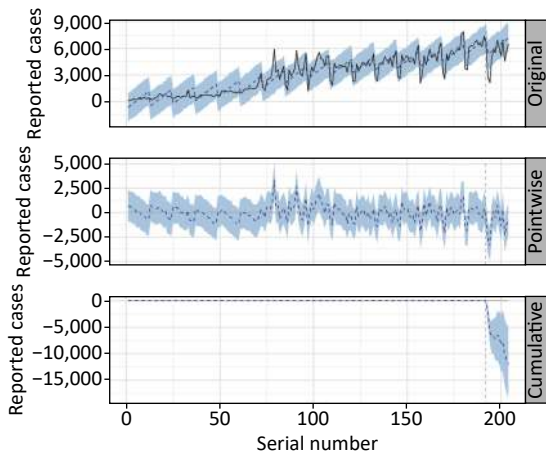
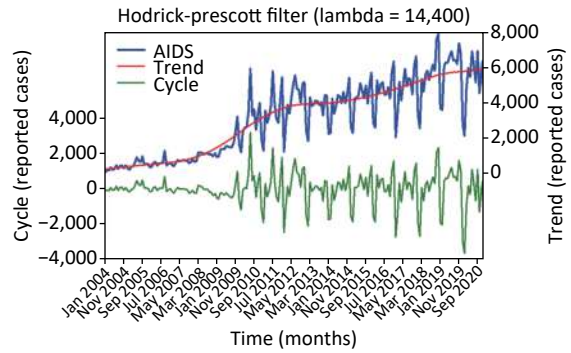


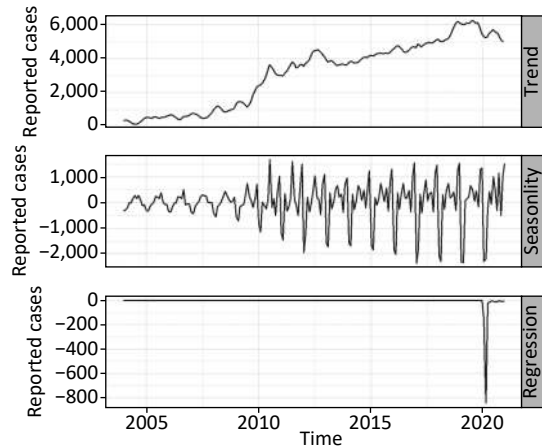
Supplementary Figure S1. Joinpoint regression plot showing the AIDS epidemiological trends during 2004–2020. *Showed that the annual percent change (APC) is statistically significant.



