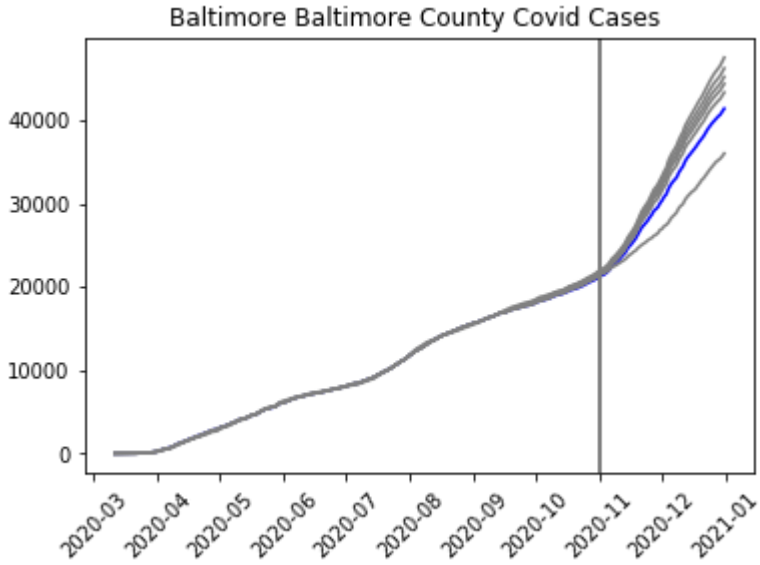


```
Buffalo
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8
7
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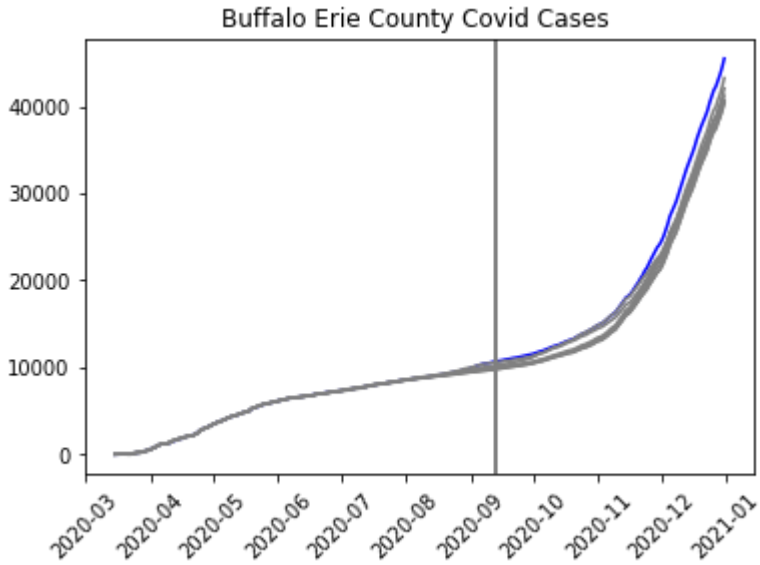

```
Carolina
4
6
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5
4
5
5
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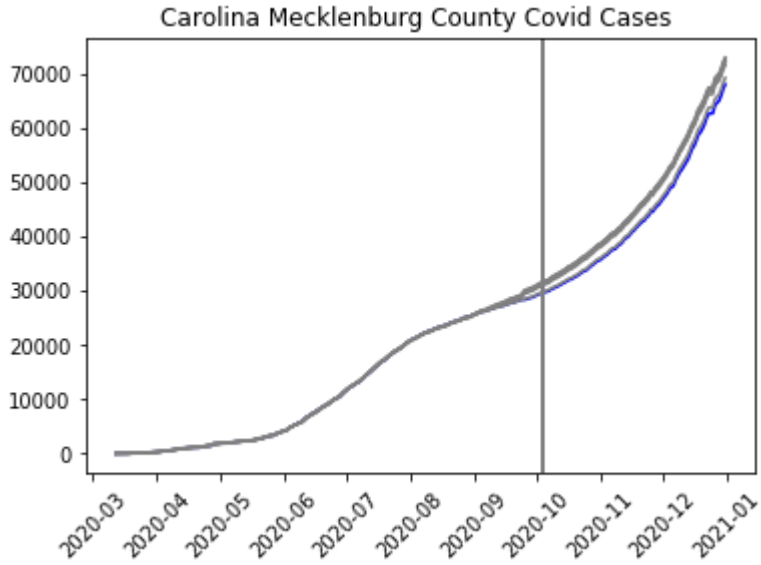


```
Chicago
3
3
3
3
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3
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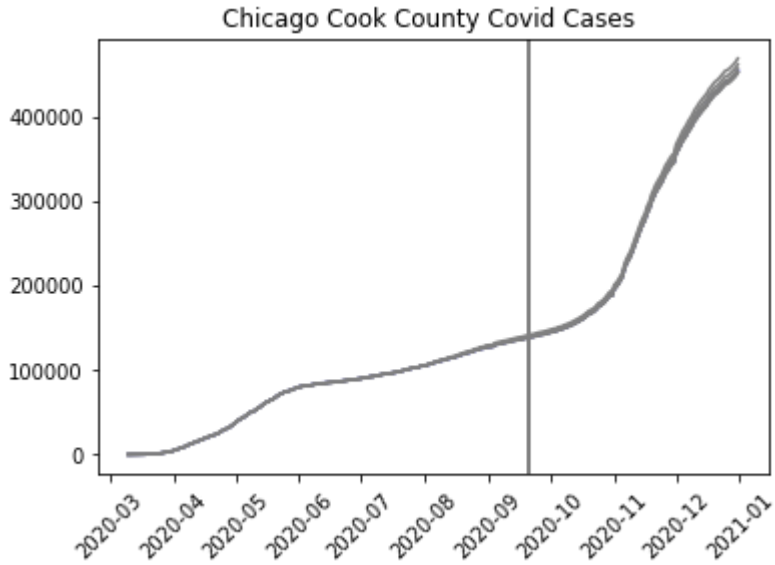

