Covid19 Policy Stringency and Outdoor Recreation The Case of Resident Marine Sportfishing in the United States

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Abstract

Governments responded to the Covid-19 pandemic with different policies to curtail the spread of the virus. We show how sportfishing levels are related to the stringency of Covid-19 policies. Specifically, the number of sportfishing trips increases at a decreasing rate as Covid-19 policies become more stringent.

Author summary

He does this and that.

Text based on plos sample manuscript, see
https://journals.plos.org/ploscompbiol/s/latex

Introduction

- Intro to C-19 and the anecdotal evidence related to C-19 and recreation
- Literature review
- Research question: How do outdoor recreation levels change as governments institute policies to protect public health during a pandemic?
- Approach: variation in state stringency policies to identify the effect of C-19 on sportfishing levels

Methods

Data

We assemble monthly observations from 2017-2020 for three different modes of fishing: private boats, charter boats, and shore. With 4 years and 12 months in each year, the data set for each mode has 768 observations.

- MRIP monthly estimates (via program) by mode (private, charter, shore) for each state bordering the Atlantic and Gulf of Mexico
  - refer to MRIP website with template programs
  - potential issue with PSEs
  - Only residents (show percentage of res. vs nonres.)

- Annual population estimates for each state bordering the Atlantic and Gulf of Mexico
  - 2017-2019: ACS
  - 2020 Census
- Monthly C-19 Stringency index for each state bordering the Atlantic and Gulf of Mexico
  - daily estimates summed to each month
  - higher numbers equate with more stringent policies

Modeling Approach

Quasi-poisson regression estimated with mean equal to $exp(pop) * exp(xb)$ and variance equal to $scale * mean$.

Results

References

Table 1. Mean Estimates by Mode and State

State	Mode	Trips	Stringency	Trips/Pop (2020)	Trips/Pop (before 2020)	Trips/Pop (ratio)
Alabama	3	231279	1310	0.046	0.049	0.948
Connecticut	3	197226	1760	0.055	0.047	1.161
Delaware	3	78288	1693	0.079	0.080	0.989
Florida	3	3403822	1534	0.158	0.149	1.058
Georgia	3	211386	1591	0.020	0.018	1.081
Maine	3	68148	1914	0.050	0.044	1.133
Maryland	3	293858	1678	0.048	0.045	1.062
Massachusetts	3	248415	1632	0.035	0.043	0.831
Mississippi	3	198339	1486	0.067	0.071	0.945
New Hampshire	3	32587	1443	0.024	0.015	1.546
New Jersey	3	592567	1611	0.064	0.052	1.237
New York	3	706673	1891	0.035	0.031	1.143
North Carolina	3	639075	1664	0.061	0.071	0.863
Rhode Island	3	95737	1782	0.087	0.071	1.234
South Carolina	3	254181	1483	0.050	0.054	0.916
Virginia	3	391248	1519	0.045	0.035	1.306
Alabama	5	2336	1310	0.000	0.001	0.835
Connecticut	5	700	1760	0.000	0.000	0.949
Delaware	5	58	1693	0.000	0.000	0.803
Florida	5	33921	1534	0.002	0.001	1.338
Georgia	5	1182	1591	0.000	0.000	0.991
Maine	5	371	1914	0.000	0.000	2.208
Maryland	5	9614	1678	0.002	0.001	1.292
Massachusetts	5	1640	1632	0.000	0.001	0.385
Mississippi	5	331	1486	0.000	0.000	0.536
New Hampshire	5	316	1443	0.000	0.000	0.550
New Jersey	5	1593	1611	0.000	0.001	0.222
New York	5	2181	1891	0.000	0.000	0.629
North Carolina	5	5841	1664	0.001	0.000	1.618
Rhode Island	5	415	1782	0.000	0.000	1.238
South Carolina	5	2429	1483	0.000	0.000	1.019
Virginia	5	678	1519	0.000	0.000	0.713
Alabama	7	142542	1310	0.028	0.030	0.948
Connecticut	7	107241	1760	0.030	0.028	1.050
Delaware	7	42556	1693	0.043	0.040	1.087
Florida	7	2272706	1534	0.106	0.103	1.029
Georgia	7	132066	1591	0.012	0.011	1.077
Maine	7	41174	1914	0.030	0.029	1.046
Maryland	7	223460	1678	0.036	0.031	1.162
Massachusetts	7	184967	1632	0.026	0.029	0.901
Mississippi	7	110395	1486	0.037	0.038	0.971
New Hampshire	7	20248	1443	0.015	0.017	0.857
New Jersey	7	363044	1611	0.039	0.034	1.162
New York	7	455338	1891	0.023	0.024	0.927
North Carolina	7	406368	1664	0.039	0.033	1.169
Rhode Island	7	52188	1782	0.048	0.041	1.161
South Carolina	7	184038	1483	0.036	0.038	0.948
Virginia	7	192082	1519	0.022	0.020	1.087