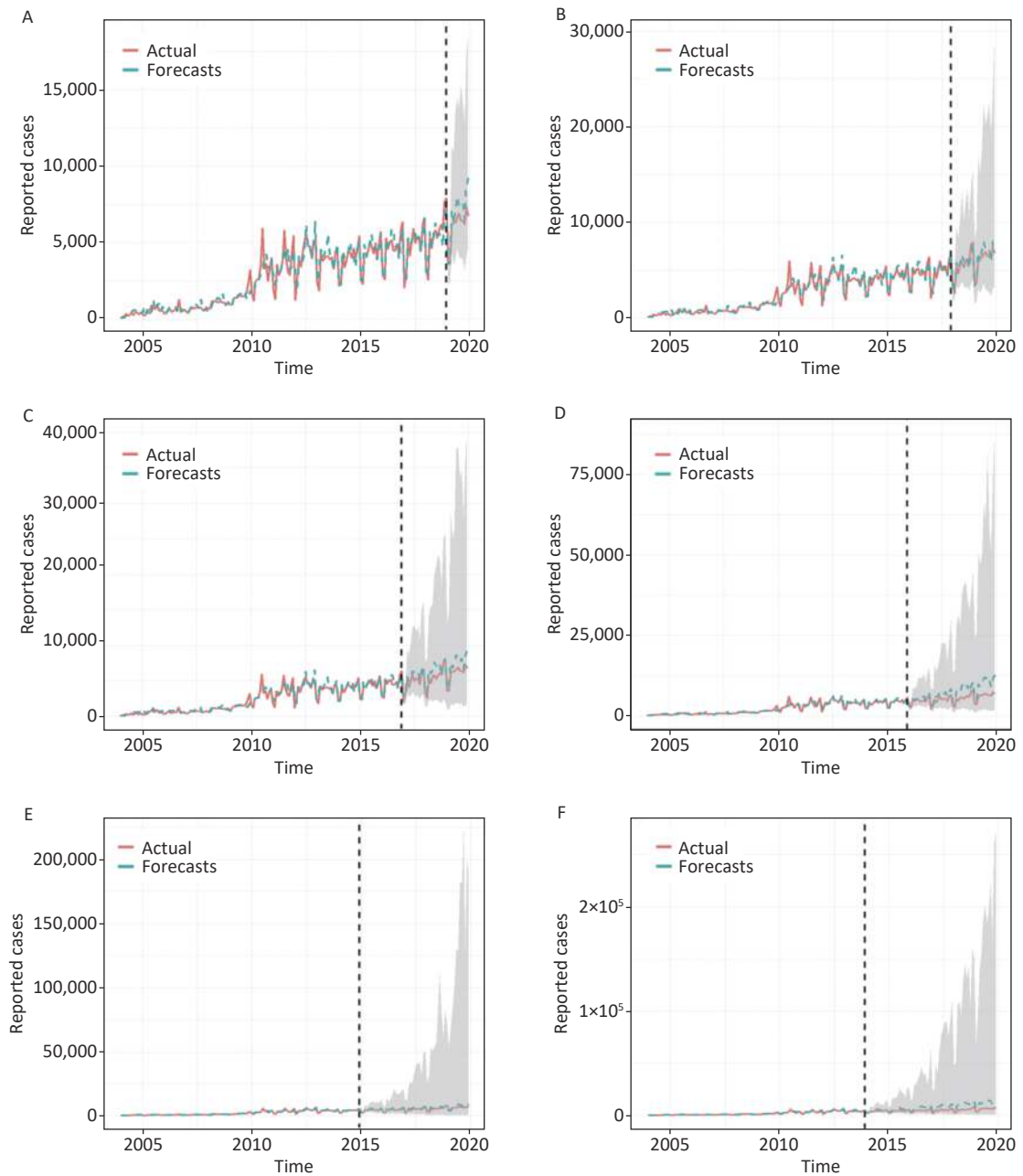
Supplementary Figure S3. Time series plot displaying the causal impacts of the COVID-19 outbreak on the decreases in AIDS cases from January–December 2020. The first panel provides the reported AIDS cases and counterfactual expected figures for the post-outbreak period. The second panel describes the pointwise causal impact that indicates the difference between reported cases and expected figures. The third panel illustrates a cumulative effect of the COVID-19 pandemic on the decreases in AIDS cases via accumulating the pointwise effects from the second panel.



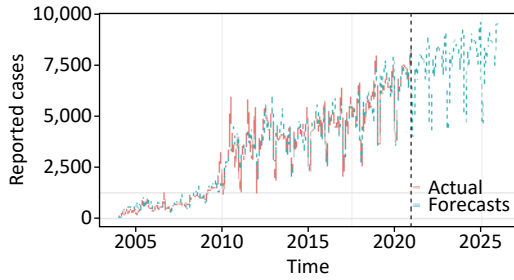
Supplementary Figure S2. Time series plot showing the AIDS incidence and the decomposed trend and cyclicity based on the Hodrick-Prescott filter technique.



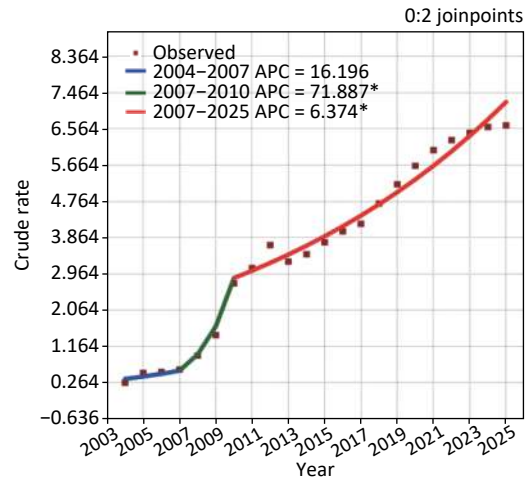
Supplementary Figure S4. Contribution of trend, seasonality, and regression (COVID-19 outbreak) components to the AIDS incidence. As depicted, the AIDS incidence has a noticeable seasonal pattern and the COVID-19 outbreak causes a remarkable decrease in AIDS cases during this period.



Supplementary Figure S5. Time series plot showing the forecasted temporal trends of the AIDS incidence for (A) 12 holdout data, (B) 24 holdout data, (C) 36 holdout data, (D) 48 holdout data, (E) 60 holdout data, and (F) 72 holdout data under BSTS approaches. It can be seen that the BSTS approaches are able to better capture the long-term epidemiological trends of AIDS for the 60-step ahead forecast except for the 72 holdout data.



Supplementary Figure S6. Time series plot showing the forecasting results until 2025. This plot displays the actual series in red, and the fitting and forecasting results as a blue line. It seemed that the BSTS method predicted a rising trend from January 2021 to December 2025.



Supplementary Figure S7. Joinpoint regression plot showing the AIDS epidemiological trends during 2004–2025. *Showed that the annual percent change (APC) is statistically significant.

Supplementary Table S1. Projection into the next 12 months with the best BSTS model

Time	Observed values	Forecasts	Lower 95% CI	Upper 95% CI
Jan-19	3,688	3,585	2,312	5,456
Feb-19	3,587	3,705	2,392	5,749
Mar-19	6,086	7,096	4,435	11,251
Apr-19	6,277	6,243	3,561	10,956
May-19	6,291	7,160	3,953	13,509
Jun-19	6,642	7,998	4,629	14,462
Jul-19	6,912	7,419	4,017	13,787
Aug-19	6,404	7,495	3,994	15,313
Sep-19	6,435	7,645	3,919	14,208
Oct-19	6,207	6,554	3,210	12,858
Nov-19	7,366	8,685	4,182	17,364
Dec-19	6,735	9,262	4,648	18,713

Note. BSTS, bayesian structural time series; CI, confidence interval.

Supplementary Table S2. Projection into the next 24 months with the best BSTS model

Time	Observed values	Forecasts	Lower 95% <i>CI</i>	Upper 95% <i>CI</i>
Jan-18	3,309	2,706	1,733	4,268
Feb-18	2,559	3,282	2,034	5,223
Mar-18	5,331	5,764	3,453	9,530
Apr-18	4,642	5,084	3,012	8,324
May-18	5,593	5,713	3,337	10,153
Jun-18	5,809	6,589	3,817	13156
Jul-18	5,289	5,947	3,413	10,132
Aug-18	5,750	6,046	2,982	11,945
Sep-18	6,155	6,299	3,339	13,452
Oct-18	5,823	5,156	2,819	10,586
Nov-18	7,622	6,724	3,594	13,686
Dec-18	7,897	7,782	3,960	15,353
Jan-19	3,688	3,270	1,460	8,265
Feb-19	3,587	3,948	1,691	9,199
Mar-19	6,086	6,775	3,091	16,810
Apr-19	6,277	5,947	2,570	15,191
May-19	6,291	7,084	3,006	17,463
Jun-19	6,642	7,916	3,595	22,345
Jul-19	6,912	7,161	2,983	20,196
Aug-19	6,404	7,167	2,806	21,118
Sep-19	6,435	7,223	2,768	22,372
Oct-19	6,207	5,907	2,186	19,169
Nov-19	7,366	8,081	3,164	23,776
Dec-19	6,735	8,696	3,095	29,832

Note. BSTS, bayesian structural time series; *CI*, confidence interval.