```
Cincinnati
12
12
12
11
11
10
10
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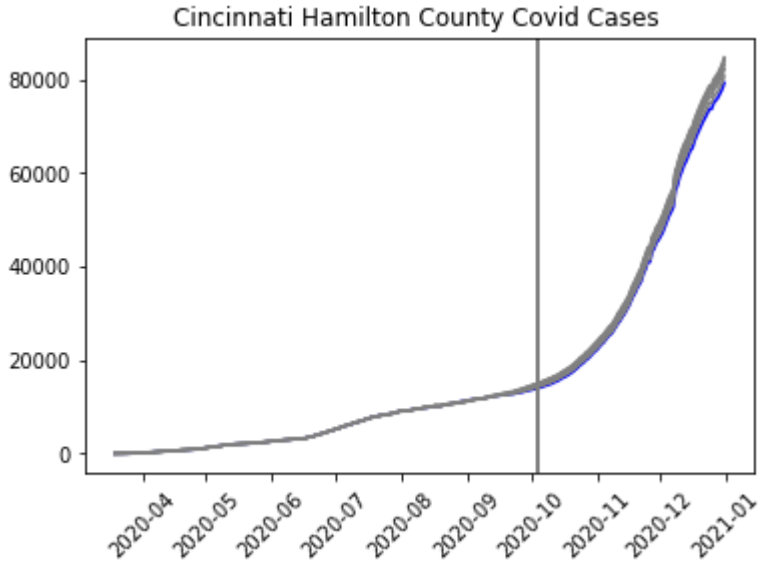


```
Cleveland
15
10
13
14
13
12
13
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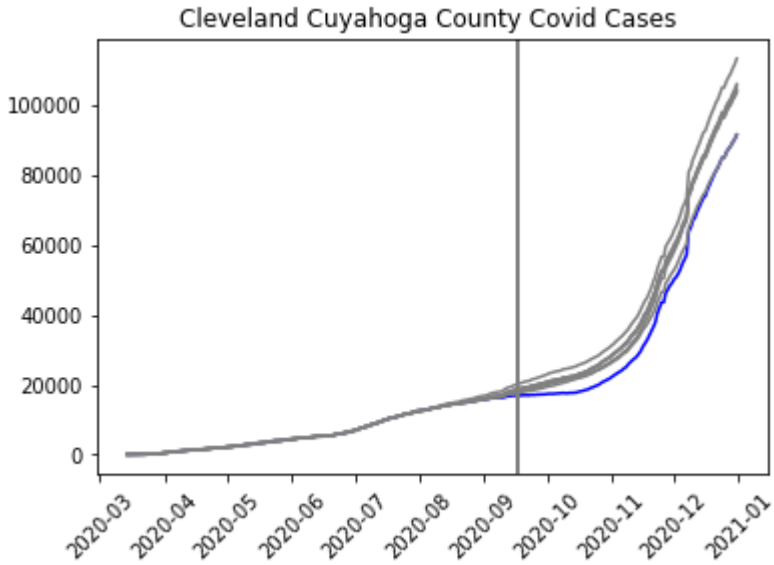

```
Dallas
37
36
38
38
37
26
26
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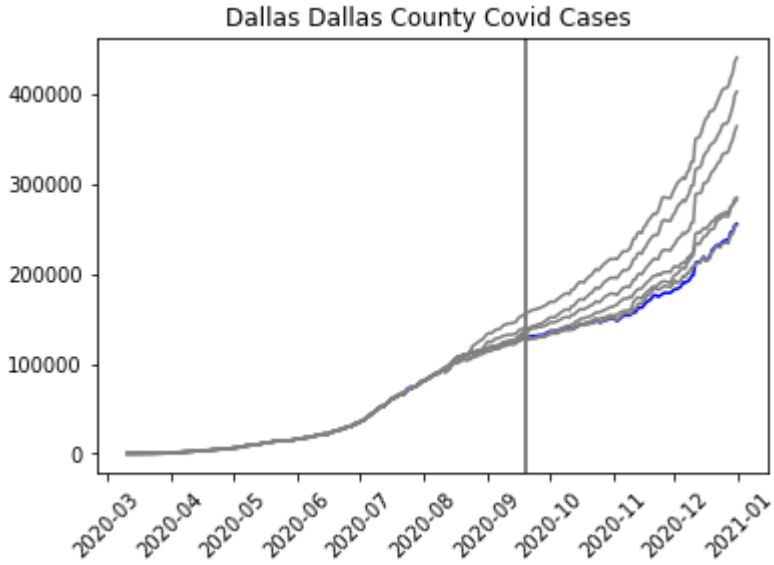
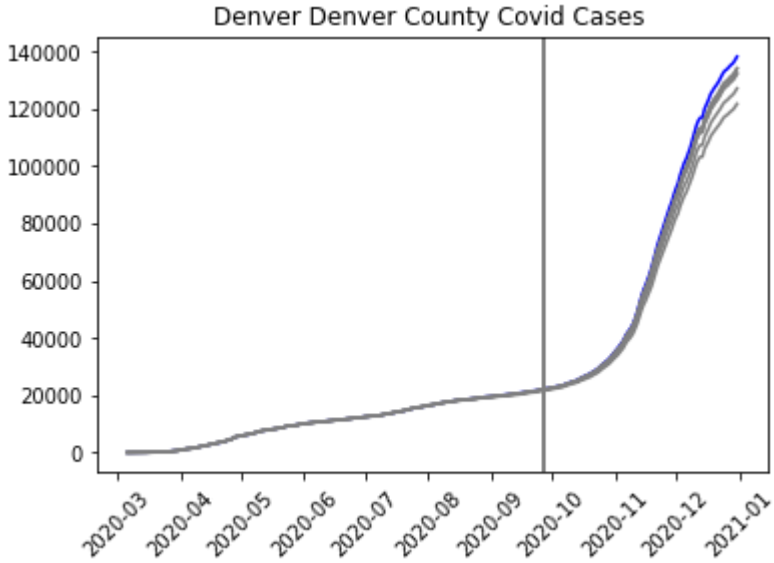
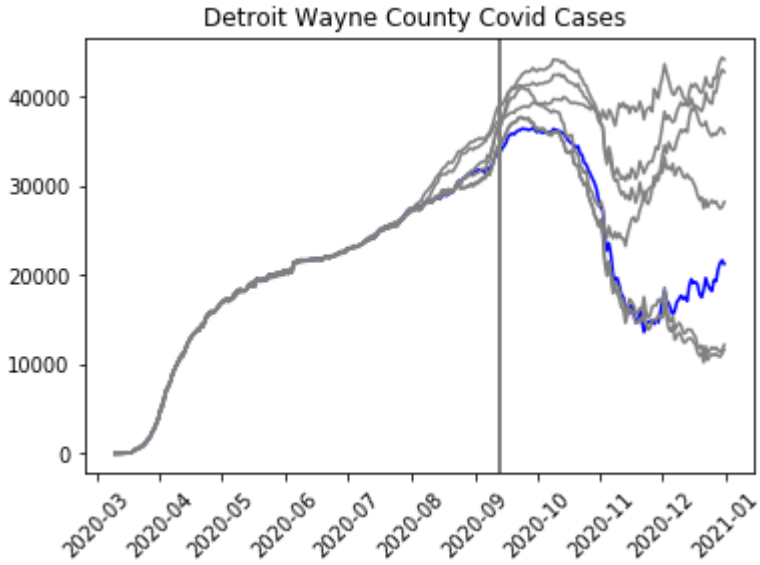


