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Brief communication

Differences in rapid increases in county-level COVID-19 incidence by implementation of statewide closures and mask mandates — United States, June 1–September 30, 2020

Sharoda Dasgupta, PhD, MPH[a,1], Ahmed M. Kassem, MD, PhD[a,1], Gregory Sunshine, JD[a,b], Tiebin Liu, MSPH[a], Charles Rose, PhD[a], Gloria J. Kang, PhD, MPH[a], Rachel Silver, MPH[a], Brandy L. Peterson Maddox, MPH[a], Christina Watson, DrPH[a], Mara Howard-Williams, JD, MPH[b], Maxim Gakh, JD, MPH[c], Russell McCord, JD[a,b], Regen Weber, BA[b], Kelly Fletcher, MPH[a], Trieste Musial, MS[a], Michael A. Tynan, BA[a], Rachel Hulkower, JD, MSPH[a,b], Amanda Moreland, JD, MPH[b], Dawn Pepin, JD, MPH[a], Lisa Landsman, JD[b], Amanda Brown, JD[b], Siobhan Gilchrist, JD, MPH[a], Catherine Clodfelter, JD[a], Michael Williams, MPH[a], Ryan Cramer, JD[a], Alexa Limeres, JD[a], Adebola Popoola, JD[a], Sebnem Dugmeoglu, MPH[a], Julia Shelburne, JD[b], Gi Jeong, JD[b], Carol Y. Rao, MSc, ScD[a,*]

[a] *CDC COVID-19 Response Team, Centers for Disease Control and Prevention, Atlanta, GA*
[b] *Public Health Law Program, Centers for Disease Control and Prevention, Atlanta, GA*
[c] *University of Nevada, Las Vegas, Las Vegas, NV*

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Background and Objective: Community mitigation strategies could help reduce COVID-19 incidence, but there are few studies that explore associations nationally and by urbanicity. In a national county-level analysis, we examined the probability of being identified as a county with rapidly increasing COVID-19 incidence (rapid riser identification) during the summer of 2020 by implementation of mitigation policies prior to the summer, overall and by urbanicity.
Methods: We analyzed county-level data on rapid riser identification during June 1–September 30, 2020 and statewide closures and statewide mask mandates starting March 19 (obtained from state government websites). Poisson regression models with robust standard error estimation were used to examine differences in the probability of rapid riser identification by implementation of mitigation policies (*P*-value< .05); associations were adjusted for county population size.
Results: Counties in states that closed for 0–59 days were more likely to become a rapid riser county than those that closed for >59 days, particularly in nonmetropolitan areas. The probability of becoming a rapid riser county was 43% lower among counties that had statewide mask mandates at reopening (adjusted prevalence ratio = 0.57; 95% confidence intervals = 0.51–0.63); when stratified by urbanicity, associations were more pronounced in nonmetropolitan areas.
Conclusions: These results underscore the potential value of community mitigation strategies in limiting the COVID-19 spread, especially in nonmetropolitan areas.

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

* Corresponding author. Centers for Disease Control and Prevention, 1600 Clifton Rd, Atlanta, GA 30030.
E-mail address: crao@cdc.gov (C.Y. Rao).

[1] These authors contributed equally.

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Introduction

To date, nearly 29 million people have been diagnosed with coronavirus disease 2019 (COVID-19) in the United States, of whom over 500,000 persons have died [1]. In addition, there has been increased spread of the B.1.1.7 SARS-CoV-2 variant in the United States that has been shown to be more transmissible than other variants [2,3]. Community mitigation strategies, including staying home and wearing masks in public, can reduce the spread of SARS-CoV-2 [4]. Studies have shown that countries that implemented earlier and longer closures and stay-at-home orders had decreases in COVID-19 incidence and mortality [5,6]. In the spring of 2020, the majority of U.S. states implemented mandatory stay-at-home orders [7], which can help reduce activities associated with community spread of COVID-19 — including limiting population movement and close person-to-person contact outside the household. A modeling framework study showed that facemask use by the public, when used in combination with periods of closure, may help in managing the COVID-19 pandemic and re-opening economic activity [8].

