

Expanding Access to COVID-19 Tests through US Postal Service Facilities

Bismark Singh , Simon Risanger, David Morton, Michael Pignone, and Lauren Ancel Meyers 

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Widespread, convenient access to COVID-19 testing has been challenging in the United States. We make a case for provisioning COVID-19 tests through the United States Postal Service (USPS) facilities and demonstrate a simple method for selecting locations to improve access. We provide quantitative evidence that even a subset of USPS facilities could provide broad access, particularly in remote and at-risk communities with limited access to health care. Based on daily travel surveys, census data, locations of USPS facilities, and an established care-seeking model, we estimate that more than 94% of the US population would be willing to travel to an existing USPS facility if warranted. For half of the US population, this would require traveling less than 2.5 miles from home; for 90%, the distance would be less than 7 miles. In Georgia, Illinois, and Minnesota, we estimate that testing at USPS facilities would provide access to an additional 4.1, 3.1, and 1.3 million people and reduce the median travel distance by 3.0, 0.8, and 1.2 miles, respectively, compared with existing testing sites per 28 July 2020. We also discuss the option of distributing test-at-home kits via USPS instead of private carriers. Finally, our proposal provides USPS an opportunity to increase revenues and expand its mission, thus improving its future prospects and relevance.

Keywords

COVID-19, optimization, testing, underserved populations, USPS

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The World Health Organization has called for countries to provide mass-scale testing to combat the COVID-19 pandemic.¹ However, in most countries, hospitals and clinics lack the logistical capacity to serve entire populations.² Countries have thus taken unprecedented steps to extend access, including leveraging the capabilities of major search engines such as Google and Yandex to disseminate information about testing locations.³ E-commerce giants are also playing their part; Amazon has pledged resources,⁴ while Alibaba is donating testing kits.⁵ Fortunately, there is a growing supply of COVID-19 diagnostic tests that are easily self-administered outside of the health care setting. In the United States, test-at-home COVID-19 diagnostic kits were approved by the Food and Drug Administration on 16 May 2020.⁶ Since rapid at-home COVID-19 testing—from which results are available almost immediately without requiring laboratory

processing—is still unavailable in the United States,⁷ at-home self-administered tests that require shipping samples to a laboratory and on-site testing for COVID-19 remain the only 2 viable options at the moment. Thus, a successful US testing strategy requires not only more tests but also proactive logistics to provide access for all residents.

The United States Postal Service (USPS) is the only governmental agency with a logistical framework designed to visit every US household on a daily basis, even in remote locations far from health care facilities.⁸ Competitors such as FedEx and UPS do not have the infrastructure to reach

Corresponding Author

Bismark Singh, Department of Mathematics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Cauerstraße 11, Erlangen, 91054, Germany (bismark.singh@fau.de).

every household and rely on collaborations with USPS.^{9,10} In 2011, the USPS further expanded its “last mile” reach with a low-priced program for delivering advertisements: Every Door Direct Mail.¹¹ In 2006, under the federally funded Cities Readiness Initiative, the USPS launched a successful pilot program for dispensing medical resources in Minneapolis–St. Paul.¹² Following this program, in 2009, former US President Barack Obama issued an Executive Order to “pursue a national US Postal Service medical countermeasures dispensing model to respond to a large-scale biological attack.”¹³ In early April of this year, the USPS developed plans to send 5 reusable face masks to every US household, although the plan was not adopted by the president’s administration.¹⁴ These models could be deployed to deliver COVID-19 tests, as well as antivirals and vaccines, as they become available.⁸

In the absence of widespread testing, populations residing in remote areas far from health care facilities are left particularly vulnerable.¹⁵ As of 27 May 2020, only a limited number of pharmacies in a handful of locations are offering COVID-19 tests in the United States.^{16–18} Furthermore, these drive-through tests are available only for preregistered and eligible patients with access to automobiles. As rapid and affordable tests for COVID-19 are showing promise,¹⁹ the USPS facilities and workforce could be leveraged to broaden access, especially for these underserved groups. With more than 600,000 workers, facilities in every county, and in more than 28,000 of the approximately 33,000 ZIP Code Tabulation Areas (ZCTAs) in the United States, USPS has a nationwide

presence (ZCTAs are generalized areal representations of ZIP codes used by the US Census Bureau²⁰). Moreover, USPS has the largest retail network in the United States, even larger than the combined network of McDonald’s, Starbucks, and Walmart.²¹