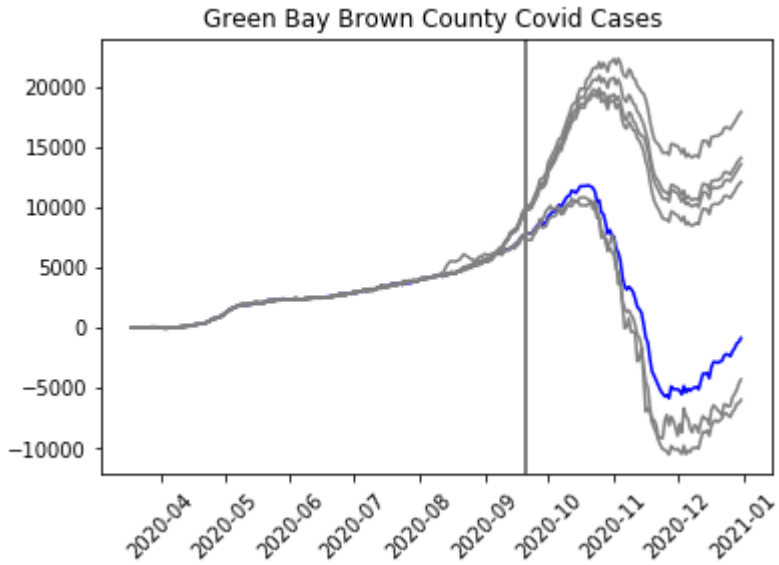

```
Denver
6
6
6
6
6
6
7
```



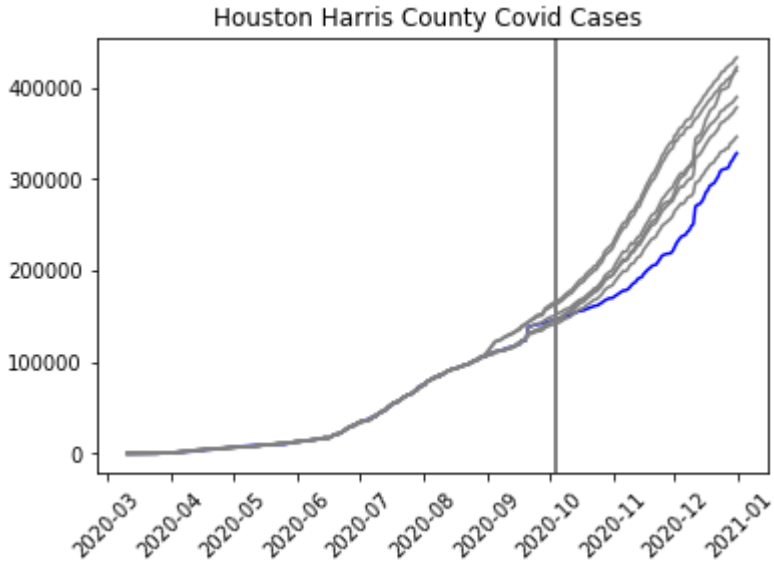
```
Detroit
14
13
12
12
12
11
8
```



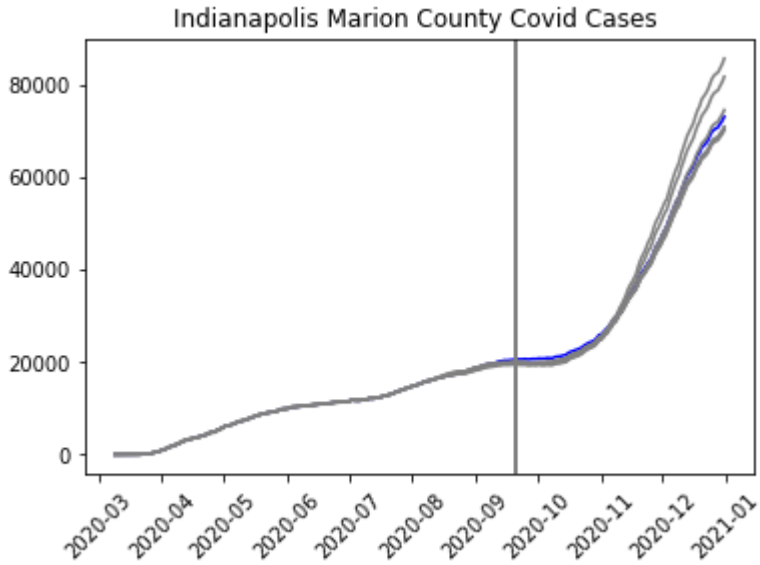

```
Green Bay
14
15
15
13
12
12
19
```



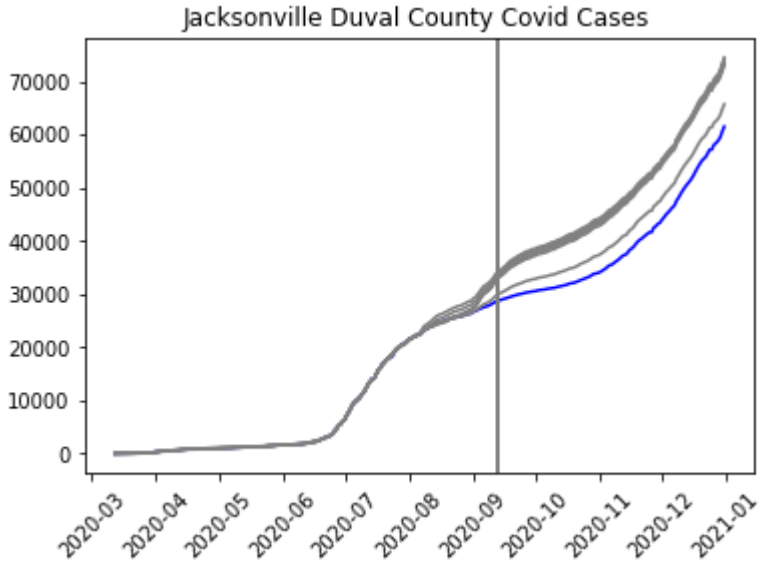
```