The evidence of the positive impact of the community mitigation policies on the burden of COVID-19 is increasing. For instance, several individual state- or county-level investigations have shown the efficacy of mask mandates in reducing COVID-19 transmission [9–13]. However, no studies have systematically examined the effect of community mitigation measures on rapid increases in COVID-19 incidence across the entire nation. Further, associations have not been examined by urbanicity, which may be of strong interest given the differences in COVID-19 incidence over time by urbanicity [14]. Specifically, although metropolitan counties were strongly affected by the pandemic during the spring and much of the summer of 2020, COVID-19 incidence began rapidly increasing in nonmetropolitan counties, eventually exceeding that of metropolitan areas starting in August; this trajectory continued through much of the fall and winter [1,15,16]. In addition, because social vulnerabilities may be higher among less urban areas [17], examining associations between community mitigation policies and COVID-19 incidence by urbanicity might be important in informing public health action, particularly during periods of high COVID-19 incidence.

Since March 8, 2020, CDC has used county-level case counts and standard criteria to identify counties with rapidly increasing COVID-19 incidence, known as rapid riser counties (previously referred to as "hotspot" counties [18]), on a daily basis; rapid riser identification has been used to focus public health efforts in these communities with disproportionately high COVID-19 rates. In this study, we conducted a national analysis of county-level data to examined the probability of being identified as a county with rapidly increasing COVID-19 incidence (rapid riser identification) during the summer of 2020 by implementation of mitigation policies prior to the summer, overall and by urbanicity.

Materials and methods

Daily county-level COVID-19 case counts for all U.S. counties were obtained through USAFacts [19], which compiles data reported by state and local health departments. Rapid riser counties were defined as those that met the following criteria: (1) >100 new cases in the last 7 days, (2) >0% change in the 7-day incidence, (3) a decrease of no more than 60% or an increase in the most recent 3-day COVID-19 incidence over the preceding 3-day incidence, and (4) a 7-day incidence/30-day incidence ratio >0.31. In addition, rapid riser counties met one or both of the following triggering criteria: (1) >60% change in 3-day incidence, or (2) >60% change in 7-day incidence. These standardized criteria were developed through a collaborative process involving multiple federal agencies.

CDC and the University of Nevada, Las Vegas obtained data on statewide closures and mask mandates from state government websites containing executive and administrative orders. The date of the statewide closure was the earlier of either (1) the date that persons were required to stay home or (2) the date that both restaurants were required to cease any on-premises dining and nonessential retail businesses were ordered to close. The date of the statewide reopening was the earlier of either (1) the date the stay-at-home order was lifted or (2) the date that both restaurants were allowed to resume any on-premises dining and nonessential retail businesses were permitted to reopen. The start date of statewide public mask mandate was defined as the date persons operating in a personal capacity were required to wear masks (1) anywhere outside the home or (2) both in retail businesses and in restaurants/food establishments. Each order was analyzed and coded based on the effective start and end date of the mitigation measure. For counties in states with no statewide closure, the assigned date of reference was April 24, 2020 (the date of the first statewide reopening (Alaska [20]). All coding underwent secondary review and quality assurance checks.

Based on the distribution of length of closure and natural breaks in the data, statewide closures were categorized into five groups: 0 days, 1–29 days, 30–50 days, 51–59 days, and >59 days. States that did not close at all were categorized separately because we hypothesized that they may be different from states that closed for any length of time. States were also categorized according to whether a statewide mask mandate was in effect on the reopening date. Urbanicity of counties was based on the National Center for Health Statistics 2013 urban-rural classification scheme [21]. For this analysis, results were presented in three categories: large metropolitan (large central metropolitan and large fringe metropolitan); medium and small metropolitan; and nonmetropolitan (micropolitan and noncore areas).

All U.S. counties were categorized based on statewide closure and mask mandate data. The distribution of counties by length of statewide closures and implementation of mask mandates was described overall and by urbanicity. Comparisons between urbanicity groups were assessed using chi-squared tests or Fisher's exact tests (for comparisons with at least one cell with <5 observations).

Using Poisson regression models with robust standard error estimation, prevalence ratios (PR) with 95% confidence intervals (CI) were calculated to examine associations between implementation of community mitigation policies and identification of a county as a rapid riser one or more times during June 1–September 30, overall and by urbanicity. All associations were adjusted (aPR) for county population size (log population size) since population size was independently associated with rapid riser identification, and thus, might have confounded associations between mitigation strategies and rapid riser identification. All analyses were conducted using SAS (version 9.4; SAS Institute). *P*-values <.05 were considered statistically significant.