We explore 2 possible models: at-home testing with test kits delivered to, and retrieved from, homes by USPS carriers and testing conducted at USPS facilities by USPS employees or other trained personnel. For the first model, several companies such as Labcorp and Everlywell are now offering at-home diagnostic kits for self-administered nasal swabs for COVID-19 testing with results available within 72 h.^{22,23} A recent study found self-administered tests to be as accurate as those administered by a health care professional.²⁴ USPS home delivery could be leveraged to ensure broad access at a lower cost than FedEx and UPS.²⁵ Quick delivery is important to ensure that test results are known in a timely manner. USPS offers express services with expected delivery times of 1 to 2 business days. Although the main alternative carriers, UPS and FedEx, offer same-day and overnight express options,²⁵ they do not have as comprehensive a network as USPS, which limits their ability to provide these services. In addition, public trust in USPS may increase the willingness to obtain COVID-19 testing. Surveys conducted in 2020 ranked USPS as the most trusted brand in America²⁶ and reported that 91% of Americans view USPS favorably.²⁷ USPS might thus be a more reliable custodian of private health information than private organizations.

The second model (USPS-based testing) could further accelerate the administration of tests. Based on daily travel surveys, census data, locations of USPS facilities, and an established care-seeking model²⁸ (see Appendix A for details), we estimate that more than 94% of the US population would be willing to travel to an existing USPS facility if warranted. For half of the US population, this would require traveling less than 2.5 miles from home; for 90%, the distance would be less than 7 miles (see Table 1). Our analysis assumes at most 1 USPS facility is open for testing per ZCTA.

Given current financial constraints,²⁹ offering COVID-19 tests through all USPS facilities may be impractical and costly. The administration or collection of tests may require trained personnel as well as physical barriers and personal protective equipment (PPE) to protect employees and customers. We show that the judicious use of only a fraction of existing USPS facilities is sufficient to achieve broad access for testing. We consider several scaled-back scenarios for USPS-based testing (Table 1). In each case, we apply an optimization model to determine which USPS

Department of Mathematics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany (BS); Department of Industrial Economics and Technology Management, Norwegian University of Science and Technology, Trondheim, Norway (SR); Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL, USA (DM); Department of Internal Medicine, Dell Medical School, The University of Texas at Austin, Austin, TX, USA (MP); Department of Integrative Biology and Department of Statistics and Data Sciences, The University of Texas at Austin, Austin, TX, USA (LAM). The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Financial support for this study was provided in part by the National Institutes of Health under grant NIH R01 AI151176 and grant NIH U01 GM087791, the US Department of Homeland Security under grant 2017-ST-061-QA0001 and Tito’s Handmade Vodka. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the US Department of Homeland Security. The funding agreement ensured the authors’ independence in designing the study, interpreting the data, writing, and publishing the report.

Table 1 Expected Proportion of Population Willing to Travel to a USPS-Based COVID-19 Testing Site and Corresponding Travel Distances, Depending on the Budget (Percentage of USPS Facilities Offering Tests, Allowing at Most 1 per ZCTA)^a

Share of Facilities Offering Tests	Population Access	Travel Distance (Miles)		
		10th Percentile	Median	90th Percentile
100%	94.1%	1.0	2.6	7.0
90%	94.1%	1.0	2.6	7.0
80%	93.8%	1.0	2.6	7.0
70%	93.4%	1.0	2.6	7.1
60%	92.5%	1.0	2.6	7.2
50%	91.2%	1.1	2.6	7.6
40%	88.9%	1.1	2.7	8.1
30%	85.0%	1.2	2.8	9.1
20%	78.3%	1.3	3.1	11.1
10%	65.3%	1.5	3.8	18.1

^aFor each budget, the facilities are selected via an optimization model that maximizes national access. For details, see Appendix A.

Table 2 Expected Proportion of Population Willing to Travel to a USPS-Based COVID-19 Testing Site and Corresponding Travel Distances, for the Most Densely Populated (New Jersey, Rhode Island, Massachusetts, Connecticut, and Maryland) and Least Densely Populated States (Alaska, Wyoming, Montana, North Dakota, and South Dakota)