Houston
13
12
14
14
15
13
13
```



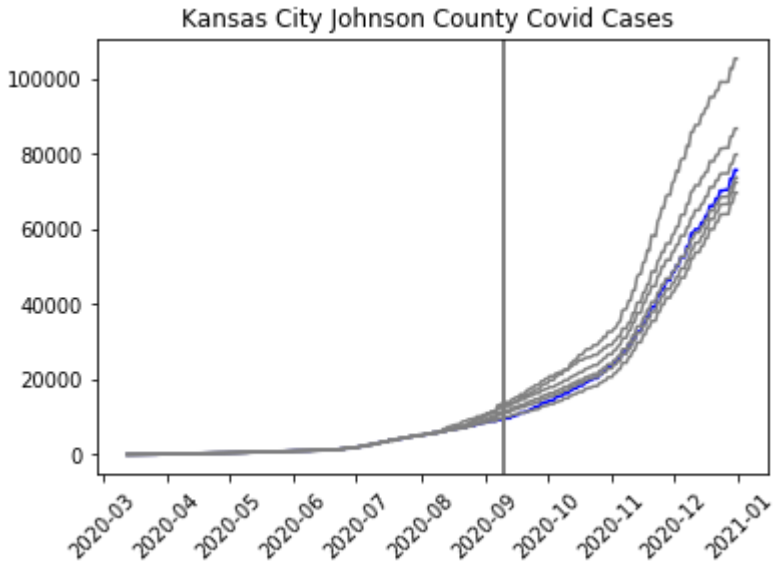

```
Indianapolis
9
9
9
8
7
7
8
```



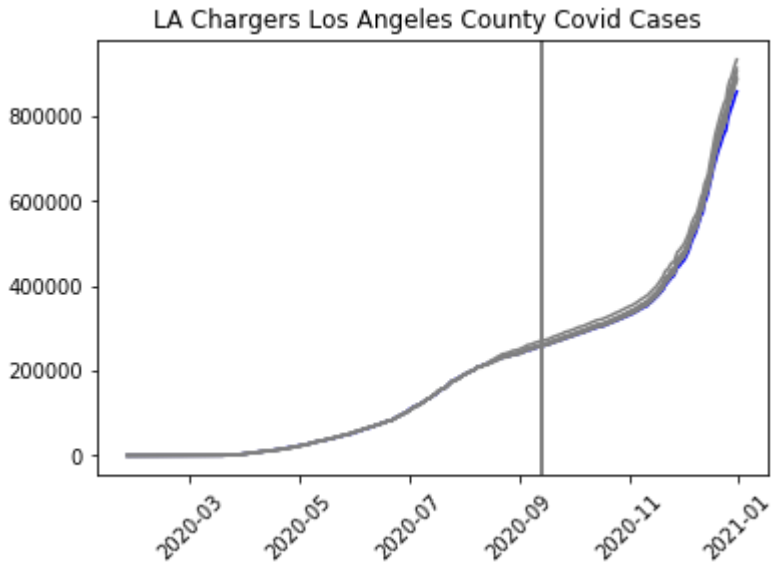
```
Jacksonville
9
9
8
8
8
9
8
```



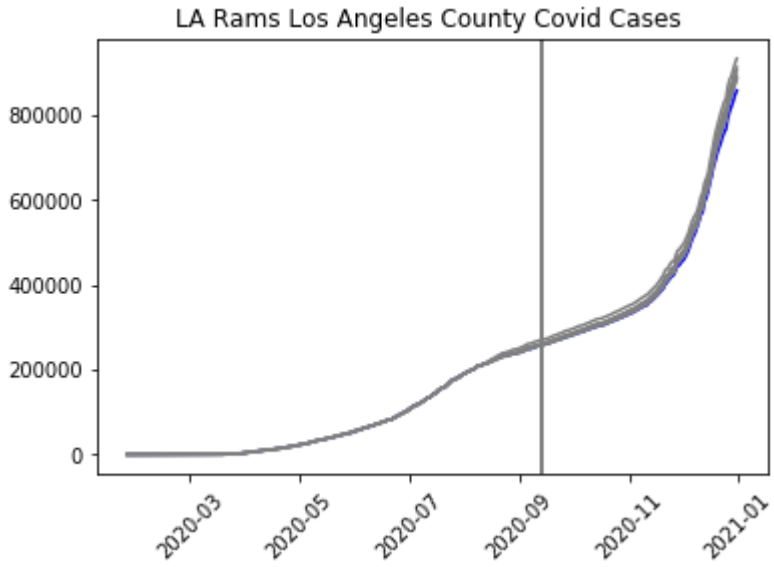

```
Kansas City
24
16
15
13
23
31
10
```