Results

Among all U.S. counties, 2803 (89%) were in states with statewide closure orders. For counties in states that closed, statewide closure lengths ranged from 27 to 116 days; all closures began during March 19–April 7, 2020 (Figure 1, Table A.1).

Overall, 339 counties did not have a statewide closure in place, 280 (83%) of which were nonmetropolitan counties (Table 1). Among 674 (22%) counties in states with statewide mask mandates at reopening, distribution varied significantly by urbanicity: 40% were large metropolitan counties, 26% were medium/small metropolitan counties, and 16% were nonmetropolitan counties.

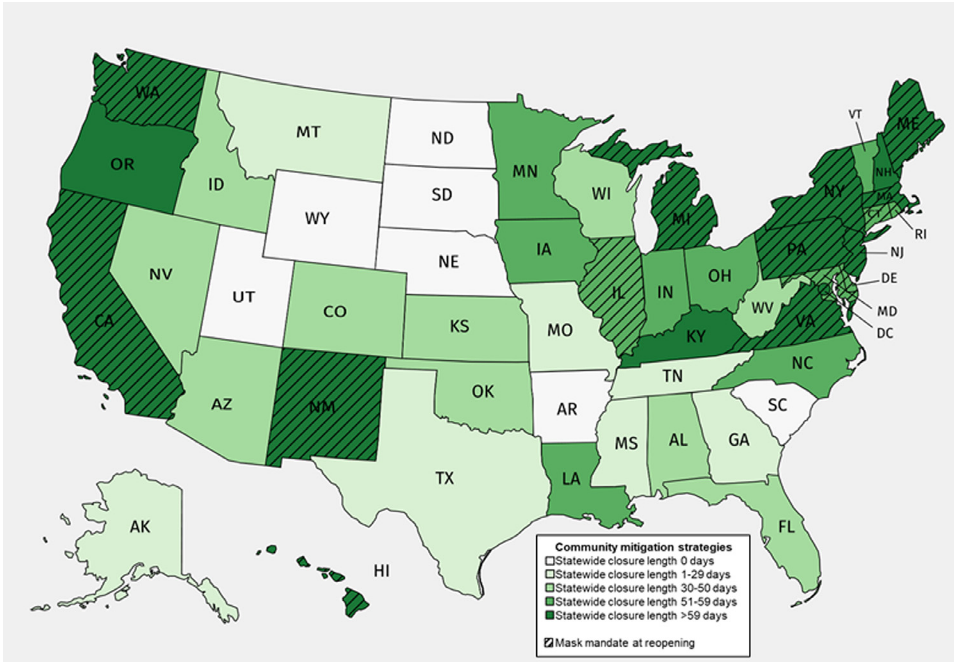

Fig. 1. Length of statewide closures and states with mask mandates in place at reopening United States, March 19September 30, 2020*
*The length of statewide closure was defined as starting on the earlier of either 1) the date persons in all counties were required to stay home or 2) the date both restaurants were required to cease any on-premises dining and nonessential retail businesses were ordered to close in all counties; the earliest date one of these restrictions were lifted for all counties was defined as the statewide reopening. The start date of statewide mask mandate was defined as the date that persons operating in a personal capacity were required to wear masks 1) anywhere outside the home or 2) both in retail businesses and in restaurants/food establishments. (created with mapchart.net)

Table 1
Distribution of community mitigation measures in all U.S. counties (n=3142), overall and by urbanicity — United States, March 19–September 30, 2020.