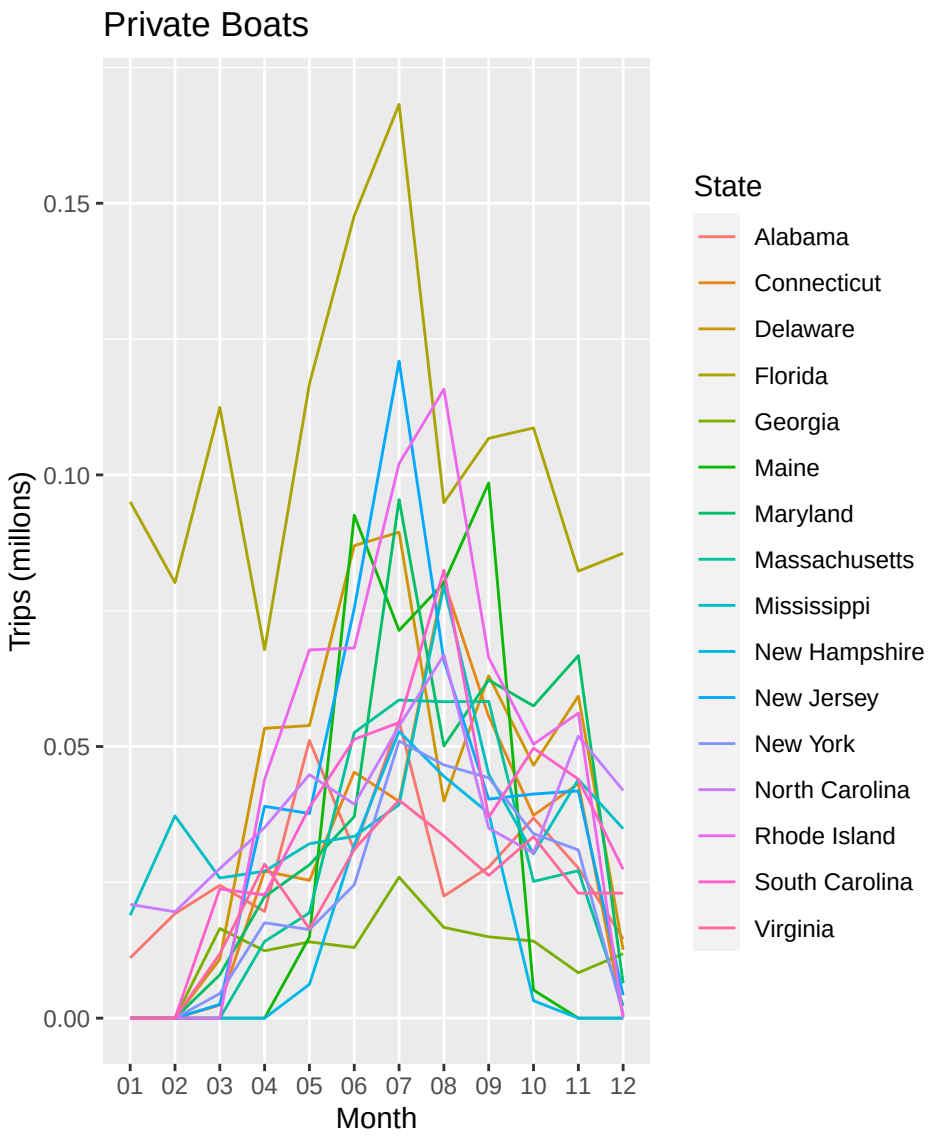

Fig 1. 2020 Monthly Marine Sportfishing Trips per Capita by State

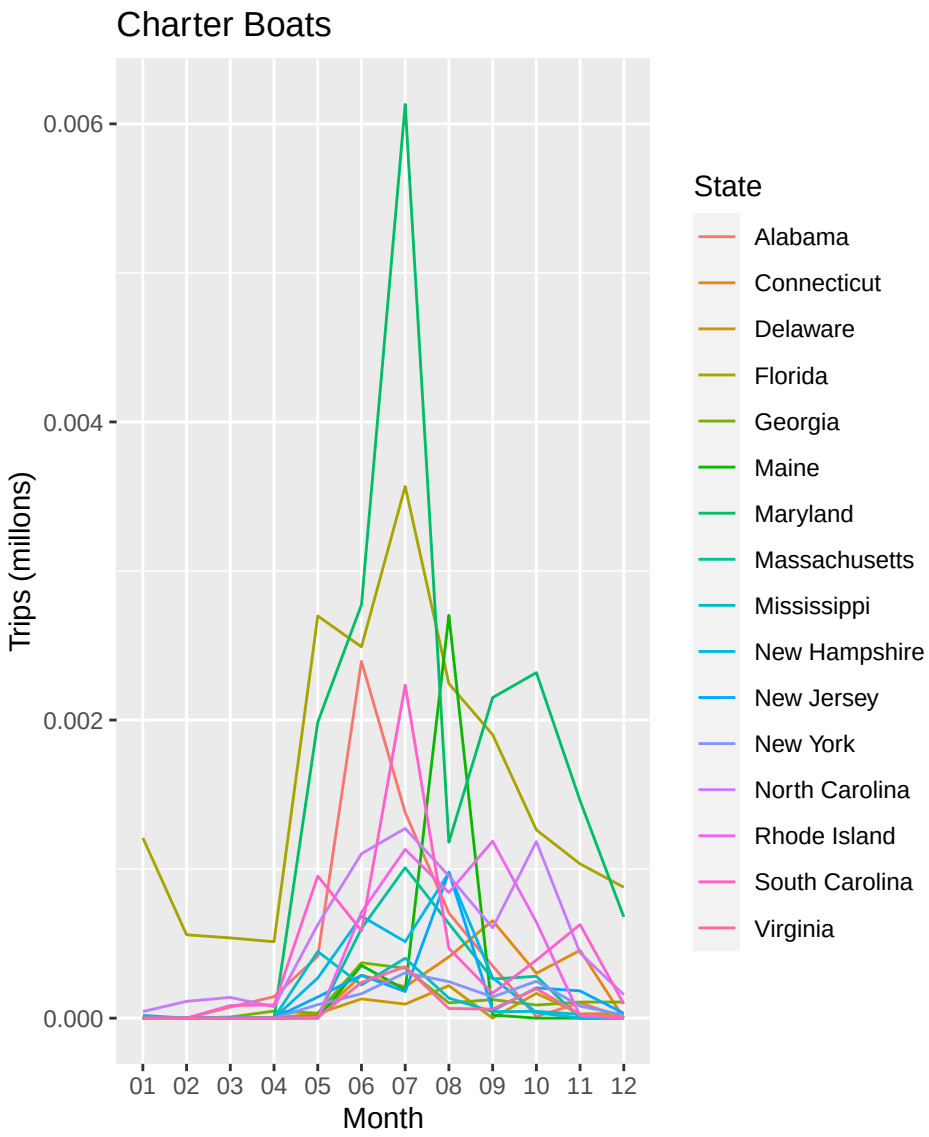

Fig 2. 2020 Monthly Marine Sportfishing Trips per Capita by State

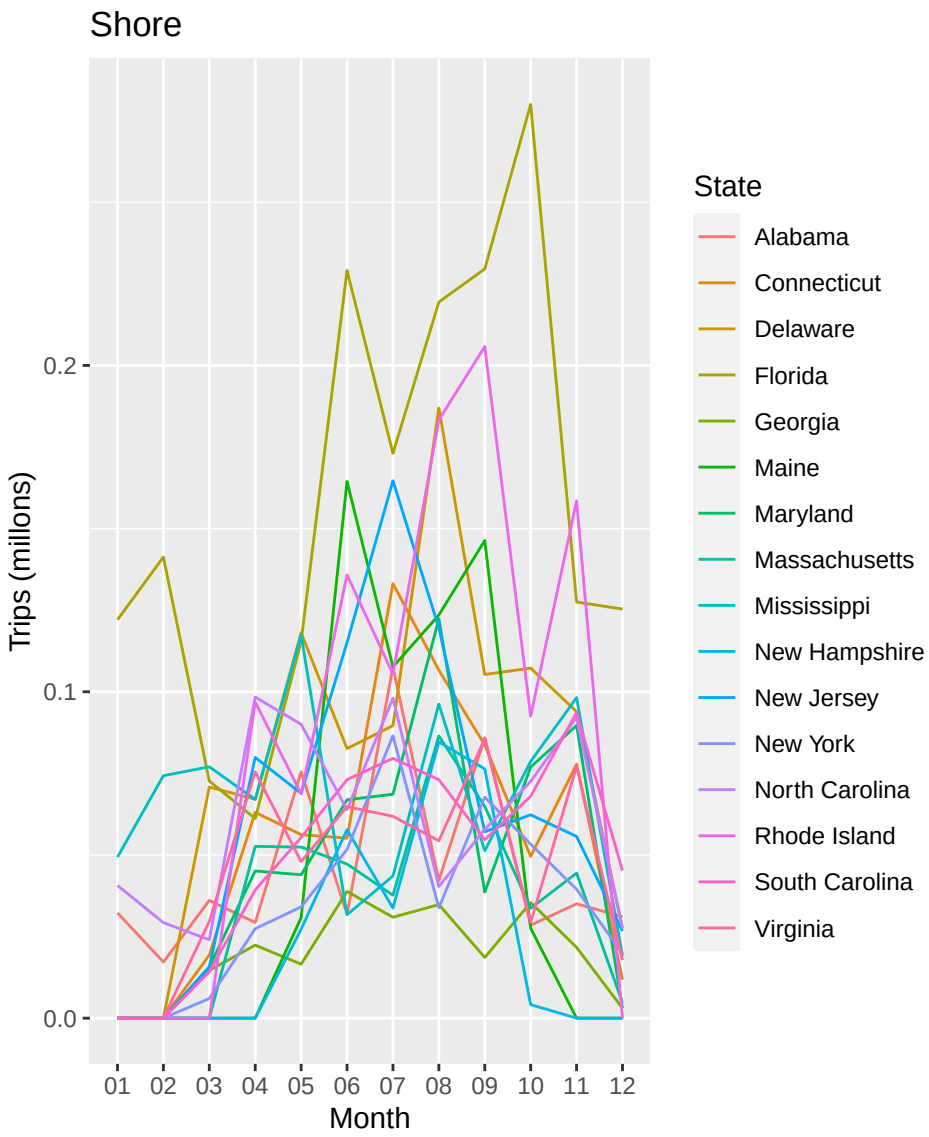

Fig 3. 2020 Monthly Marine Sportfishing Trips per Capita by State

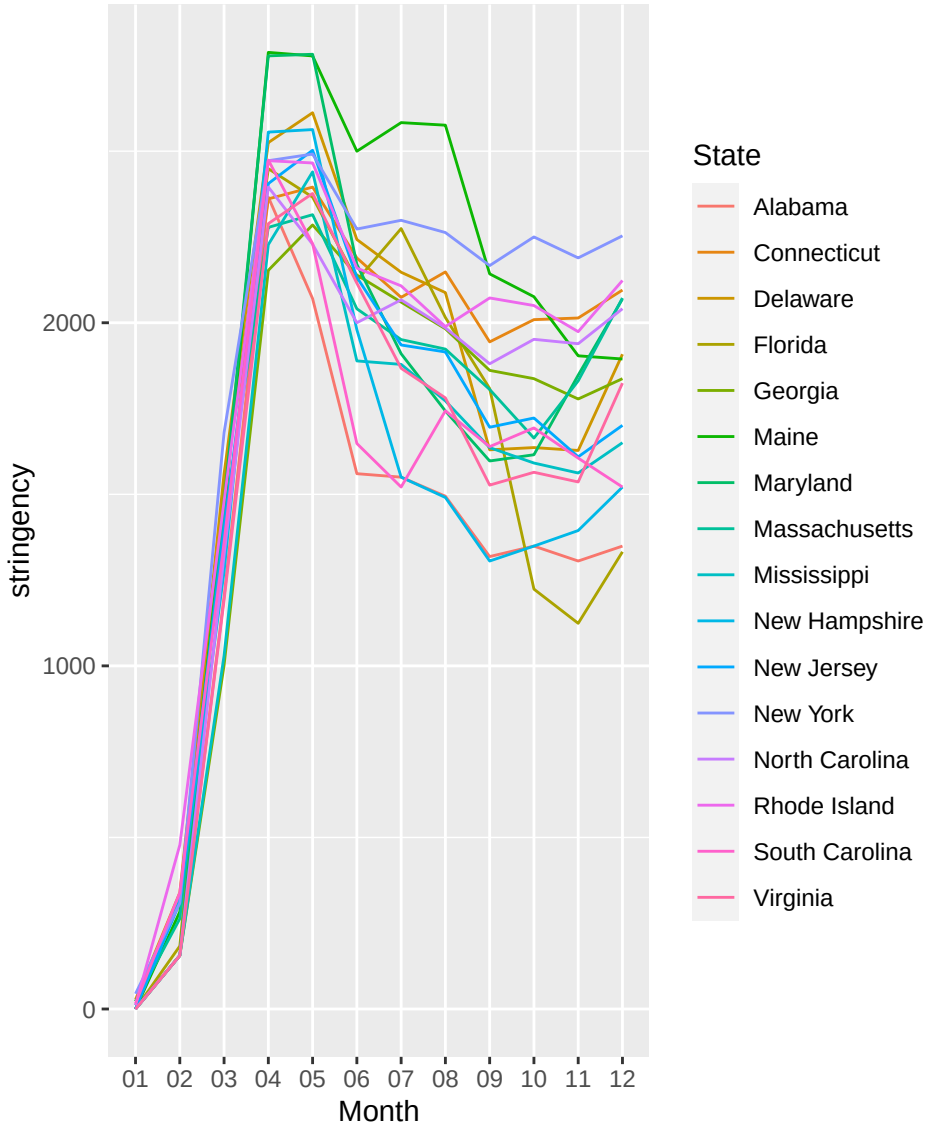

Fig 4. Monthly 2020 stringency Index by State

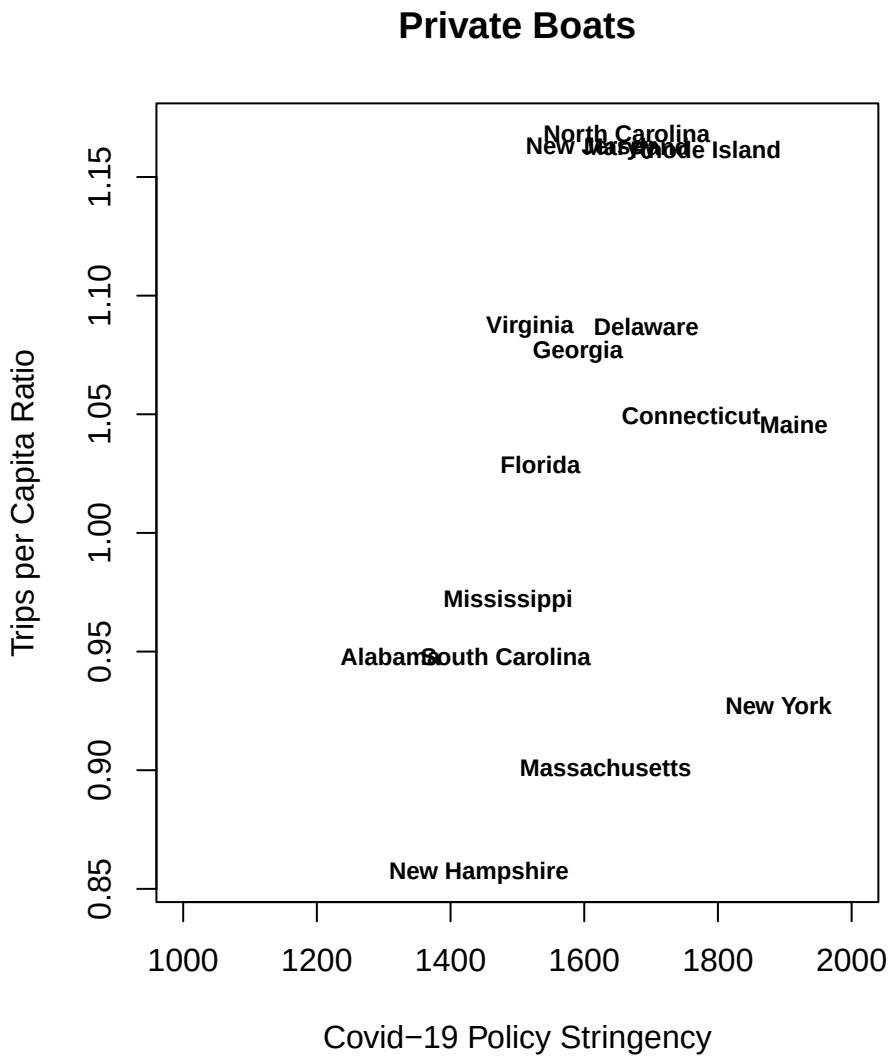