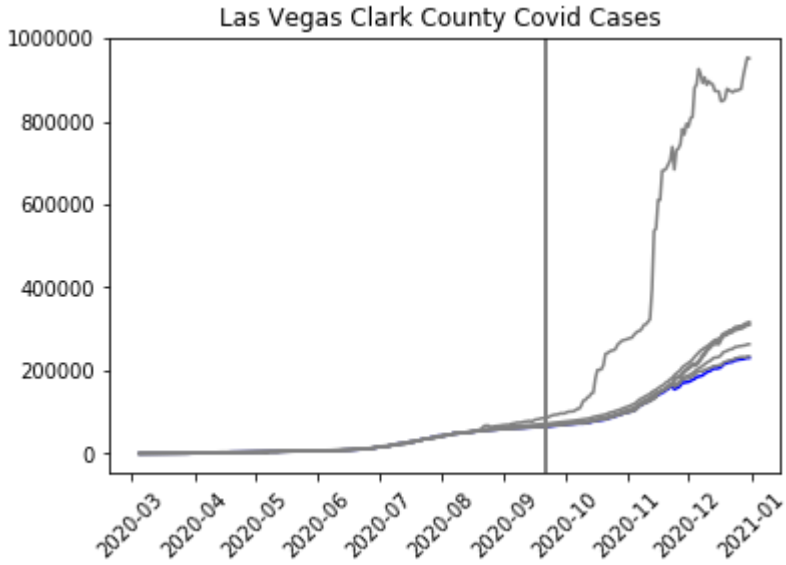
```
LA Chargers
6
6
6
6
6
5
5
```



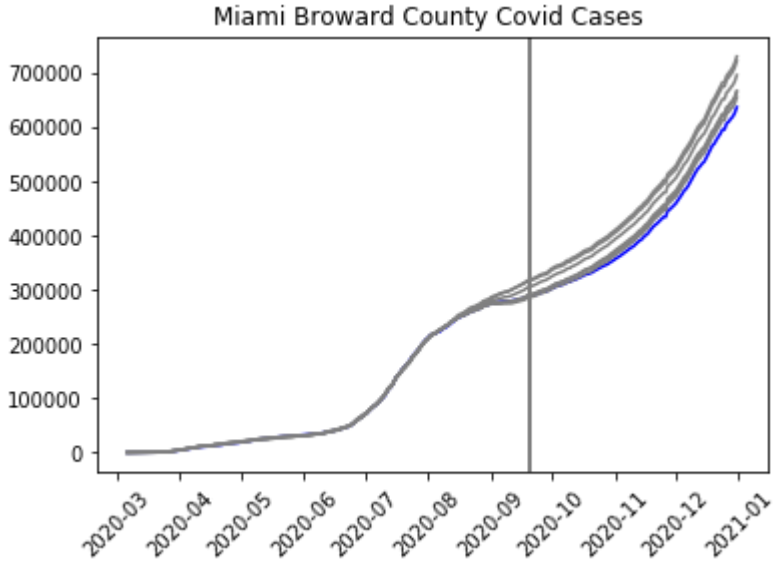

```
LA Rams
6
6
6
6
6
5
5
```



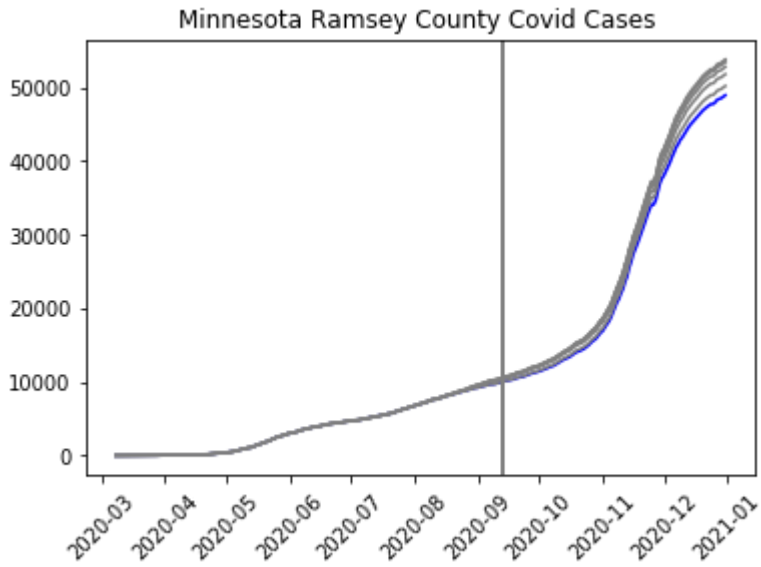
```
Las Vegas
4
5
5
3
4
3
12
```



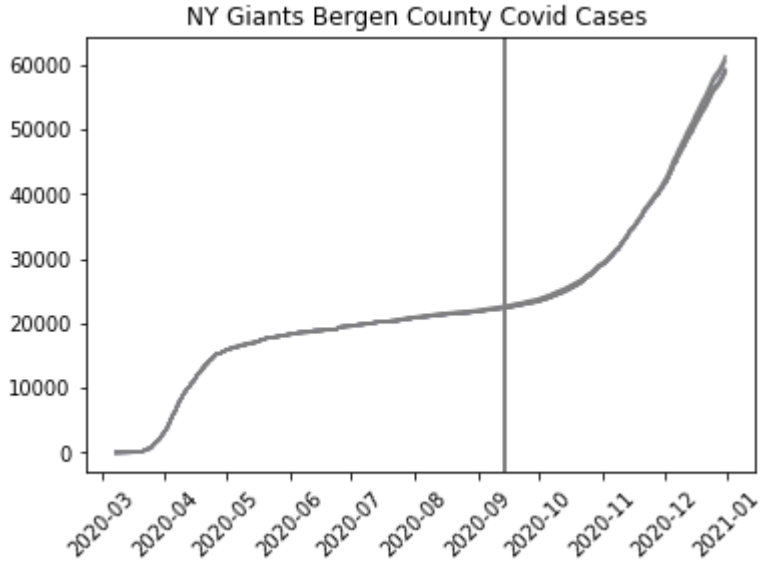

```
Miami
7
8
8
8
8
10
9
```



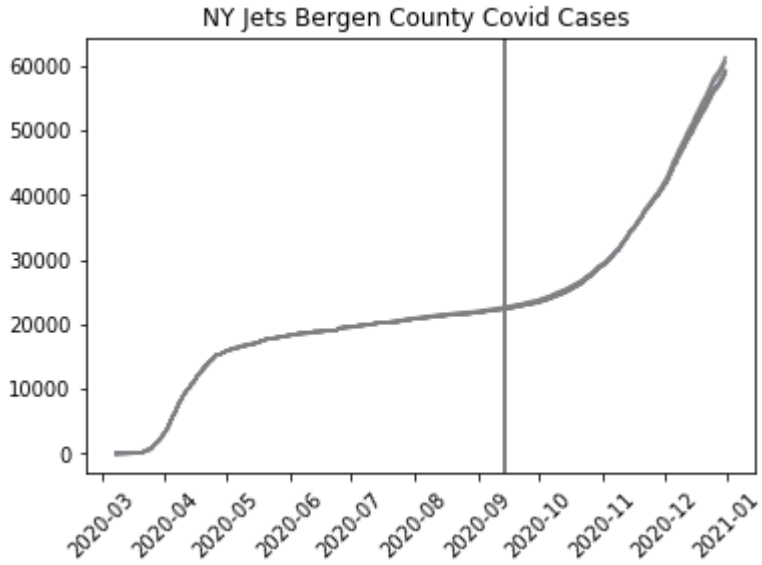
```
Minnesota
6
6
5
5
5
5
5
```



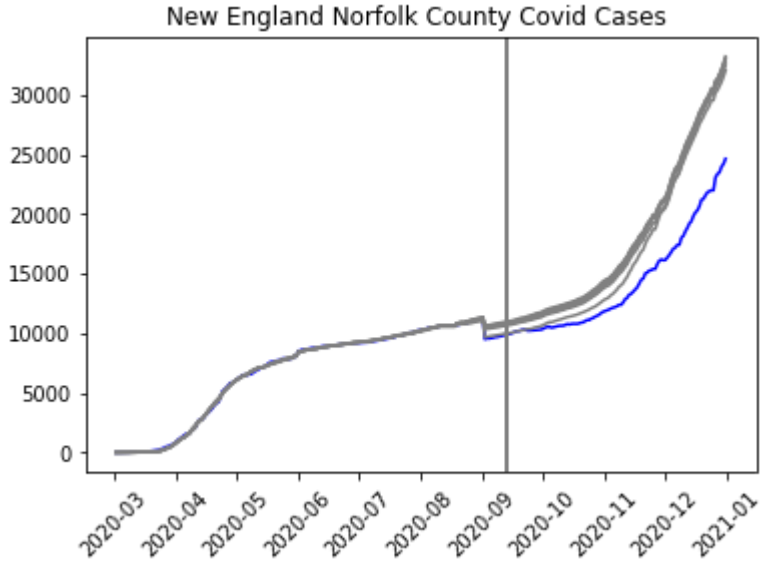

