Graph 1: Mean Lung Cancer Incidents vs Year in Treatment and Control States in Pre-ban period.

Chart, line chart

Description automatically generated

Notes: Mean lung cancer incident is calculated by averaging lung cancer incidents in all 50 states in each year, categorized by treatment and control groups. Vaping ban in 23 states are instituted in year 2021.

Graph 2: Mean Lung Cancer Incidents vs Year in Treatment and Control States

Chart, line chart

Description automatically generated

Notes: Mean lung cancer incident is calculated by averaging lung cancer incidents in all 50 states in each year, categorized by treatment and control groups. Vaping ban in 23 states are instituted in year 2021.

Regression of Lung Cancers Incidents on Vaping Ban

|  |  |  |
| --- | --- | --- |
|  | Model 1 | Model 2 |
| Year | 45.54\*\* |  |
|  | (2.78) |  |
|  |  |  |
| Vaping Ban | -14856.1 | -4917.5\*\*\* |
|  | (-0.31) | (-28.37) |
|  |  |  |
| Post X Vaping Ban | 6.164 |  |
|  | (0.26) |  |
|  |  |  |
| Post Period |  | 521.5\*\*\* |
|  |  | (11.24) |
|  |  |  |
| post\_treatment |  | -4030.5\*\*\* |
|  |  | (-58.93) |
|  |  |  |
| State.Id=1 |  | 0 |
|  |  | (.) |
|  |  |  |
| State.Id=2 |  | -203.4 |
|  |  | (-1.19) |
|  |  |  |
| State.Id=3 |  | 229.3 |
|  |  | (1.35) |
|  |  |  |
| State.Id=4 |  | 54.38 |
|  |  | (0.32) |
|  |  |  |
| State.Id=5 |  | 483.8\*\* |
|  |  | (2.84) |
|  |  |  |
| State.Id=6 |  | 411.7\* |
|  |  | (2.42) |
|  |  |  |
| State.Id=7 |  | 464.7\*\* |
|  |  | (2.73) |
|  |  |  |
| State.Id=8 |  | 453.9\*\* |
|  |  | (2.67) |
|  |  |  |
| State.Id=9 |  | 971.4\*\*\* |
|  |  | (5.71) |
|  |  |  |
| State.Id=10 |  | 632.8\*\*\* |
|  |  | (3.72) |
|  |  |  |
| State.Id=11 |  | 969.6\*\*\* |
|  |  | (5.70) |
|  |  |  |
| State.Id=12 |  | 1002.0\*\*\* |
|  |  | (5.89) |
|  |  |  |
| State.Id=13 |  | 1092.6\*\*\* |
|  |  | (6.42) |
|  |  |  |
| State.Id=14 |  | 1225.7\*\*\* |
|  |  | (7.20) |
|  |  |  |
| State.Id=15 |  | 1360.2\*\*\* |
|  |  | (7.99) |
|  |  |  |
| State.Id=16 |  | 1257.0\*\*\* |
|  |  | (7.38) |
|  |  |  |
| State.Id=17 |  | 1482.4\*\*\* |
|  |  | (8.71) |
|  |  |  |
| State.Id=18 |  | 1819.9\*\*\* |
|  |  | (10.69) |
|  |  |  |
| State.Id=19 |  | 1598.8\*\*\* |
|  |  | (9.39) |
|  |  |  |
| State.Id=20 |  | 1774.2\*\*\* |
|  |  | (10.42) |
|  |  |  |
| State.Id=21 |  | 2078.9\*\*\* |
|  |  | (12.21) |
|  |  |  |
| State.Id=22 |  | 1995.4\*\*\* |
|  |  | (11.72) |
|  |  |  |
| State.Id=23 |  | 2030.8\*\*\* |
|  |  | (11.93) |
|  |  |  |
| State.Id=24 |  | -2938.5\*\*\* |
|  |  | (-17.26) |
|  |  |  |
| State.Id=25 |  | -2734.6\*\*\* |
|  |  | (-16.06) |
|  |  |  |
| State.Id=26 |  | -2651.3\*\*\* |
|  |  | (-15.57) |
|  |  |  |
| State.Id=27 |  | -2458.6\*\*\* |
|  |  | (-14.44) |
|  |  |  |
| State.Id=28 |  | -2382.2\*\*\* |
|  |  | (-13.99) |