	No. (column%)				
Mitigation measures	All counties	Large metropolitan counties	Medium and small metropolitan counties	Nonmetropolitan counties	*P*-value†
Overall	3142	436	730	1976	–
U.S. population represented, n (row%)	328,239,523	183,480,600 (56)	98,695,862 (30)	46,063,061 (14)	–
Length of closure, days					<0.0001
0 days of closure	339 (10.8)	3 (0.7)	56 (7.7)	280 (14.2)	
1–29 days of closure	836 (26.6)	105 (24.1)	178 (24.4)	553 (28.0)	
30–50 days of closure	687 (21.9)	61 (14.0)	163 (22.3)	463 (23.4)	
51–59 days of closure	480 (15.3)	94 (21.6)	128 (17.5)	258 (13.1)	
>59 days of closure	800 (25.5)	173 (39.7)	205 (28.1)	422 (21.4)	
Mask mandate at reopening*					<0.0001
Yes	674 (21.5)	174 (39.9)	187 (25.6)	313 (15.8)	
No	2468 (78.5)	262 (60.1)	543 (74.4)	1663 (84.2)	
Mask mandate by length of closure*					
0 days of closure					
Mask mandate	0	0	0	0	–
No mask mandate	339 (100)	3 (100)	56 (100)	280 (100)	
1–29 days of closure					
Mask mandate	0	0	0	0	–
No mask mandate	836 (100)	105 (100)	178 (100)	553 (100)	
30–50 days of closure					
Mask mandate	5 (0.7)	5 (8.2)	0	0	<0.0001
No mask mandate	682 (99.3)	56 (91.8)	163 (100.0)	463 (100.0)	
51–59 days of closure					
Mask mandate	35 (7.3)	17 (18.1)	12 (9.4)	6 (2.3)	<0.0001
No mask mandate	445 (92.7)	77 (81.9)	116 (90.6)	252 (97.7)	
>59 days of closure					
Mask mandate	634 (79.3)	152 (87.9)	175 (85.4)	307 (72.7)	<0.0001
No mask mandate	166 (20.8)	21 (12.1)	30 (14.6)	115 (27.3)	

* For counties in states that did not close, a reference date of April 24, 2020 was used.
† *P*-value < .05 were considered statistically significant based on results from chi-squared tests or Fisher's exact tests (for comparisons with at least one cell with <5 observations).

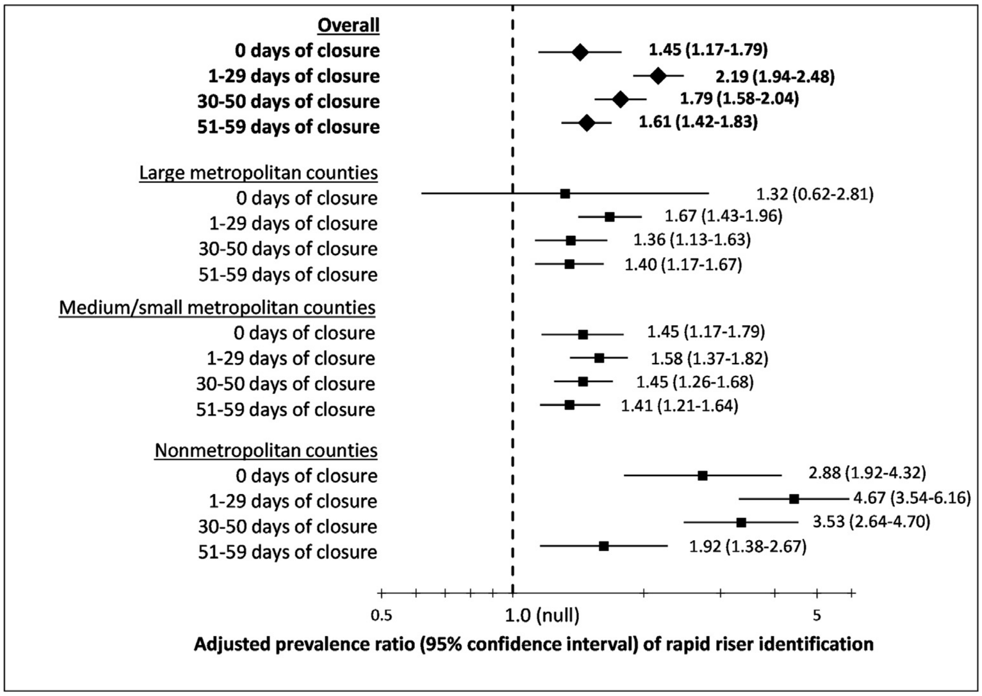

Fig. 2. Adjusted^ prevalence ratios and 95% confidence intervals comparing rapid riser* identification during June 1–September 30, 2020 by length of statewide closure (days)+, stratified by urbanicity.

