**Supplementary Digital Content**

eAppendix 1.

Model 1.

Where, is the number of hospital admissions for acute respiratory distress syndrome (ARDS) in year t at ZIP code z; is the number of Medicare enrollees in year t at ZIP code z and log() is the year and ZIP code specific offset; is the number of construction (or manufacturing) industries or ZIP code categories (low, mid, high-number of construction or manufacturing industries by business size s in year t at ZIP code z; is the business size in year t at ZIP code z; , , , , and are the proportions of white, black, Hispanic, Asian, and Native American populations, respectively, in year t at ZIP code z; is the proportion of females in year t at ZIP code z; is the median household income in year t at ZIP code z; is the proportion of ever smokers in year t at ZIP code z; is the proportion of the adults aged more than 85 in year t at ZIP code z; is the random intercept for ZIP code.

 is the estimated log incidence rate ratio of annual hospital admissions for ARDS for an increase of one company per year in construction manufacturing sector.

To deliver results in a more meaningful way, the effect estimate was converted to percent change (%) in annual hospital admission rates by an increase of ten construction (or manufacturing) companies per year across all ZIP codes:

eTable 1. ICD-9-CM codes to define ARDS, sepsis, pneumonia, and traumatic injury

|  |  |
| --- | --- |
|   | ICD-9-CM codes |
| ARDS  | 518.51, 518.52, 518.53, and 518.82  |
| Sepsis | A: Infection codes (primary OR secondary): 001–005, 008–018, 020–027, 030–041, 054.5, 090–098, 100–104, 110–112, 114–118, 320, 322, 324, 325, 420, 421, 451, 461–465, 481, 482, 485, 486, 491.21, 494, 510, 513, 540–542, 562.01, 562.03, 562.11, 562.13, 566, 567, 569.5, 569.83, 572.0, 572.1, 575.0, 590, 597, 599.0, 601, 614, 615, 616, 681–683, 686, 711.0, 730, 790.7, 996.6, 998.5, 993.3 B: Organ dysfunction codes (primary OR secondary): 96.7, 286.6, 286.9, 287.4, 287.5, 293, 297.4, 348.1, 348.3, 427.5, 458, 458.8, 458.9, 518.81, 518.82, 570, 572.2, 573.4, 584, 780.01, 785.5, 786.09, 799.1, 796.3C: Sepsis direct codes (primary): 995.91(sepsis), 995.92 (severe sepsis), 785.52 (septic shock) Defined as (A AND B) OR C  |
| Pneumonia | 480.0 - 487.0 |
| Traumatic Injury | 800 - 904, 910 - 929, 940 - 959.9  |

ARDS indicates acute respiratory distress syndrome.

eTable 2. Pearson correlation coefficients between exposures, health outcomes, and confounders

|  |  |  |
| --- | --- | --- |
| Variable | Construction sites | Manufacturing sites |
| Medicare Enrollees | 0.75 | 0.52 |
| ARDS | 0.63 | 0.44 |
| ARDS with sepsis | 0.59 | 0.42 |
| ARDS with pneumonia | 0.26 | 0.20 |
| ARDS with traumatic injury | 0.42 | 0.29 |
| Construction sites | 1.00 | 0.73 |
| Manufacturing sites | 0.73 | 1.00 |
| Proportion of whites | -0.13 | -0.19 |
| Proportion of blacks | 0.05 | 0.07 |
| Proportion of Hispanics | 0.15 | 0.21 |
| Proportion of Asians | 0.23 | 0.29 |
| Proportion of Native Americans | -0.06 | -0.05 |
| Proportion of females | 0.23 | 0.19 |
| Proportion of adults aged ≥ 85 | 0.12 | 0.14 |
| Median Household Income | 0.29 | 0.16 |
| Proportion of ever smokers | -0.05 | -0.07 |
| PM2.5 | 0.10 | 0.13 |
| Ozone | -0.09 | -0.14 |
| Trauma center | 0.17 | 0.15 |

Note: p-value for all coefficients were < 0.001

ARDS indicates acute respiratory distress syndrome.

eTable 3. Percent change (%) in annual hospital admission rates for ARDS by a ten-company increase per year (95% CI). Number of trauma centers per ZIP code was further adjusted.

|  |  |  |  |
| --- | --- | --- | --- |
|   | Model 1 | Model 1 + PM2.5 + Ozone | Model 1 + PM2.5 + Ozone + Trauma center |
| Construction | 0.75 (0.69, 0.82) | 0.77 (0.71, 0.84) | 0.75 (0.69, 0.82) |
| Manufacturing | 1.05 (0.94, 1.17) | 1.21 (1.09, 1.33) | 1.18 (1.06, 1.30) |

Model 1. Adjusted for ZIP code level covariates: proportion of racial groups (whites, blacks, Hispanics, Asians, Native Americans), proportion of females, proportion of adults aged more than 85, median household income, the proportion of ever smokers, a dummy variable for each year, and business size.

ARDS indicates acute respiratory distress syndrome, PM2.5 particulate matter with an aerodynamic diameter < 2.5 mm

eTable 4. Percent change (%) in annual hospital admission rates for ARDS by one-company per year increase in chemical product manufacturing sector (95% CI)

|  |  |  |
| --- | --- | --- |
|   | Model 1 + PM2.5 + Ozone | Model 1 + PM2.5 + Ozone + Trauma center |
| All ZIP codes (n=201,481) | 1.50 (1.25, 1.75) | 1.47 (1.22, 1.72) |
| ZIP codes having more than one chemical product manufacturing firm (n=44,770) | 1.36 (1.03, 1.68) | 1.35 (1.03, 1.67) |

Model 1. Adjusted for ZIP code level covariates: proportion of racial groups (whites, blacks, Hispanics, Asians, Native Americans), proportion of females, proportion of adults aged more than 85, median household income, the proportion of ever smokers, a dummy variable for each year, and business size.

ARDS indicates acute respiratory distress syndrome, PM2.5 particulate matter with an aerodynamic diameter < 2.5 mm

eTable 5. Means and proportions of all variables (potential confounders) and their absolute standardized difference before and after matching with propensity scores, which were created separately for two industries (construction and manufacturing).

|  |  |  |
| --- | --- | --- |
| **Construction**  | Before matching | After matching  |
|   | Mean (SD) or N (%) |   | Mean (SD) or N (%) |   |
|   | Low (<50) | High (≥50) | Absolute Standardized Difference | Low (<50) | High (≥50) | Absolute Standardized Difference |
| Median Household Income | 48040 (19900) | 59700 (22560) | 0.55 | 55680 (25800) | 57850 (22020) | 0.09 |
| Proportion of females |  0.55 (0.05) | 0.57 (0.03) | 0.53 | 0.57 (0.04) | 0.57 (0.03) | 0.04 |
| Business size (N, %)  |   |   | 0.50 |   |   | 0.08 |
| 0 | 96289 (28.4) | 33206 (19.8) |   | 27325 (20.3) | 29326 (21.7) |   |
| 1-19 | 137411 (40.6) | 45628 (27.2) |   | 37387 (27.7) | 40469 (30.0) |   |
| 20-99 | 68978 (20.4) | 44819 (26.8) |   | 39265 (29.1) | 36126 (26.8) |   |
| 100-499 | 30007 (8.9) | 33813 (20.2) |   | 25216 (18.7) | 23086 (17.1) |   |
| 500+ employees | 6118 (1.8) | 10030 (6.0) |   | 5728 (4.2) | 5914 (4.4) |   |
| Proportion of Asians | 0.01 (0.03) | 0.02 (0.05) | 0.38 | 0.01 (0.05) | 0.02 (0.04) | 0.02 |
| Proportion of Hispanics | 0.01 (0.04) | 0.02 (0.05) | 0.26 | 0.02 (0.05) | 0.02 (0.04) | 0.02 |
| Proportion of adults aged ≥ 85 | 0.13 (0.05) | 0.14 (0.04) | 0.26 | 0.14 (0.05) | 0.14 (0.04) | 0.01 |
| Proportion of whites | 0.90 (0.18) | 0.86 (0.17) | 0.23 | 0.87 (0.20) | 0.87 (0.17) | 0.01 |
| PM2.5 | 10.36 (2.49) | 10.72 (2.34) | 0.15 | 10.69 (2.35) | 10.63 (2.26) | 0.03 |
| Proportion of ever smokers | 0.47 (0.08) | 0.46 (0.07) | 0.14 | 0.47 (0.07) | 0.47 (0.07) | 0.01 |
| Proportion of Native Americans | 0.01 (0.05) | 0.00 (0.01) | 0.13 | 0.00 (0.02) | 0.00 (0.01) | 0.01 |
| Ozone | 0.04 (0.00) | 0.04 (0.00) | 0.12 | 0.04 (0.00) | 0.04 (0.00) | 0.04 |
| Proportion of blacks | 0.07 (0.15) | 0.08 (0.14) | 0.06 | 0.09 (0.17) | 0.08 (0.14) | 0.02 |
| Year (N, %) |   |   | 0.04 |   |   | 0.01 |
| 2006 | 53866 (15.9) | 25068 (15.0) |   | 20310 (15.1) | 20371 (15.1) |  |
| 2007 | 53413 (15.8) | 25767 (15.4) |   | 21032 (15.6) | 21109 (15.6) |   |
| 2008 | 52908 (15.6) | 26316 (15.7) |   | 21077 (15.6) | 21120 (15.7) |   |
| 2009 | 52462 (15.5) | 26495 (15.8) |   | 20923 (15.5) | 21236 (15.7) |   |
| 2010 | 51974 (15.3) | 26325 (15.7) |   | 20965 (15.5) | 21156 (15.7) |   |
| 2011 | 37415 (11.0) | 17962 (10.7) |   | 14828 (11.0) | 14509 (10.8) |   |
| 2012 | 36765 (10.9) | 19563 (11.7) |   | 15786 (11.7) | 15420 (11.4) |   |
| **Manufacturing**  | Before matching | After matching  |
|   | Mean (SD) or N (%) |   | Mean (SD) or N (%) |   |
|  | Low (<20) | High (≥20) | Absolute Standardized Difference | Low (<20) | High (≥20) | Absolute Standardized Difference |
| Proportion of females | 0.55 (0.05) | 0.57 (0.04) | 0.62 | 0.57 (0.04) | 0.57 (0.04) | < 0.01 |
| Business size (N, %)  |   |   | 0.60 |   |   | 0.09 |
| 0 | 97810 (28.9) | 31685 (18.9) |   | 27420 (20.6) | 28150 (21.1) |   |
| 1-19 | 139038 (41.1) | 44001 (26.2) |   | 37674 (28.3) | 39131 (29.4) |   |
| 20-99 | 69983 (20.7) | 43814 (26.1) |   | 39423 (29.6) | 36053 (27.1) |   |
| 100-499 | 27055 (8.0) | 36765 (21.9) |   | 23988 (18.0) | 24195 (18.2) |   |
| 500+ employees | 4752 (1.4) | 11396 (6.8) |   | 4620 (3.5) | 5596 (4.2) |   |
| Proportion of adults aged ≥ 85 | 0.13 (0.05) | 0.15 (0.04) | 0.41 | 0.15 (0.05) | 0.15 (0.04) | < 0.01 |
| Proportion of Asians | 0.01 (0.03) | 0.03 (0.06) | 0.40 | 0.01 (0.04) | 0.01 (0.03) | 0.01 |
| Proportion of whites | 0.91 (0.16) | 0.84 (0.19) | 0.38 | 0.86 (0.20) | 0.86 (0.18) | 0.01 |
| Proportion of Hispanics | 0.01 (0.03) | 0.02 (0.05) | 0.32 | 0.01 (0.05) | 0.02 (0.04) | 0.02 |
| Median Household Income | 49640 (20720) | 56460 (22390) | 0.32 | 55460 (26480) | 55470 (21710) | < 0.001 |
| PM2.5 | 10.26 (2.48) | 10.92 (2.31) | 0.28 | 10.86 (2.29) | 10.75 (2.25) | 0.05 |
| Ozone | 0.04 (0.00) | 0.04 (0.00) | 0.27 | 0.04 (0.00) | 0.04 (0.00) | 0.04 |
| Proportion of blacks | 0.06 (0.14) | 0.09 (0.16) | 0.20 | 0.09 (0.18) | 0.09 (0.16) | < 0.01 |
| Proportion of ever smokers | 0.47 (0.08) | 0.46 (0.06) | 0.16 | 0.46 (0.07) | 0.47 (0.07) | 0.02 |
| Proportion of Native Americans | 0.01 (0.05) | 0.00 (0.01) | 0.13 | 0.00 (0.02) | 0.00 (0.01) | < 0.01 |
| Year (N, %) |   |   | 0.05 |   |   | 0.01 |
| 2006 | 53100 (15.7) | 25834 (15.4) |   | 20448 (15.4) | 20762 (15.6) |   |
| 2007 | 53629 (15.8) | 25551 (15.2) |   | 20681 (15.5) | 20577 (15.5) |   |
| 2008 | 53456 (15.8) | 25768 (15.4) |   | 20654 (15.5) | 20569 (15.5) |   |
| 2009 | 53298 (15.7) | 25659 (15.3) |   | 20146 (15.1) | 20370 (15.3) |   |
| 2010 | 52287 (15.4) | 26012 (15.5) |   | 21119 (15.9) | 20760 (15.6) |   |
| 2011 | 37006 (10.9) | 18371 (11.0) |   | 14350 (10.8) | 14440 (10.8) |   |
| 2012 | 35862 (10.6) | 20466 (12.2) |   | 15727 (11.8) | 15647 (11.8) |   |

SD indicates standard deviation, PM2.5 particulate matter with an aerodynamic diameter < 2.5 mm

eTable 6. Percent change (%) in annual hospital admission rates for ARDS (95% CI) from fitting generalized linear mixed models using binary exposures. Results of models adjusted for decile of propensity scores and models adjusted for covariates are presented.

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| --- |
| Adjusted for decile of propensity scores  |
| Construction | 4.59 (4.19, 5.00) |
| Manufacturing | 3.29 (2.90, 3.69) |
| Adjusted for covariates |
| Construction | 4.95 (4.54, 5.36) |
| Manufacturing | 2.82 (2.42, 3.21) |

Adjusted covariates: proportion of racial groups (whites, blacks, Hispanics, Asians, Native Americans), proportion of females, proportion of adults aged more than 85, median household income, the proportion of ever smokers, a dummy variable for each year, business size, and air pollution (PM2.5, and ozone)

ARDS indicates acute respiratory distress syndrome, CI confidence interval, PM2.5 particulate matter with an aerodynamic diameter < 2.5 mm