Fig 5. Average Trips per Capita versus Covid-19 Policy Stringency

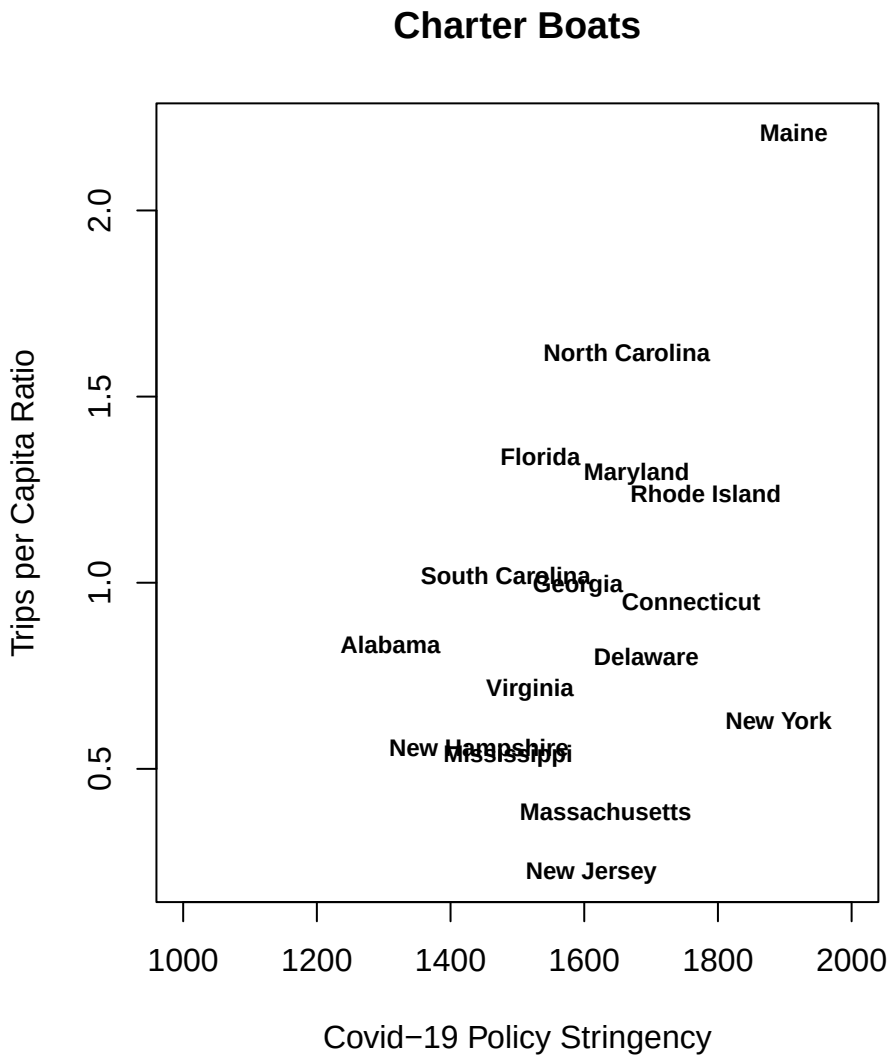

Fig 6. Average Trips per Capita versus Covid-19 Policy Stringency

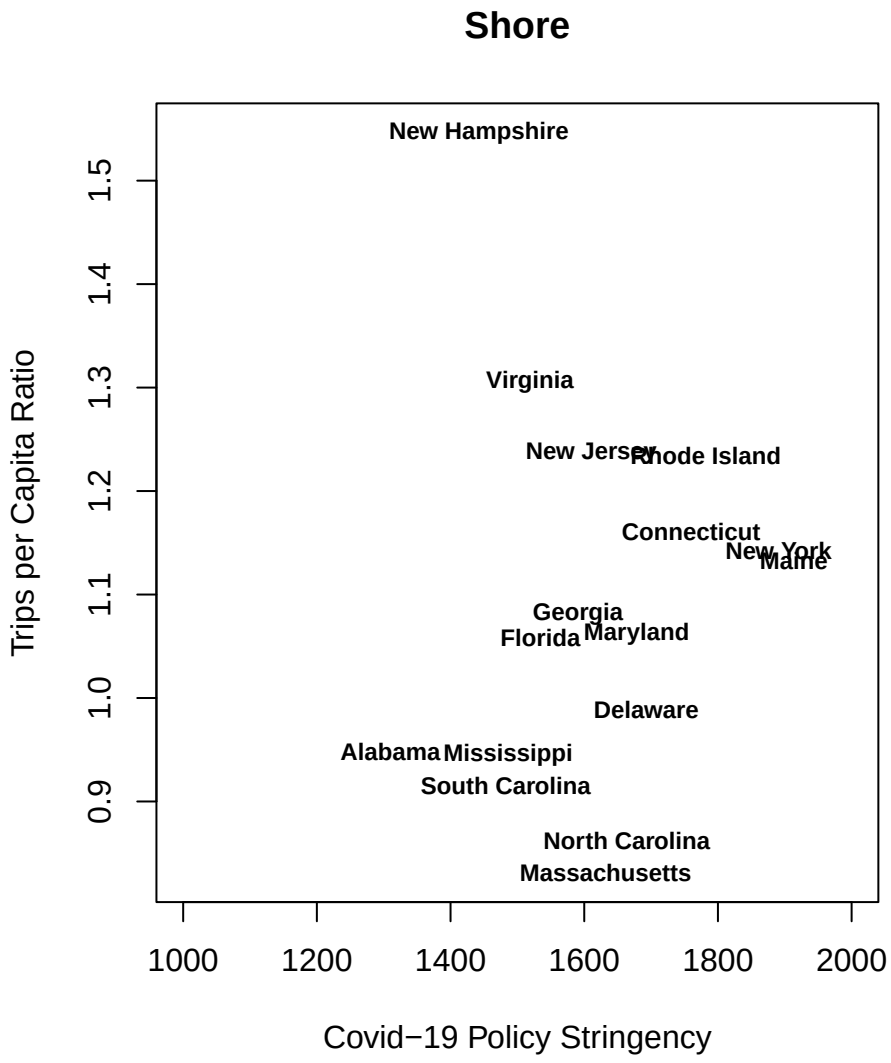

Fig 7. Average Trips per Capita versus Covid-19 Policy Stringency

Table 2. Quasi-Poisson Fixed Effect Regression of Trips on Covid-19 Stringency by Mode

	Private	Charter	Shore