Figure 2 Footnotes: ^Adjusted for population size; * Rapid riser counties were defined as those that met the following criteria: 1) >100 new cases in the last 7 days, 2) >0% change in the 7-day incidence, 3) a decrease of no more than 60% or an increase in the most recent 3-day COVID-19 incidence over the preceding 3-day incidence, and 4) a 7-day incidence/30-day incidence ratio >0.31. In addition, rapid riser counties met one or both of the following triggering criteria: 1) >60% change in 3-day incidence, or 2) >60% change in 7-day incidence. +Each statewide closure length category compared to reference category of statewide closure >59 days.

There was substantial overlap between statewide closures and mask mandates. Counties in states with statewide closures of >59 days were more likely to have a statewide mask mandate at reopening (79%) than were those in states closed for 51–59 days (7%), 30–50 days (1%), 1–29 days (0%), and 0 days (0%).

During June 1–September 30, 1112 (35%) counties were identified as rapid risers. After adjustment for county population size, counties in states that closed between 0 and 59 days were more likely to become rapid riser counties compared with those that closed for >59 days (0 days: adjusted prevalence ratio [aPR] = 1.45, 95% confidence interval [CI] = 1.17–1.79; 1–29 days: aPR = 2.19, 95% CI = 1.94–2.48; 30–50 days: aPR = 1.79, 95% CI = 1.58–2.04; 51–59 days: aPR = 1.61, 95% CI = 1.42–1.83) (Figure 2, Table A.2). These associations were more pronounced in nonmetropolitan counties (0 days: aPR = 2.88, 95% CI = 1.92–4.32; 1–29 days: aPR = 4.67, 95% CI = 3.54–6.16; 30–50 days: aPR = 3.53, 95% CI = 2.64–4.70; 51–59 days: aPR = 1.92, 95% CI = 1.38–2.67).

The probability of a county becoming a rapid riser during the summer months was 43% lower among counties in states with statewide mask mandates at reopening (aPR = 0.57; 95% CI = 0.51–0.63); this association was more pronounced in nonmetropolitan areas (aPR = 0.33, 95% CI = 0.24–0.44) (Figure 3, Table A.2).

Discussion

After adjustment for county population size, counties in states with lack of, or shorter, closure periods or without statewide mask mandates at reopening were more likely to experience sharp increases in COVID-19 incidence during June 1–September 30, 2020. These findings are consistent with other studies that have demonstrated the effect of community mitigation policies in reducing the spread of COVID-19 [9,11,12,22,23]. In addition, this analysis demonstrated that longer statewide closures and mask mandates might have had an even greater impact on slowing the acceleration of COVID-19 incidence in nonmetropolitan counties.

Among all 3142 U.S. counties, 89% were in states with statewide closures; 22% were in states with statewide mask mandates at reopening. Differences in the distribution of community mitigation policies by urbanicity could reflect a higher COVID-19 incidence in large metropolitan areas during the spring of 2020 that necessitated mitigation measures. With lower COVID-19 incidence among nonmetropolitan areas before the summer [1], increased incidence in these areas during the summer could be attributed to lack of community mitigation strategies, such as stay-at-home orders, closing restaurants and nonessential businesses, and mask mandates.

Differences in associations between community mitigation policies and rapid riser identification by urbanicity might also reflect variability in awareness of and adherence to mitigation policies. Previous studies have shown differences in mask-wearing behavior and other mitigation behaviors by gender, age, ethnicity, and urbanicity [24–27]. Further, inherent differences in structural and social factors of counties could have influenced both statewide mitigation policies and individual behavior, and thus, may also have contributed to differences in observed associations by urbanicity [17,28].

Counties in states with statewide closure periods >59 days had a significantly lower probability of rapid riser identification when adjusted by county population size, particularly in nonmetropolitan areas. By limiting population movement, statewide closures can be an important strategy to reduce COVID-19 transmission in areas with high incidence [7,8]. In addition, there was a 43% reduction in the probability of becoming a rapid riser county among counties in states with a statewide mask mandate at reopening; associations between mask mandates and rapid riser identification differed by urbanicity, with the strongest association observed in