|  |  |  |
| State.Id=29 |  | -2290.1\*\*\* |
|  |  | (-13.45) |
|  |  |  |
| State.Id=30 |  | -2178.7\*\*\* |
|  |  | (-12.80) |
|  |  |  |
| State.Id=31 |  | -1994.2\*\*\* |
|  |  | (-11.71) |
|  |  |  |
| State.Id=32 |  | -1789.2\*\*\* |
|  |  | (-10.51) |
|  |  |  |
| State.Id=33 |  | -1817.8\*\*\* |
|  |  | (-10.68) |
|  |  |  |
| State.Id=34 |  | -1797.0\*\*\* |
|  |  | (-10.56) |
|  |  |  |
| State.Id=35 |  | -1693.8\*\*\* |
|  |  | (-9.95) |
|  |  |  |
| State.Id=36 |  | -1629.3\*\*\* |
|  |  | (-9.57) |
|  |  |  |
| State.Id=37 |  | -1484.0\*\*\* |
|  |  | (-8.72) |
|  |  |  |
| State.Id=38 |  | -1455.5\*\*\* |
|  |  | (-8.55) |
|  |  |  |
| State.Id=39 |  | -1169.0\*\*\* |
|  |  | (-6.87) |
|  |  |  |
| State.Id=40 |  | -1108.2\*\*\* |
|  |  | (-6.51) |
|  |  |  |
| State.Id=41 |  | -1094.0\*\*\* |
|  |  | (-6.43) |
|  |  |  |
| State.Id=42 |  | -957.0\*\*\* |
|  |  | (-5.62) |
|  |  |  |
| State.Id=43 |  | -924.2\*\*\* |
|  |  | (-5.43) |
|  |  |  |
| State.Id=44 |  | -921.1\*\*\* |
|  |  | (-5.41) |
|  |  |  |
| State.Id=45 |  | -755.7\*\*\* |
|  |  | (-4.44) |
|  |  |  |
| State.Id=46 |  | -528.4\*\* |
|  |  | (-3.10) |
|  |  |  |
| State.Id=47 |  | -332.7 |
|  |  | (-1.95) |
|  |  |  |
| State.Id=48 |  | -292.9 |
|  |  | (-1.72) |
|  |  |  |
| State.Id=49 |  | -412.7\* |
|  |  | (-2.42) |
|  |  |  |
| State.Id=50 |  | 0 |
|  |  | (.) |
|  |  |  |
| Constant | 22671.4 | 115913.8\*\*\* |
|  | (0.69) | (947.12) |
| Observations | 550 | 1050 |

Model 1 tests the parallel trend assumption by regressing the number of lung cancer incidents on the treatment condition, year, and their interaction. States with and without vaping band does not differ significant in the occurrence of lung cancer; trend in change of occurrence over year is parallel between the two kinds of states. Model 2 regress lung cancer occurrence over vaping ban treatment, a period fixed effect(1 if after 2021) and its interaction with treatment, as well as state fixed effects. States without vaping ban see a significant increases in cancer occurrence of 521.5 incidents after the ban; states with vaping ban has -4917.5 less occurrence, on average; and the difference in difference of change in cancer occurrence between the treatment and control states (estimated causal effect) is a significant -4030.5 incidents decrease in cancer occurrence.

\* *p* < 0.05, \*\* *p* < 0.01, \*\*\* *p* < 0.001

Answers:

1. There are 49 state level fixed effects plus 1 omitted base-line level (state 50)
2. Each state level fixed effect represents how many less or more lung cancer occurrence compared to state 50 is explained by time-invariant idiosyncratic differences between states.
3. An F-test rejects the null hypothesis that all fixed effects are jointly insignificant: F( 48, 998) = 40.26 Prob > F = 0.0000