Intercept	−4.487 (0.137)***	−9.083 (0.227)***	−3.729 (0.130)***
Connecticut	−0.006 (0.153)	−0.947 (0.267)***	0.053 (0.151)
Delaware	0.335 (0.214)	−2.021 (0.783)*	0.537 (0.198)**
Florida	1.269 (0.102)***	0.893 (0.130)***	1.172 (0.102)***
Georgia	−0.912 (0.146)***	−1.552 (0.223)***	−0.924 (0.146)***
Maine	0.032 (0.214)	−1.151 (0.449)*	0.006 (0.218)
Maryland	0.114 (0.130)	0.907 (0.144)***	−0.024 (0.135)
Massachusetts	−0.022 (0.130)	−0.028 (0.164)	−0.145 (0.134)
Mississippi	0.265 (0.149)	−1.052 (0.298)***	0.391 (0.144)**
New Hampshire	−0.574 (0.269)*	−0.359 (0.309)	−1.002 (0.327)**
New Jersey	0.186 (0.119)	0.163 (0.151)	0.152 (0.120)
New York	−0.180 (0.114)	−1.198 (0.170)***	−0.368 (0.117)**
North Carolina	0.180 (0.117)	−0.271 (0.159)	0.381 (0.114)***
Rhode Island	0.391 (0.202)	−0.475 (0.363)	0.478 (0.196)*
South Carolina	0.243 (0.131)	−0.126 (0.179)	0.112 (0.135)
Virginia	−0.333 (0.133)*	−1.641 (0.248)***	−0.233 (0.130)