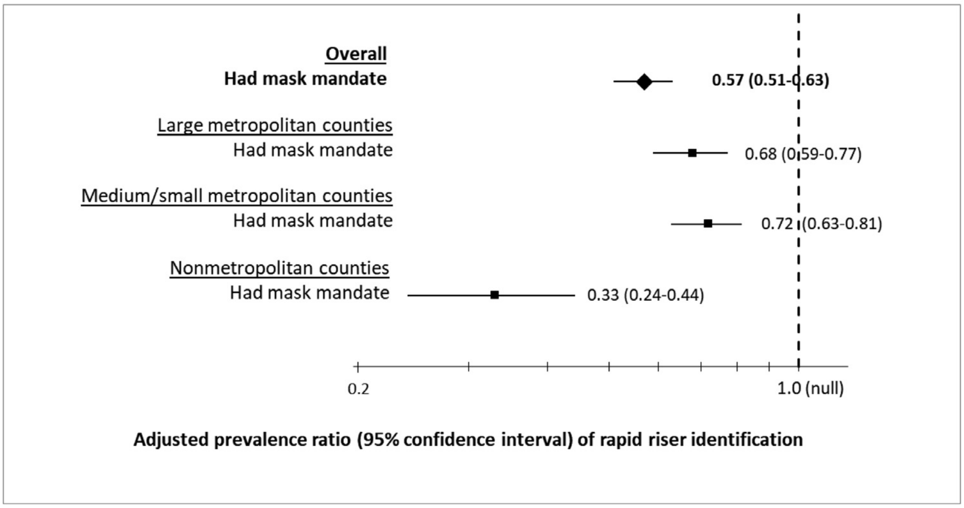

Fig. 3. Adjusted^ prevalence ratios and 95% confidence intervals comparing rapid riser* identification during June 1–September 30, 2020 by statewide mask mandate upon statewide reopening, stratified by urbanicity.
Figure 3 Footnotes: ^Adjusted for population size. *Rapid riser counties were defined as those that met the following criteria: (1) >100 new cases in the last 7 days, (2) >0% change in the 7-day incidence, (3) a decrease of no more than 60% or an increase in the most recent 3-day COVID-19 incidence over the preceding 3-day incidence, and (4) a 7-day incidence/30-day incidence ratio >0.31. In addition, rapid riser counties met one or both of the following triggering criteria: (1) >60% change in 3-day incidence, or (2) >60% change in 7-day incidence.

nonmetropolitan areas. Mask mandates can play a critical role in preventing COVID-19 and could be especially important for persons who are required to work in-person, including essential workers and those working in crowded conditions, particularly in nonmetropolitan areas. Although it was not possible to ascertain the individual contribution of each mitigation strategy in reducing the probability of rapid riser identification, combining multiple mitigation strategies is recommended to reduce transmission [4,29].

Associations between statewide mitigation policies and rapid riser identification were confounded by county population size. Confounding may have been, in part, due to the fact that larger counties may have been more substantially affected by COVID-19 during the summer. In addition, one of the criteria of the rapid riser definition was that counties had to have >100 new cases in the last 7 days, which might decrease the likelihood that small counties (specifically those with <20,000 population) would meet the definition. However, in a sensitivity analysis, even restricting the dataset to counties with ≥20,000 population yielded similar findings to the adjusted estimates presented in this study.

The findings in this report are subject to several limitations. First, policy data were limited to mandatory statewide mitigation measures; therefore, data did not account for county-specific variability or nonmandatory recommendations [30]. For example, some states issued orders that applied to certain counties, and others authorized counties to receive variances if certain thresholds are met (e.g., low COVID-19 test percent positivity). Second, heterogeneity in implementing mandatory mitigation measures were not incorporated in this study; thus, some states not meeting the definition of a closure state may have still implemented some mitigation measures. Further, this study could not assess motivations for implementation of community mitigation policies; states may have chosen not to implement policies despite high incidence, or because of lower baseline incidence [31]. Future studies assessing temporal associations between implementation of mitigation strategies and changes in COVID-19 incidence could account for factors (e.g., baseline incidence) that may have influenced decisions around community mitigation policies. Also, because of natural variations in national COVID-19 incidence and a wide range of reopening dates over time, rapid riser identification was examined based on a fixed period (summer months) and not on time since reopening; therefore, some states may have reopened during the rapid riser identification period. Examining the identification of rapid riser counties during summer, however, was important to assess the potential effect of mitigation measures implemented in the spring. Finally, universal compliance with mandatory statewide mitigation measures was not likely [28]. Although statewide mandates may not be consistently applied or complied with throughout an entire state, several studies have shown that governmental mitigation mandates, even at a national level, can have an impact on COVID-19 morbidity and mortality [5,6,29]. In addition, statewide mitigation mandates may be important from the standpoint of signaling and communicating a consistent and cohesive statewide policy and public health message as well as expected behaviors and social norms within a state.