```
NY Giants
3
3
3
3
3
4
4
```



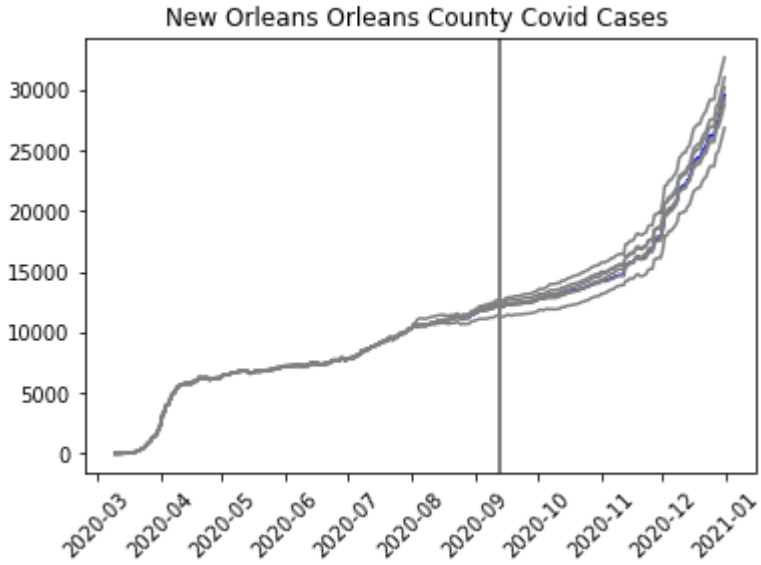
```
NY Jets
3
3
3
3
3
4
4
```



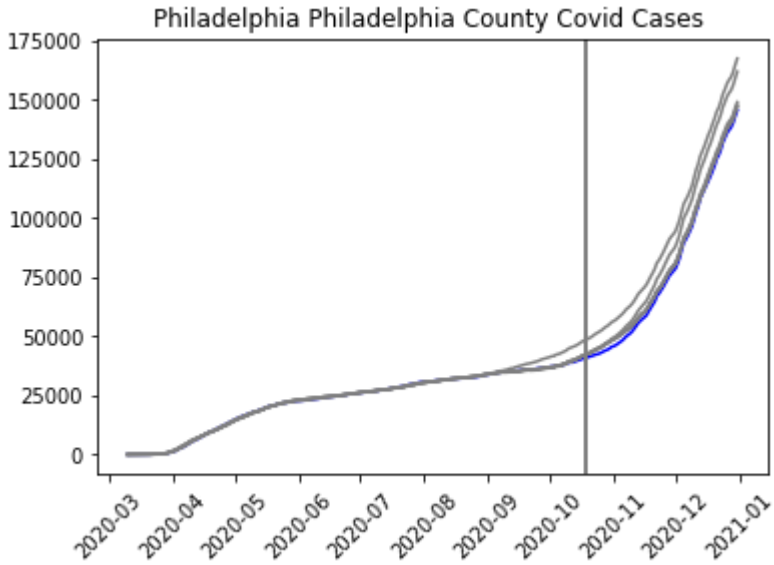

```
New England
7
4
3
3
3
3
3
```



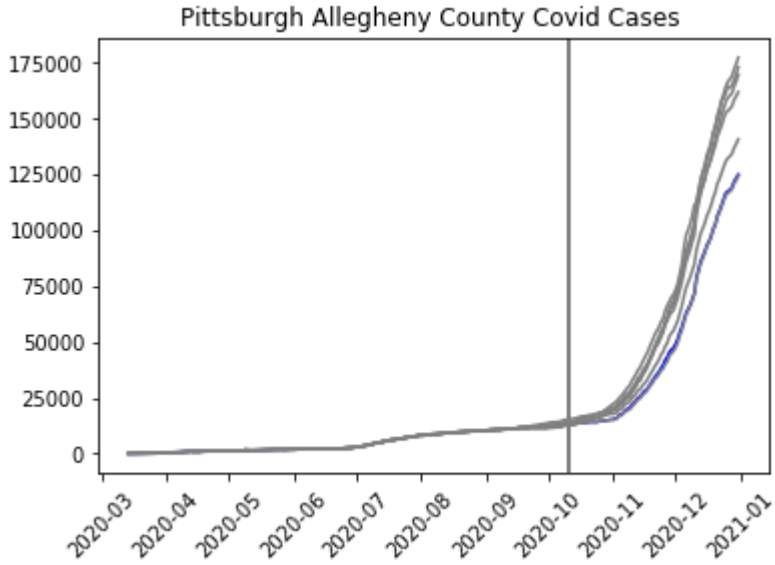
```
New Orleans
10
10
10
9
10
10
9
```



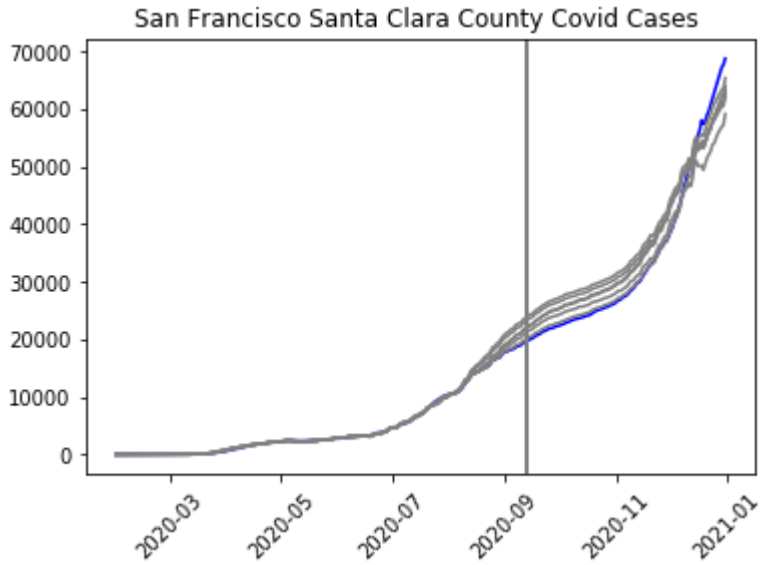

```
Philadelphia
8
5
5
5
5
6
6
```



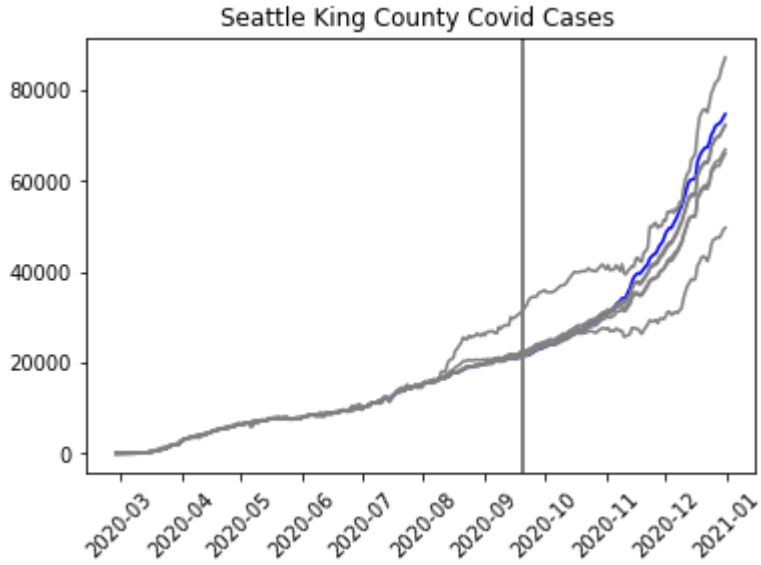
```
Pittsburgh
22
20
20
24
25
29