State	Population Access	Travel Distance (Miles)		
		10th Percentile	Median	90th Percentile
New Jersey	99.2%	0.7	1.4	3.3
Rhode Island	99.3%	0.8	1.4	2.7
Massachusetts	99.2%	0.7	1.7	2.8
Connecticut	97.6%	1.1	2.1	3.1
Maryland	97.9%	1.1	1.9	3.9
Alaska	96.6%	1.3	7.2	29.6
Wyoming	96.8%	3.8	14.1	21.5
Montana	95.5%	2.9	9.8	16.3
North Dakota	97.0%	2.2	5.8	12.0
South Dakota	98.6%	2.3	6.2	10.9

facilities would provide the greatest national access. Dispensing tests through half of all USPS facilities would still be expected to provide access to more than 91% of the population and hardly increase requisite travel distances, if the sites are selected judiciously. In fact, employing only 10% of the USPS facilities would be expected to provide testing within 4 miles of home for at least half of the US population (see Appendix B for more details). Thus, a voluntary program in which only employees willing to assist in collecting or administering tests would also provide high levels of access to underserved populations.

Individual states can leverage this strategy as well (see Appendix C for results for individual states). With the exception of Michigan, 49 of the 50 states would be expected to achieve greater than 88% coverage via USPS-based dispensation of COVID-19 tests. (In Michigan, only

57% of ZCTAs contain a USPS facility; roughly 5.85 million people live in a ZCTA without USPS facilities. In contrast, 87% of ZCTAs nationwide contain a USPS facility.) In 40 of 50 states, half of the population would be within 5 miles of the nearest test site.

Population density is positively correlated with SARS-CoV-2 spread.³⁰ Table 2 provides coverage estimates for USPS-based testing in the 5 most densely populated states and 5 least densely populated states. USPS would be expected to expand access in both low-population-density settings where long distances can be prohibitive and high-density settings where demand can outstrip availability and lead to unsafe test sites.

Although no official nationwide listing of testing sites exists, the departments of health in Georgia, Illinois, and Minnesota have released an online overview for their

Table 3 Estimated Proportion of State Population Willing to Travel to the Nearest USPS Facility or Existing Testing Location to Obtain a COVID-19 Test and Median, 10th Percentile, and 90th Percentile Travel Distances

State	Distribution	Population Access	Travel Distance (Miles)		
			10th Percentile	Median	90th Percentile
Georgia	USPS	95.5%	1.7	3.5	6.9
	Existing sites	53.5%	2.8	6.5	13.3
Illinois	USPS	98.0%	0.9	1.8	4.8
	Existing sites	73.5%	1.0	2.6	10.7
Minnesota	USPS	97.5%	1.2	3.2	6.8
	Existing sites	73.7%	1.3	4.4	12.3


states.^{31–33} Table 3 outlines estimated access and travel distances of all USPS facilities in these states and existing testing sites as of July 28, 2020. We note that the states' lists may not be comprehensive, as new testing sites open continually. Still, we observe in Table 3 that USPS facilities would significantly increase estimated access and reduce travel distances compared with existing testing locations. By increasing both the proximity and number of COVID-19 test sites, a USPS-based program could mitigate COVID-19 transmission risks associated with travel to, and long lines, at testing sites. Our proposed strategy would also reduce travel time on public transit, which has also been associated with racial disparities in COVID-19 risks.^{34,35}


The viability of such a program depends on the future integrity and trustworthiness of USPS, which is self-funding and under financial strain since 2006.²⁹ Leading up to the 2020 US presidential election, there are growing concerns about handling of mail-in voting ballots.³⁶ Although these threats to USPS could undermine the feasibility of USPS-based COVID-19 testing, rapidly ramping up such a program could, in fact, bolster the struggling agency by bringing in government support to ensure delivery speed and reliability, additional revenue associated with provisioning of COVID-19 tests, and public trust. The recent USPS cutbacks have already resulted in discussions about the role of the postal service and policy action when the US House of Representatives approved a controversial bill for USPS funding on 22 August 2020.³⁷

USPS-based testing will also require extensive precautions to maintain the safety and integrity of the postal service. Proximity to symptomatic individuals may jeopardize the health of USPS employees. Measures to mitigate the additional risk could include physical separation of the testing units, hiring of trained personnel to administer or dispense test kits, access to ample PPE, and other measures for protecting front-line health care workers.³⁸

To summarize, large-scale testing is key to reduce the impact of COVID-19; however, testing is dependent on an efficient logistical network. The USPS has an extensive network that can either deliver and collect at-home testing kits or facilitate testing at their own facilities. The latter provides substantial estimated access and low travel distances. Still, amidst the COVID-19 pandemic, USPS faces financial challenges that have influenced operations, and the safety of the employees is a concern. If these barriers can be successfully overcome, we believe that USPS-based testing represents a potentially effective and efficient means of accelerating COVID-19 diagnoses and thereby slowing the spread of the pandemic.