Conclusions

Statewide closures and mask mandates might have reduced COVID-19 transmission during June 1–September 30. These results underscore the value of community mitigation strategies in limiting the spread of COVID-19, especially in nonmetropolitan areas, and particularly with continued high COVID-19 incidence and increased transmission risk associated with the B.1.1.7 variant [1,32,3]. Federal, state, and local partners should work together to monitor COVID-19 incidence and establish a threshold for implementing closures and mask mandates, if needed, to prevent increases in COVID-19 incidence.

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This activity was reviewed by the Centers for Disease Control and Prevention and was conducted consistent with applicable federal law and CDC policy (45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.).

The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry.

Appendix

Appendix Tables

Table A.1
Statewide closure, reopening, and mask mandate effective dates — United States, March 19–September 30, 2020.

State	Date of Statewide Closure*	Date of Statewide Reopening†	Number of days between statewide closure and statewide reopening	Date of Statewide Mask Mandate‡
Alabama	3/28/2020	4/30/2020	33	7/16/2020
Alaska	3/28/2020	4/24/2020	27	NA
Arizona	3/31/2020	5/16/2020	46	NA
Arkansas	NA	NA	0	7/20/2020
California	3/19/2020	7/13/2020	116	6/18/2020§
Colorado	3/26/2020	4/27/2020	32	7/16/2020
Connecticut	3/22/2020	5/20/2020	59	4/20/2020§
Delaware	3/24/2020	5/22/2020	59	4/28/2020§
District of Columbia	3/25/2020	5/29/2020	65	5/16/2020§
Florida	4/3/2020	5/4/2020	31	NA
Georgia	4/3/2020	4/30/2020	27	NA
Hawaii	3/25/2020	6/10/2020	77	4/17/2020§
Idaho	3/25/2020	5/1/2020	37	NA
Illinois	3/21/2020	5/29/2020	69	5/1/2020§
Indiana	3/24/2020	5/18/2020	55	7/27/2020
Iowa	3/26/2020	5/15/2020	50	NA
Kansas	3/30/2020	5/4/2020	35	7/3/2020
Kentucky	3/23/2020	5/22/2020	60	7/10/2020
Louisiana	3/23/2020	5/15/2020	53	7/13/2020
Maine	3/25/2020	5/31/2020	67	5/1/2020§
Maryland	3/23/2020	5/13/2020	51	4/18/2020§
Massachusetts	3/24/2020	6/8/2020	76	5/6/2020§
Michigan	3/24/2020	6/1/2020	69	4/26/2020§
Minnesota	3/27/2020	5/17/2020	51	7/24/2020
Mississippi	3/31/2020	4/27/2020	27	8/5/2020
Missouri	4/6/2020	5/4/2020	28	NA
Montana	3/28/2020	4/26/2020	29	7/15/2020
Nebraska	NA	NA	0	NA
Nevada	3/20/2020	5/9/2020	50	6/24/2020
New Hampshire	3/27/2020	6/16/2020	81	NA
New Jersey	3/21/2020	6/9/2020	80	4/10/2020§
New Mexico	3/24/2020	6/1/2020	69	6/1/2020§
New York	3/19/2020	6/6/2020	79	4/17/2020§
North Carolina	3/30/2020	5/22/2020	53	6/26/2020
North Dakota	NA	NA	0	NA
Ohio	3/23/2020	5/15/2020	53	7/23/2020
Oklahoma	3/25/2020	5/1/2020	37	NA
Oregon	3/23/2020	6/19/2020	88	7/1/2020
Pennsylvania	3/19/2020	6/5/2020	78	4/19/2020§
Rhode Island	3/28/2020	5/9/2020	42	5/8/2020§
South Carolina	4/7/2020	5/4/2020	27	NA
South Dakota	NA	NA	0	NA
Tennessee	3/31/2020	4/29/2020	29	NA
Texas	4/2/2020	5/1/2020	29	7/3/2020
Utah	NA	NA	0	NA
Vermont	3/24/2020	5/15/2020	52	8/1/2020
Virginia	3/30/2020	5/29/2020	60	5/29/2020§
Washington	3/23/2020	7/3/2020	102	6/26/2020§
West Virginia	3/24/2020	5/4/2020	41	7/7/2020
Wisconsin	3/25/2020	5/13/2020	49	8/1/2020
Wyoming	NA	NA	0	NA

Abbreviation: NA = No applicable statewide closure or mask mandate during the study period

* The date of the statewide closure was the earlier of either 1) the date persons were required to stay home or 2) the date both restaurants were required to cease any on-premises dining and nonessential retail businesses were ordered to close.

† The date of the statewide reopening was the earlier of either 1) the date the stay-at-home order was lifted or 2) the date both restaurants were allowed to resume any on-premises consumption and nonessential retail businesses were permitted to reopen.

‡ The start date of statewide public mask mandate was defined as the date that persons operating in a personal capacity were required to wear masks 1) anywhere outside the home or 2) both in retail businesses and in restaurants/food establishments.

§ Indicates a statewide mask mandate that was implemented on or before the statewide reopening.

Table A.2
Associations* between community mitigation measures and rapid riser counties identification, overall and by urbanicity (n = 3142 U.S. counties) — United States, June 1–September 30, 2020.

Urbanicity category	Characteristics		Length of closure (days)					Mask mandate at reopening	
			0	1–29	30–50	51–59	>59	Yes	No
All	Total, No.	3,142 (100)	339	836	687	480	800	674	2,468
	Rapid riser (% of total)	1,112 (35.4)	59 (17.4)	351 (42.0)	258 (37.6)	201 (41.9)	243 (30.4)	240 (35.6)	872 (35.3)
	aPR† (95% CI)		1.45 (1.17 - 1.79)	2.19 (1.94 - 2.48)	1.79 (1.58 - 2.04)	1.61 (1.42 - 1.83)	Ref	0.57 (0.51–0.63)	Ref
	P-value		0.0005	<0.0001	<0.0001	<0.0001		<0.0001	
Large metropolitan	Total, No. (%)	436 (13.9)	3	105	61	94	173	174	262
	Rapid riser (% of total)	277 (63.5)	2 (66.7)	78 (74.3)	44 (72.1)	60 (63.8)	93 (53.8)	98 (56.3)	179 (68.3)
	aPR† (95% CI)		1.32 (0.62 - 2.81)	1.67 (1.43 - 1.96)	1.36 (1.13 - 1.63)	1.40 (1.17 - 1.67)	Ref	0.68 (0.59–0.77)	Ref
	P-value		0.4719	<0.0001		0.0002		<0.0001	
Medium/small metropolitan	Total, No. (%)	730 (23.2)	56	178	163	128	205	187	543
	Rapid riser (% of total)	431 (59.0)	30 (53.6)	108 (60.7)	108 (66.3)	82 (64.1)	103 (50.2)	103 (55.1)	328 (60.4)
	aPR† (95% CI)		1.45 (1.17 - 1.79)	1.58 (1.37 - 1.82)	1.45 (1.26 - 1.68)	1.41 (1.21 - 1.64)	Ref	0.72 (0.63–0.81)	Ref
	P-value		0.0006	<0.0001	<0.0001	<0.0001		<0.0001	
Nonmetropolitan	Total, No. (%)	1,976 (62.9)	280	553	463	258	422	313	1663
	Rapid riser (% of total)	404 (20.4)	27 (9.6)	165 (29.8)	106 (22.9)	59 (22.9)	47 (11.1)	39 (12.5)	365 (21.9)
	aPR† (95% CI)		2.88 (1.92 - 4.32)	4.67 (3.54 - 6.16)	3.53 (2.64 - 4.70)	1.92 (1.38 - 2.67)	Ref	0.33 (0.24–0.44)	Ref
	P-value		<0.0001	<0.0001	<0.0001			<0.0001	

* Associations adjusted for county population size
§ *P*-value< .05 determined statistical significance
† aPR = adjusted prevalence ratio; CI = confidence interval

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