17
```



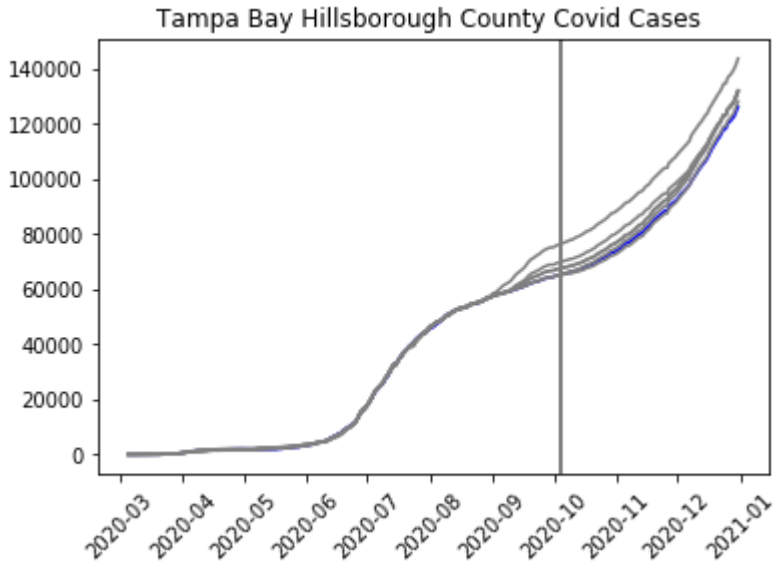

```
San Francisco
12
14
14
13
34
40
11
```



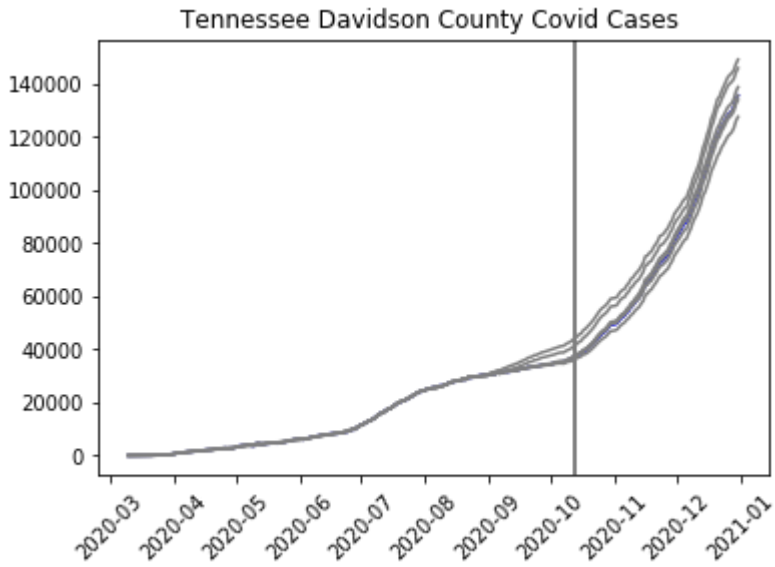
```
Seattle
5
5
3
3
3
22
22
```




```
Tampa Bay
8
9
10
9
9
11
9
```



```
Tennessee
14
13
14
16
16
16
15
```



In [ ]:
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#create_synthetic_lines("Kansas City",["Johnson", "Jackson"], ["K
S", "MO"], ["09/10/2020"])
```