Supplementary Table S3. Projection into the next 36 months with the best BSTS model

Time	Observed values	Forecasts	Lower 95% CI	Upper 95% CI
Jan-17	2,053	2,944	1,868	4,654
Feb-17	3,325	2,815	1,749	4,723
Mar-17	5,179	5,577	3,370	9,258
Apr-17	4,140	4,976	2,788	8,672
May-17	5,025	5,517	2,834	10,287
Jun-17	5,916	6,377	3,482	12,599
Jul-17	4,950	6,269	3,141	12,730
Aug-17	5,400	5,717	2,748	11,901
Sep-17	5,283	6,059	3,008	12,664
Oct-17	4,485	5,100	2,345	10,740
Nov-17	6,136	6,371	3,006	14,836
Dec-17	6,622	7,131	2,986	16,146
Jan-18	3,309	3,441	1,504	7,664
Feb-18	2,559	3,267	1,299	8,142
Mar-18	5,331	6,569	2,303	14,159
Apr-18	4,642	6,023	2,296	15,409
May-18	5,593	6,394	2,034	15,797
Jun-18	5,809	7,606	2,418	19,859
Jul-18	5,289	7,200	2,279	21,236
Aug-18	5,750	6,673	2,307	22,733
Sep-18	6,155	7,243	2,021	21,877
Oct-18	5,823	5,769	1,755	18,021
Nov-18	7,622	7,548	2,445	24,995
Dec-18	7,897	8,122	2,112	25,658
Jan-19	3,688	4,014	1,178	13,043
Feb-19	3,587	3,796	842	14,831
Mar-19	6,086	7,528	1,739	28,360
Apr-19	6,277	6,792	1,596	24,977
May-19	6,291	7,499	1,692	26,202
Jun-19	6,642	8,662	1,901	37,588
Jul-19	6,912	8,251	1,831	37,973
Aug-19	6,404	7,661	1,746	33,448
Sep-19	6,435	8,179	1,764	34,716
Oct-19	6,207	6,671	1,312	27,925
Nov-19	7,366	8,418	1,565	35,771
Dec-19	6,735	9,528	1,606	40,078

Note. BSTS, bayesian structural time series; CI, confidence interval.

Supplementary Table S4. Projection into the next 48 months with the best BSTS model

Time	Observed values	Forecasts	Lower 95% CI	Upper 95% CI
Jan-16	2,862	2,766	1,781	4,174
Feb-16	2,582	2,751	1,717	4,439
Mar-16	5,255	5,259	3,168	8,292
Apr-16	4,574	4,938	2,831	8,590
May-16	5,041	5,151	2,922	8,973
Jun-16	5159	6106	3454	11682
Jul-16	4,459	6,173	3,197	11,654
Aug-16	4,469	5,745	2,797	11,691
Sep-16	4,877	6,061	3,029	13,069
Oct-16	4,244	4,885	2,295	9,766
Nov-16	5,743	6,146	3,018	12,823
Dec-16	6,335	6,898	3,033	14,758
Jan-17	2,053	3,339	1,592	7,973
Feb-17	3,325	3,362	1,433	8,756
Mar-17	5,179	6,321	2,557	15,687
Apr-17	4,140	5,876	2,221	13,813
May-17	5,025	6,263	2,290	15,660
Jun-17	5,916	7,497	2,779	18,637
Jul-17	4,950	7,643	2,277	22,919
Aug-17	5,400	6,807	2,341	22,403
Sep-17	5,283	7,443	2,333	22,594
Oct-17	4,485	5,853	1,745	16,034
Nov-17	6,136	7,388	2,245	23,326
Dec-17	6,622	8,332	2,706	29,883
Jan-18	3,309	4,021	1,123	13,424
Feb-18	2,559	3,994	1,037	14,080
Mar-18	5,331	7,724	2,011	27,797
Apr-18	4,642	7,050	1,963	31,483
May-18	5,593	7,573	1,900	27,575
Jun-18	5,809	9,408	2,449	37,644
Jul-18	5,289	9,804	2,312	40,557
Aug-18	5,750	8,510	2,014	41,629
Sep-18	6,155	9,478	2,198	36,469
Oct-18	5,823	7,441	1,447	32,547
Nov-18	7,622	9,239	1,979	37,493
Dec-18	7,897	10,527	1,783	44,662
Jan-19	3,688	5,195	1,086	24,229
Feb-19	3,587	5,156	1,042	25,715
Mar-19	6,086	9,818	1,860	50,315
Apr-19	6,277	9,066	1,679	46,861
May-19	6,291	9,884	1,700	50,171
Jun-19	6,642	11,797	2,223	65,983
Jul-19	6,912	12,051	2,034	61,158
Aug-19	6,404	10,416	1,676	81,220
Sep-19	6,435	11,049	1,731	58,159
Oct-19	6,207	8,958	1,486	51,077
Nov-19	7,366	11,484	1,667	74,941
Dec-19	6,735	12,685	1,831	88,125

Note. BSTS, bayesian structural time series; CI, confidence interval.

Supplementary Table S5. Projection into the next 60 months with the best BSTS model

Time	Observed values	Forecasts	Lower 95% CI	Upper 95% CI
Jan-15	2,597	2,474	1,534	4,413
Feb-15	2,294	2,574	1,436	4,199
Mar-15	4,238	4,854	2,911	8,455
Apr-15	4,299	4,196	2,592	7,072
May-15	4,401	4,612	2,580	8,747
Jun-15	5,089	5,411	3,130	10,218
Jul-15	4,701	5,836	2,930	11,613
Aug-15	4,268	4,749	2,546	9,391
Sep-15	4,967	5,105	2,315	11,255
Oct-15	3,955	4,103	2,018	9,834
Nov-15	5,040	5,004	2,234	10,702
Dec-15	5,707	5,819	2,536	13,160
Jan-16	2,862	2,703	1,067	6,714
Feb-16	2,582	2,776	893	7,598
Mar-16	5,255	5,274	1,924	13,781
Apr-16	4,574	4,288	1,575	10,917
May-16	5,041	4,984	1,554	12,621
Jun-16	5,159	5,793	1,757	16,881
Jul-16	4,459	6,415	1,910	21,076
Aug-16	4,469	5,358	1,465	16,956
Sep-16	4,877	5,619	1,634	17,392
Oct-16	4,244	4,662	1,452	17,245
Nov-16	5,743	5,677	1,804	19,784
Dec-16	6,335	6,425	1,591	20,543
Jan-17	2,053	3,010	732	11,769
Feb-17	3,325	3,051	720	13,038
Mar-17	5,179	5,875	1,364	22,057
Apr-17	4,140	5,123	1,168	26,849
May-17	5,025	5,609	1,159	24,855
Jun-17	5,916	6,616	1,177	32,987
Jul-17	4,950	6,833	1,181	39,226
Aug-17	5,400	6,172	1,115	40,976
Sep-17	5,283	6,263	1,049	41,277
Oct-17	4,485	5,240	931	31,314
Nov-17	6,136	6,396	940	48,099
Dec-17	6,622	7,250	1,060	50,689
Jan-18	3,309	3,367	357	24,691
Feb-18	2,559	3,608	418	30,930
Mar-18	5,331	6,746	643	53,437
Apr-18	4,642	5,930	465	50,670
May-18	5,593	6,379	648	53,217
Jun-18	5,809	7,881	737	57,138
Jul-18	5,289	8,078	677	78,031
Aug-18	5,750	7,179	487	111,173
Sep-18	6,155	7,219	540	80,104
Oct-18	5,823	6,078	584	60,510
Nov-18	7,622	7,437	503	82,208
Dec-18	7,897	8,265	533	71,013
Jan-19	3,688	3,820	211	52,724
Feb-19	3,587	4,016	236	68,210
Mar-19	6,086	7,672	460	83,660
Apr-19	6,277	6,665	318	101,159
May-19	6,291	7,481	322	129,623
Jun-19	6,642	8,742	415	128,950

Continued

Time	Observed values	Forecasts	Lower 95% CI	Upper 95% CI
Jul-19	6,912	8,871	453	182,465
Aug-19	6,404	7,825	323	181,758
Sep-19	6,435	8,215	304	222,292
Oct-19	6,207	6,633	216	130,049
Nov-19	7,366	8,190	337	199,002
Dec-19	6,735	9,085	230	188,134

Note. BSTS, bayesian structural time series; CI, confidence interval.

Supplementary Table S6. Projection into the next 72 months with the best BSTS model

Time	Observed values	Forecasts	Lower 95% CI	Upper 95% CI
Jan-14	2,245	2,248	1,364	3,811
Feb-14	2,289	2,326	1,417	4,103
Mar-14	4,221	4,551	2,796	8,753
Apr-14	3,369	4,071	2,337	7,789
May-14	3,823	4,300	2,242	8,564
Jun-14	4,432	5,176	2,632	11,535
Jul-14	4,354	6,050	3,237	13,252
Aug-14	3,997	5,118	2,518	10,324
Sep-14	4,611	5,095	2,510	11,326
Oct-14	3,999	4,216	2,080	9,447
Nov-14	4,464	5,388	2,334	12,817
Dec-14	5,411	5,983	2,389	14,747
Jan-15	2,597	2,886	1,249	8,076
Feb-15	2,294	2,991	1,121	8,015
Mar-15	4,238	5,855	2,103	16,965
Apr-15	4,299	5,358	1,821	15,957
May-15	4,401	5,732	2,180	17,290
Jun-15	5,089	6,551	2,356	19,142
Jul-15	4,701	7,366	2,031	25,922
Aug-15	4,268	6,224	1,919	22,123
Sep-15	4,967	6,304	1,843	21,615
Oct-15	3,955	5,018	1,325	16,571
Nov-15	5,040	6,926	1,817	25,702
Dec-15	5,707	7,242	1,651	26,487
Jan-16	2,862	3,499	780	14,964
Feb-16	2,582	3,619	773	15,472
Mar-16	5,255	7,045	1,596	29,623
Apr-16	4,574	6,511	1,430	29,495
May-16	5,041	7,017	1,527	34,917
Jun-16	5,159	7,990	1,740	38,840
Jul-16	4,459	8,977	1,779	463,46
Aug-16	4,469	7,771	1,604	38,165
Sep-16	4,877	7,892	1,443	40,796
Oct-16	4,244	6,228	1,004	29,315
Nov-16	5,743	8,205	1,686	38,088
Dec-16	6,335	9,241	1,489	62,837
Jan-17	2,053	4,246	804	24,857
Feb-17	3,325	4,470	826	24,584
Mar-17	5,179	8,495	1,276	49,529
Apr-17	4,140	7,744	1,220	40,241
May-17	5,025	8,628	1,425	61,772
Jun-17	5,916	9,532	1,397	76,932