ORCID iDs

Bismark Singh  <https://orcid.org/0000-0002-6943-657X>

Lauren Ancel Meyers  <https://orcid.org/0000-0002-5828-8874>

Supplemental Material

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Reference

1. World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19, 13 April 2020. Available from: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-13-april-2020>. Accessed 2020 June 6.
2. Behnam M, Ha L, Kumar P, Singhal S. Major challenges remain in COVID19 testing. McKinsey & Company; 2020. Available from: <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/major-challenges-remain-in-covid-19-testing#>. Accessed 2020 June 6.
3. Makhortykh M, Urman A, Ulloa R. How search engines disseminate information about COVID-19 and why they should do better. Harvard Kennedy School Misinformation

- Review. 2020 May. Available from: <https://misinforeview.hks.harvard.edu/article/how-search-engines-disseminate-information-about-covid-19-and-why-they-should-do-better/>. Accessed 2020 June 6.
4. Amazon.com. AWS launches global initiative to accelerate COVID-19 diagnostics, research, and testing. 2020. Available from: <https://blog.aboutamazon.com/innovation/aws-launches-initiative-to-accelerate-covid-19-diagnostics-research-and-testing>. Accessed 2020 June 6.
 5. Alizila Staff. Factsheet: Jack Ma Foundation and Alibaba foundation's global donations and efforts to combat COVID-19. 2020. Available from: <https://www.alizila.com/factsheet-jack-ma-foundation-alibaba-foundations-coronavirus-donations-and-efforts/>. Accessed 2020 June 6.
 6. US Food & Drug Administration. Coronavirus (COVID-19) update: FDA authorizes first standalone at-home sample collection kit that can be used with certain authorized tests; 2020. Available from: <https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-first-standalone-home-sample-collection-kit-can-be-used>. Accessed 2020 June 6.
 7. Shaw J. Failing the coronavirus-testing test. *Harvard Magazine*; 2020. Available from: <https://harvardmagazine.com/2020/08/covid-19-test-for-public-health>. Accessed 2020 August 30.
 8. Graff GM. The Postal Service's surprising role in surviving doomsday; 2020. Available from: <https://www.wired.com/story/us-postal-plan-coronavirus-vaccine-doomsday/#:~:text=The%20little%20known%20Postal%20Plan,vaccines%E2%80%94as%20a%20last%20resort>. Accessed 2020 June 6.
 9. Stevens L. For FedEx and UPS, a cheaper route: the Post Office; 2014. Available from: <https://www.wsj.com/articles/u-s-mail-does-the-trick-for-fedex-ups-1407182247>. Accessed 2020 June 6.
 10. Panzar JC. Co-opetition in parcel delivery: an exploratory analysis. Office of Inspector General, United States Postal Service; 2015. Available from: <https://www.uspsoidg.gov/sites/default/files/document-library-files/2015/RARC-WP-16-002.pdf>
 11. Grubert E. Every door direct mail in US survey research: an anonymous census approach to mail survey sampling. *Methodological Innovations*. 2019;12(2).
 12. Ribner A, Franco C. IOM countermeasures workshop focuses on EUAs and USPS model. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*. 2010; 8(4):301–4.
 13. Obama B. EO 13527: establishing federal capability for the timely provision of medical countermeasures following a biological attack. United States Office of the Federal Register; 2009. Available from: <https://obamawhitehouse.archives.gov/the-press-office/executive-order-medical-countermeasures-following-a-biological-attack>. Accessed 2020 June 6.
 14. Romm T, Bogage J, Sun LH. Newly revealed USPS documents show an agency struggling to manage Trump, Amazon and the pandemic. 2020. Available from: www.washingtonpost.com/us-policy/2020/09/17/usps-trump-coronavirus-amazon-foia/. Accessed 2020 September 28.
 15. Coven J, Gupta A. Disparities in mobility responses to COVID-19. NYU Stern Working Paper; 2020.
 16. CVS Health. COVID-19 testing: information and locations. 2020. Available from: <https://cvshhealth.com/covid-19/testing-information-locations>. Accessed 2020 June 6.
 17. Walgreens. Drive-thru COVID-19 testing at Walgreens. 2020. Available from: <https://www.walgreens.com/findcare/covid19/testing>. Accessed 2020 June 6.
 18. Supermarket News. Kroger expands coronavirus drive-thru testing to more states. 2020. Available from: <https://www.supermarketnews.com/issues-trends/kroger-expands-coronavirus-drive-thru-testing-more-states>. Accessed 2020 June 6.
 19. Smyrlaki I, Ekman M, Lentini A, et al. Massive and rapid COVID-19 testing is feasible by extraction-free SARS-CoV-2 RT-PCR. *Nat Commun*. 2020;11(1).
 20. United States Census Bureau. ZIP Code Tabulation Areas (ZCTAs). 2020. Available from: <https://www.census.gov/programs-surveys/geography/guidance/geo-areas/zctas.html>. Accessed 2020 June 6.
 21. United States Postal Service. Top thirteen things you should know about the U.S. Postal Service. 2020. Available from: <https://facts.usps.com/top-facts/>. Accessed 2020 August 17.
 22. Labcorp. Access COVID-19 testing at home. 2020. Available from: <https://www.pixel.labcorp.com/covid-19>. Accessed 2020 August 16.
 23. EverlyWell. COVID-19 test home collection kit. 2020. Available from: <https://www.everlywell.com/products/covid-19-test/>. Accessed 2020 August 16.
 24. Altamirano J, Govindarajan P, Blomkalns AL, et al. Assessment of sensitivity and specificity of patient-collected lower nasal specimens for severe acute respiratory syndrome coronavirus 2 testing. *JAMA Netw Open*. 2020;3(6): e2012005.
 25. McCallister N. Seriously though, what is actually the cheapest way to ship something in 2020? 2020. Available from: <https://entreresource.com/cheapest-way-ship-something-comparing-rates-ups-fedex-usps/>. Accessed 2020 August 18.
 26. Morning Consult. Most trusted brands. 2020. Available from: <https://morningconsult.com/most-trusted-brands/?mod=djemCMOToday>. Accessed 2020 August 18.
 27. Pew Research Center. Public holds broadly favorable views of many federal agencies, including CDC and HHS. 2020. Available from: <https://www.pewresearch.org/politics/2020/04/09/public-holds-broadly-favorable-views-of-many-federal-agencies-including-cdc-and-hhs/>. Accessed 2020 August 18.
 28. Singh B, Huang HC, Morton DP, et al. Optimizing distribution of pandemic influenza antiviral drugs. *Emerg Infect Dis*. 2015;21(2):251–8.
 29. Pew Research Center. The state of the U.S. Postal Service in 8 charts. 2020. Available from: <https://www.pewresearch.org>