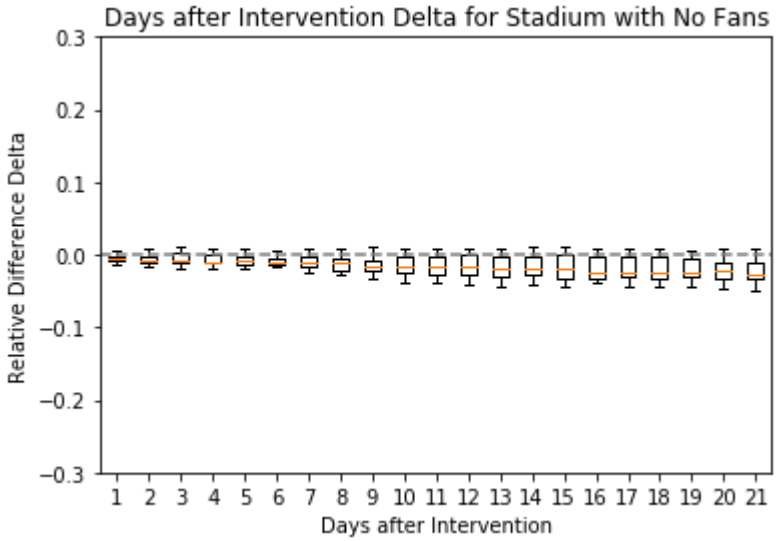
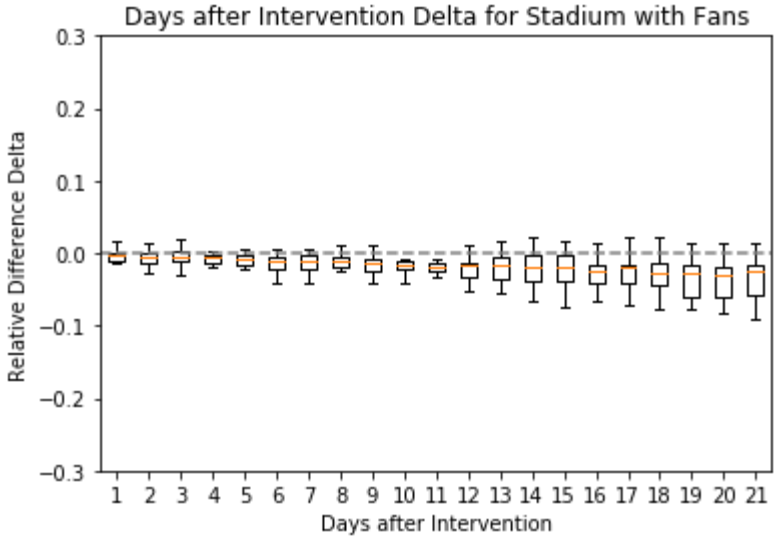

```
(14, 21)
```


Days after Intervention Delta for Stadium with No Fans
Relative Difference Delta
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Days after Intervention


Days after Intervention Delta for Stadium with Fans
Relative Difference Delta
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Days after Intervention

In [ ]:

In [ ]: