

Pandemic Protocols, Native Health: Health Care Access from American Indian Reservations During COVID-19.

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Motivation

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- Racial differences in exposure to COVID-19 and its primary (health) and secondary (health, economic and mobility-related) effects among socially and economically vulnerable populations are not well understood.
- African Americans, Hispanics and American Indians have experienced substantially higher levels of COVID-19 infection and death. American Indians, in particular, are vulnerable:
 - death rates 1.5 times and infection rates 3.5 times those for non-Hispanic whites (Atlantic, 2020; Hatcher et al., 2020).
- Health care utilization patterns among Native Americans were different before the pandemic; have they been affected differentially by the pandemic?
- Low density and scarcity of resources might result in differential effects of NPIs on reservations and other under-served areas

- Lock-downs in the US reduced overall traffic by about 40%, also affecting surrounding areas (Elenev, Quintero, Rebucci, Simeonova 2021).
- Gupta et al (2020) found that a large proportion of reduced mobility was due to voluntary effects.
- Lock-downs in California were shown to reduce cases by 125 per 100,000 in April 2020 (Friedson et al, 2020).

Background

- COVID-19 cases highest on reservations with low infrastructure (i.e. indoor plumbing) and integration (i.e. non-English only speaking) (Rodriguez-Lonebear et al (2020)).
- Akee et al (forthcoming, 2021) show NPIs affected shopping for groceries, with relative increase of consumption of foods from convenience stores.
- Ziedan, Simon & Wing (2020) analyze e-healthcare records
 - Lock downs are associated with large declines in (non-COVID19) ambulatory visits, with effects differing by type of care.
 - Mental healthcare utilization declined less (telehealth).
 - rebound is limited due to voluntary distancing

What is the impact of imposing and lifting lock-downs on healthcare utilization on tribal lands? Was it different than the rest of the country?

Reservation residents have less access to health care facilities.

	On Reservation	Off Reservation
Tracked Census Tracts	13142	58936
Percent of Census Tracts with Closures	55%	96%
Percent of Census Tracts with Re-Openings	43%	88%
Avg Distance to General Medical and Surgical Hospitals (2019)	12.05	11.62
Avg Distance to Kidney Dialysis Centers (2019)	10.75	10.80
Avg Distance to Specialist's Offices (2019)	11.14	11.31
Avg Distance to Pharmacies and Drug Stores (2019)	7.5	6.94
Avg Distance to Nursing Homes and Skilled Care Facilities (2019)	8.33	7.94
Avg Distance to Outpatient Care Centers (2019)	10.52	9.82
General Medical and Surgical Hospitals (per 100k)	5.57	6.09
Kidney Dialysis Centers (per 100k)	3.41	4.16
Specialist's Offices (per 100k)	5.62	5.69
Pharmacies and Drug Stores (per 100k)	16.43	19.65
Nursing Homes and Skilled Care Facilities (per 100k)	40.35	48.14
Outpatient care (per 100k)	152.78	159.99

Data

- SafeGraph's weekly traffic data, which covered around 16% of all smartphones in the U.S in Jan 2020.
- Track visits to healthcare facilities.¹
- We also calculate average distance traveled to each health care facility from home census tract centroid to store address.
- 328 American Indian reservations in our data.
- Data covers well mobility inside 97% of tracts on reservations and 96% off reservations during the first 31 weeks of the year.

¹classified using Google places classification.

- More than half of them - 189 - have at least one tribal casino operating on their land.
- 167 reservations closed their casinos to prevent the spread of COVID-19, 152 re-opened in our data.
- All of them have re-opened at least once; with a few having to close down again due to increasing COVID-19 cases.
- In reservations: *Casino City Press* trade publication and the *Gaming Directory Data* closure dates.
- Off reservations: stay-at-home order dates assembled by Keystone Strategy and the Johns Hopkins Coronavirus Resource Center.

Methodology

- How did NPIs affect health care utilization among reservation residents relative to the rest of the population?
- Did the relaxation of NPI measures affect health care utilization differently for those residing on reservations?

$$\begin{aligned} Y_{it} = & \alpha + \beta \times \text{Reservation}_i + \gamma_1 \times \text{NPI}_t + \gamma_2 \times \text{NPILift}_t \\ & + \delta_1 \times \text{Reservation}_i \times \text{NPI}_t + \delta_2 \times \text{Reservation}_i \times \text{NPILift}_t \\ & + \theta_c + \mu_t + \epsilon_{it} \end{aligned}$$

- We use diff-in-diff specification to estimate NPI impact on Y_{it} :
 - average distance traveled
 - average visit duration
 - Number of visits
 - Number of visitors

to

- General Medical and Surgical Hospitals
- kidney Dialysis Centers
- Outpatient care centers
- Pharmacies
- Skilled Care Services
- Specialist Offices

$$\begin{aligned} Y_{it} = & \alpha + \beta \times \text{Reservation}_i + \gamma_1 \times NPI_t + \gamma_2 \times NPILift_t \\ & + \delta_1 \times \text{Reservation}_i \times NPI_t + \delta_2 \times \text{Reservation}_i \times NPILift_t \\ & + \theta_c + \mu_t + \epsilon_{it} \end{aligned}$$

- We measure NPIs at the POI or device home level to proxy for demand vs supply-driven disruptions.
- Our observations are at the census block group-week cell.
- The regressions include calendar week fixed effects and county fixed effects and we cluster standard errors at the Census tract level.
- Our analysis is restricted to the first 7 months of 2019 and 2020.

coefficients

Results

Results - Effect of NPIs on Visits

	Dialysis		Hospitals		Outpatient	
	POI	home	POI	home	POI	home
Resrv	-0.289** (0.134)	-0.00715 (0.0116)	-0.141 (0.155)	-0.00839 (0.0341)	-0.0801 (0.105)	-0.0135 (0.0244)
NPI	-0.260*** (0.0109)	-0.0235*** (0.00385)	-0.347*** (0.00826)	-0.421*** (0.00854)	-0.399*** (0.0106)	-0.163*** (0.00759)
NPI lift	0.0471*** (0.0113)	0.0951*** (0.00646)	-0.00626 (0.0112)	-0.0342*** (0.00689)	0.00355 (0.0117)	0.0939*** (0.0113)
ResrvX NPI	0.0507 (0.0649)	0.00906 (0.0143)	0.197*** (0.0685)	0.124*** (0.0259)	0.104 (0.0655)	0.0738*** (0.0149)
ResrvX NPI lift	0.114 (0.0844)	-0.0624** (0.0269)	0.0489 (0.0700)	0.0234 (0.0288)	0.0819 (0.0566)	-0.0769*** (0.0295)
N	327155	1184993	785404	8450428	565972	2613706
R^2	0.203	0.0469	0.154	0.165	0.113	0.120
Ad R^2	0.198	0.0445	0.151	0.165	0.110	0.119

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	Effective NPIs					
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	Catching up; Recovery led by POI NPIs					
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Somewhat weaker reaction in reservations						
N	327155	1184993	785404	8450428	565972	2613706
R ²	0.203	0.0469	0.154	0.165	0.113	0.120
Ad R ²	0.198	0.0445	0.151	0.165	0.110	0.119

Results - Effect of NPIs on Visits (continued)

	Pharmacies		Skilled Care		Specialists	
	POI	home	POI	home	POI	home
Resrv	-0.241*** (0.0710)	-0.0223 (0.0552)	-0.129*** (0.0312)	-0.0952* (0.0494)	-0.148*** (0.0304)	-0.149** (0.0587)
Lower utilization of more elective services						
NPI	-0.285*** (0.0133)	-0.330*** (0.0118)	-0.623*** (0.00941)	-0.783*** (0.0180)	-0.379*** (0.00629)	-0.875*** (0.0140)
NPI lift	-0.0368*** (0.01000)	0.0243** (0.0105)	-0.191*** (0.0105)	-0.226*** (0.0107)	-0.130*** (0.00670)	-0.294*** (0.0118)
ResrvX NPI	0.152*** (0.0368)	0.186*** (0.0347)	0.219*** (0.0258)	0.294*** (0.0415)	0.145*** (0.0192)	0.329*** (0.0408)
ResrvX NPI lift	0.129*** (0.0426)	0.00717 (0.0366)	0.142*** (0.0287)	0.0944** (0.0380)	0.102*** (0.0228)	0.120** (0.0474)
N	2140238	10159781	5606574	9004425	12900493	11445285
R ²	0.149	0.161	0.0967	0.168	0.0510	0.188
Ad R ²	0.148	0.161	0.0962	0.168	0.0507	0.188

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	POI	home	POI	home	POI	home
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	Effective NPIs					
NPI	-0.285*** (0.0133)	-0.330*** (0.0118)	-0.623*** (0.00941)	-0.783*** (0.0180)	-0.379*** (0.00629)	-0.875*** (0.0140)
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N	2140238	10159781	5606574	9004425	12900493	11445285
R^2	0.149	0.161	0.0967	0.168	0.0510	0.188
Ad R^2	0.148	0.161	0.0962	0.168	0.0507	0.188

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	Some rebound; catching up, mainly in less essential sectors					
ResrvX NPI	0.152*** (0.0368)	0.186*** (0.0347)	0.219*** (0.0258)	0.294*** (0.0415)	0.145*** (0.0192)	0.329*** (0.0408)
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Somewhat weaker reaction in reservations

Results - Dwelling time and Distance

- Distance distance results
 - Reservations travel longer distances and reduce them more for hospitals when locks downs are implemented
- Dwelling time time results
 - During lock downs, visits get longer. We interpret that as more serious cases only visits the health facility. The opposite happens with pharmacies.
 - Upon reopening, this effect seems to persist.

Conclusion and Implications

- Reservations have less access to healthcare facilities
- NPIs reduced the visits to health care facilities
- Overall, the reaction to NPIs in reservations was weaker. This could stem from lower elasticities of demand due to more serious health problems, or to lower availability of services

- Reaction in reservations is more muted which could indicate overall less elective care for reservation residents, and thus more muted effects of NPIS.
- Some types of facilities show catching up behavior when reopenings happen. This is weaker in reservations.
- Some types of facilities show less than full adjustment, indicating voluntary social distance outlives lock downs. This is weaker in reservations as well.
- Catch up behavior is more frequent in more inelastic services, like dialysis centers.

- Exploration of the role of differential access to telehealth services due to different infrastructure.
- Reservations show lower elasticity to travel costs imposed by the pandemic in dialysis centers. This could indicate lower availability of Home Hemodialysis services.

THANKS

Methodology

$$Y_{it} = \alpha + \beta \times \text{Reservation}_i + \gamma_1 \times \text{NPI}_t + \gamma_2 \times \text{NPILift}_t \\ + \delta_1 \times \text{Reservation}_i \times \text{NPI}_t + \delta_2 \times \text{Reservation}_i \times \text{NPILift}_t + \theta_c + \mu_t + \epsilon_{it}$$

- β indicates the average effect of being located on a reservation relative to off reservation location.
- γ indicates the average effect of NPIs after the mandate begins
- δ estimates the differential impact of NPI mandates for households on reservations relative to off reservation households on the outcome variable.
- θ_c, μ_t are county and week fixed effects respectively.
- ϵ_{it} as the usual idiosyncratic error term.

Results - Effect of NPIs on Distance Traveled

	Hospitals	Dialysis	Outpatient	Pharmacies	Skilled Care	Specialists
Resrv	0.418*** (0.0477)	0.345*** (0.0794)	0.287*** (0.0757)	0.434*** (0.0557)	0.391*** (0.0530)	0.371*** (0.0469)
NPI	-0.0357*** (0.00342)	-0.0126* (0.00719)	-0.0263*** (0.00568)	-0.147*** (0.00752)	-0.144*** (0.00854)	-0.137*** (0.00692)
NPI lift	0.0138*** (0.00369)	-0.0347** (0.0165)	-0.0308*** (0.00888)	-0.0564*** (0.00389)	-0.00449 (0.00446)	-0.0177*** (0.00278)
ResrvX NPI	-0.0670* (0.0379)	-0.0893* (0.0475)	-0.0135 (0.0486)	0.00766 (0.0268)	0.0319 (0.0309)	0.0318 (0.0333)
ResrvX NPI lift	-0.0496 (0.0391)	-0.104 (0.119)	-0.0271 (0.0756)	-0.0228 (0.0352)	-0.00922 (0.0367)	0.00371 (0.0328)
N	8313977	1144618	2519172	10012379	8856585	11339744
R^2	0.179	0.184	0.183	0.163	0.106	0.177
Adj R^2	0.179	0.182	0.182	0.163	0.105	0.177

Return

Results - Effect of NPIs on Dwelling Time

	Hospitals	Dialysis	Outpatient	Pharmacies	Skilled Care	Specialists
Resrv	-0.0327 (0.0685)	0.0788 (0.0871)	-0.107* (0.0643)	0.0468 (0.0558)	0.0471 (0.0424)	0.0285 (0.0271)
NPI	0.182*** (0.00755)	0.104*** (0.00978)	0.106*** (0.00874)	-0.0339*** (0.00396)	0.0883*** (0.0143)	0.0340*** (0.00379)
NPI lift	0.0522*** (0.00704)	0.00580 (0.0116)	0.0213** (0.00918)	-0.0656*** (0.00335)	0.0636*** (0.00665)	-0.0245*** (0.00292)
ResrvX NPI	-0.0304 (0.0399)	-0.0178 (0.0580)	-0.127** (0.0552)	-0.0199 (0.0247)	0.0155 (0.0212)	-0.0231* (0.0131)
ResrvX NPI lift	-0.0388 (0.0523)	-0.0316 (0.0957)	-0.124 (0.0829)	-0.0177 (0.0300)	-0.0322 (0.0244)	0.0232 (0.0163)
N	785404	327155	565972	2140238	5606574	12900493
R ²	0.0855	0.121	0.0743	0.0791	0.0302	0.0146
Ad R ²	0.0825	0.116	0.0717	0.0779	0.0297	0.0144

[Return](#)

- General Medical and Surgical Hospitals; Kidney Dialysis Centers; Pharmacies and Drug Stores.
- Specialist's Offices
 - Miscellaneous Health Practitioners
 - Chiropractors
 - Dentists
 - Mental Health Practitioners
 - Optometrists
 - Physical, Occupational and Speech
 - Physicians (except Mental Health)
 - Physicians, Mental Health
- Nursing Homes and Skilled Care Facilities
 - Child Day Care Services
 - Home Health Care Services
 - Nursing Care Facilities
- Outpatient care
 - All Other Outpatient Care Centers
 - Psychiatric and Substance Abuse Hospitals
 - Specialty Hospitals