Continued

Time	Observed values	Forecasts	Lower 95% CI	Upper 95% CI
Jul-17	4,950	10,786	1,551	82,617
Aug-17	5,400	9137	1237	90,036
Sep-17	5,283	9,181	1,195	89,067
Oct-17	4,485	7,446	862	74,554
Nov-17	6,136	9,671	1,319	91,413
Dec-17	6,622	10,857	1,249	109,528
Jan-18	3,309	5,181	606	48,530
Feb-18	2,559	5,157	582	49,770
Mar-18	5,331	10,082	1,226	105,203
Apr-18	4,642	9,580	925	109,208
May-18	5,593	10,171	1,086	95,111
Jun-18	5,809	11,679	1,260	128,081
Jul-18	5,289	12,890	1,174	144,514
Aug-18	5,750	11,262	935	131,632
Sep-18	6,155	11,565	799	141,919
Oct-18	5,823	9,189	664	102,419
Nov-18	7,622	11,952	1,042	159,851
Dec-18	7,897	12,981	959	151,496
Jan-19	3,688	6,427	538	67,619
Feb-19	3,587	6,515	476	91,573
Mar-19	6,086	12,569	971	138,145
Apr-19	6,277	11,290	724	155,486
May-19	6,291	12,570	814	188,043
Jun-19	6,642	14,170	873	201,496
Jul-19	6,912	16,199	1,331	183,713
Aug-19	6,404	13,710	916	196,102
Sep-19	6,435	13,720	863	222,283
Oct-19	6,207	11,039	589	166,215
Nov-19	7,366	141,95	829	260,006
Dec-19	6,735	16,142	885	272,946

Note. BSTS, bayesian structural time series; CI, confidence interval.

Supplementary Table S7. Projection into time windows between January 2021 and December 2025 with the best BSTS model

Time	Forecasts	Lower 95% CI	Upper 95% CI
Jan-21	3,997	2,570	6,051
Feb-21	4,029	2,744	6,276
Mar-21	7,365	4,578	11,810
Apr-21	6,796	4,239	10,739
May-21	7,340	4,303	12,784
Jun-21	8,096	4,501	13,923
Jul-21	7,905	4,592	14,086
Aug-21	7,717	4,192	15,547
Sep-21	7,780	4,325	15,556
Oct-21	6,792	3,493	13,938
Nov-21	8,348	4,260	16,684
Dec-21	8,923	4,320	19,075
Jan-22	4,205	1,838	10,566
Feb-22	4,331	1,630	10,914
Mar-22	7,804	3,282	18,627
Apr-22	6,971	2,796	19,686
May-22	7,854	2,662	24,626
Jun-22	8,462	2,885	26,701

Continued

Time	Forecasts	Lower 95% <i>CI</i>	Upper 95% <i>CI</i>
Jul-22	8,349	2,543	29,112
Aug-22	8,113	2,312	29,307
Sep-22	7,987	2,466	28,822
Oct-22	6,987	1,814	27,818
Nov-22	8,734	2,159	36,316
Dec-22	9,077	2,204	41,700
Jan-23	4,383	932	21,373
Feb-23	4,359	824	26,530
Mar-23	8,055	1,700	42,445
Apr-23	7,354	1,399	46,078
May-23	8,076	1,407	54,858
Jun-23	8,753	1,531	69,291
Jul-23	8,451	1,195	68,181
Aug-23	8,417	1,238	92,746
Sep-23	8,258	1,042	68,585
Oct-23	7,251	838	67,220
Nov-23	8,917	975	98,745
Dec-23	9,380	983	99,853
Jan-24	4,436	391	47,999
Feb-24	4,545	364	58,966
Mar-24	8,161	616	123,931
Apr-24	7,552	472	129,781
May-24	8,209	480	142,703
Jun-24	9,008	583	187,843
Jul-24	8,725	426	189,636
Aug-24	8,648	426	224,957
Sep-24	8,502	384	171,097
Oct-24	7,510	307	163,992
Nov-24	9,163	297	267,638
Dec-24	9,575	327	312,094
Jan-25	4,594	141	158,220
Feb-25	4,651	114	182,361
Mar-25	8,332	230	324,672
Apr-25	7,598	157	307,727
May-25	8,367	147	400,556
Jun-25	9,073	190	522,450
Jul-25	8,714	134	535,229
Aug-25	8,604	122	576,059
Sep-25	8,463	104	548,544
Oct-25	7,485	100	525,668
Nov-25	9,453	97	726,947
Dec-25	95,36	84	803,479

Note. BSTS, bayesian structural time series; *CI*, confidence interval.