February	0.334 (0.125)**	0.191 (0.258)	−0.012 (0.121)
March	0.366 (0.125)**	0.585 (0.238)*	0.070 (0.119)
April	0.909 (0.115)***	1.003 (0.226)***	0.721 (0.107)***
May	1.051 (0.113)***	1.902 (0.206)***	0.806 (0.105)***
June	1.358 (0.108)***	2.301 (0.201)***	1.073 (0.100)***
July	1.499 (0.107)***	2.344 (0.201)***	1.069 (0.100)***
August	1.356 (0.108)***	2.075 (0.203)***	0.935 (0.102)***
September	1.070 (0.111)***	1.464 (0.212)***	0.798 (0.104)***
October	0.927 (0.114)***	1.289 (0.216)***	0.790 (0.104)***
November	0.875 (0.115)***	1.203 (0.218)***	0.655 (0.106)***
December	0.335 (0.126)**	0.659 (0.235)**	−0.045 (0.123)
Stringency/100	0.027 (0.013)*	0.026 (0.019)	0.038 (0.013)**
$(\text{Stringency}/100)^2$	−0.001 (0.001)*	−0.001 (0.001)	−0.002 (0.001)**
Scale	67644.479	1926.588	110073.475
Deviance	55884180.463	1371580.349	90756332.568
Num. obs.	768	768	768

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$. The base state is Alabama and the base Month is January.

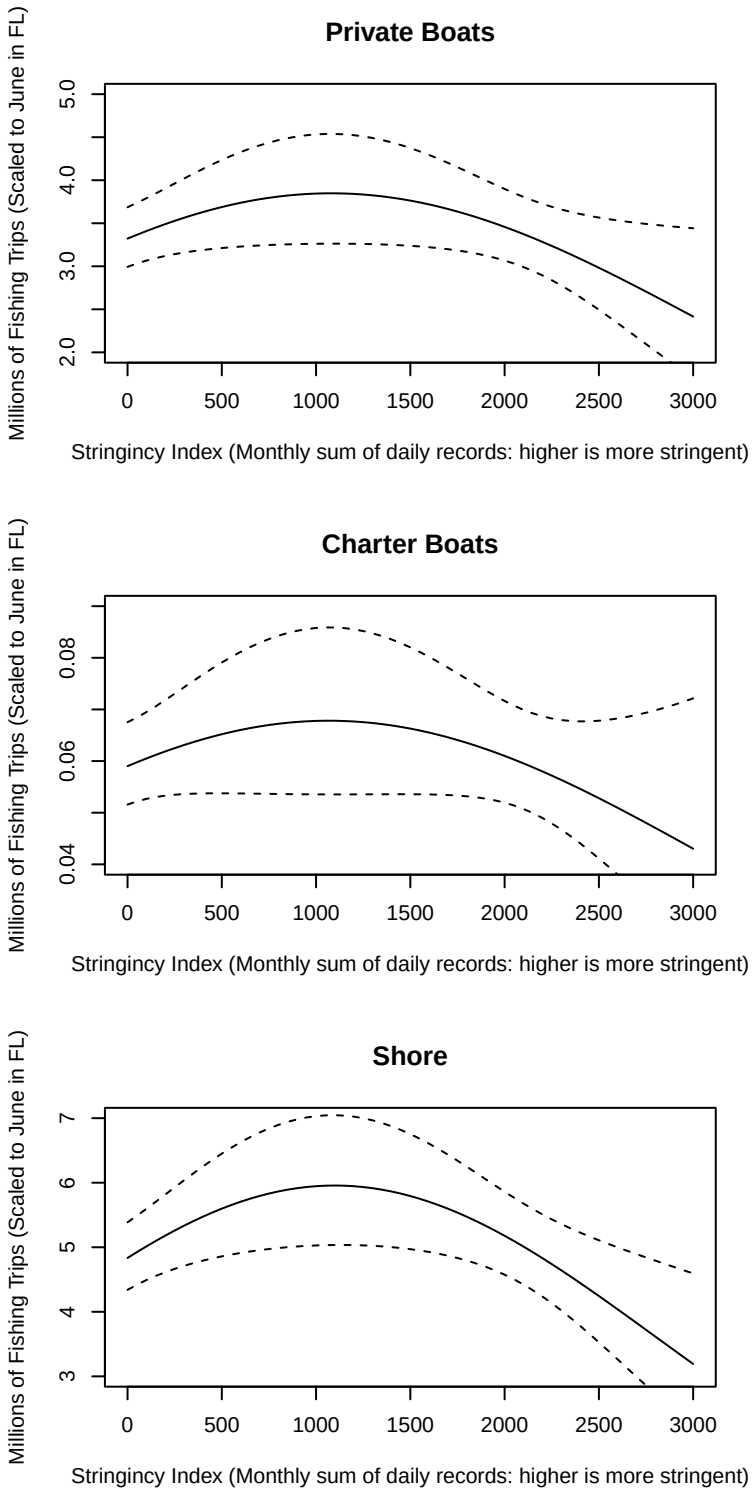

Fig 8. Predicted Trips as a Function of the Stringency Index