- .org/fact-tank/2020/05/14/the-state-of-the-u-s-postal-service-in-8-charts/. Accessed 2020 August 18.
30. Rocklöv J, Sjödin H. High population densities catalyse the spread of COVID-19. *J Travel Med.* 2020;27(3).
 31. Georgia Department of Public Health. Find a Covid 19 testing site. 2020. Available from: <https://dph.georgia.gov/covidtesting>. Accessed 2020 June 3.
 32. Illinois Department of Public Health. COVID-19 testing sites. 2020. Available from: <https://dph.illinois.gov/covid19/covid-19-testing-sites>. Accessed 2020 June 3.
 33. Minnesota COVID-19 response. Find testing locations in Minnesota. 2020. Available from: <https://mn.gov/covid19/for-minnesotans/if-sick/testing-locations/index.jsp>. Accessed 2020 June 3.
 34. Knittel CR, Ozaltun B. What does and does not correlate with COVID-19 death rates. medRxiv. 2020. Available from: <https://www.medrxiv.org/content/early/2020/06/11/2020.06.09.20126805>
 35. McLaren J. Racial disparity in COVID-19 deaths: seeking economic roots with census data. National Bureau of Economic Research; 2020. 27407. Available from: <http://www.nber.org/papers/w27407>
 36. Law of the letter: the postal service has become vital to America's elections. *The Economist.* 2020. Available from: <https://www.economist.com/united-states/2020/08/08/the-postal-service-has-become-vital-to-americas-elections>. Accessed 2020 August 18.
 37. Behrmann S. What's going on with the post office? Here's what we know. *USA Today.* 2020. Available from: <https://eu.usatoday.com/story/news/politics/2020/08/13/us-postal-service-whats-going-post-office-what-we-know/3360565001/>. Accessed 2020 August 21.
 38. Jecker NS, Wightman AG, Diekema DS. Prioritizing frontline workers during the COVID-19 pandemic. *Am J Bioethics.* 2020;20:128–32.