**Methods section**

1. **Study area and time points**
2. **Census data**
3. **Asthma incidence and prevalence rates**
4. **Exposure assessment models**
5. **Concentration-response function**
6. **Burden of disease model**
7. **Statistical software**

**Results**

1. **Asthma incident cases**
2. **Attributable number of asthma incident cases**
3. **Attributable number of asthma incident cases by living location**
4. **Attributable number of asthma incident cases by median household income**

**Tables**

1. **Census data description**

|  |  |  |
| --- | --- | --- |
| Geographic characteristics | Total populated census blocks | 6,182,882 |
| Total census-designated urban areas | 3,590,278 |
| Demographic characteristics | Total population | 73,690,271 |
| Total population of children (birth – 18) |  |
| Mean (range) number of children in census blocks |  |
| Population of children by living location | Rural | 13,763,183 |
| Urban clusters (≥2,500 and <50,000 people) | 6,994,464 |
| Urbanized area (≥50,000 people) | 52,932,624 |
| Population of children by median household income | <20,000 | 2,614,804 |
| 20,000 to <35,000 | 12,770,843 |
| 35,000 to <50,000 | 18,573,954 |
| 50,000 to <75,000 | 21,953,876 |
| ≥75,000 | 17,763,239 |

1. **Summary of pollutant concentrations using populated census blocks only**

|  |  |
| --- | --- |
| **NO2 µg/m3** |  |
| Mean |  |
| Min |  |
| 25% |  |
| 50% |  |
| 75% |  |
| Max |  |

1. **Total childhood asthma incident cases, attributable number of cases, and percentage of cases due to NO2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Asthma incident cases | AC | % of all asthma cases |
|  | Total | 754,893 | 132,829 | 17.6 |
| By living location (% of Total) | Rural | 142,559 (19%) | 13,951 (11%) | 9.8 |
| Urban cluster | 71,249 (9%) | 9,296 (7%) | 13.0 |
| Urbanized area | 541,085 (72%) | 109,581 (82%) | 20.3 |
| By median household income (% of Total) | <20,000 | 28,039 (4%) | 5,834 (4%) | 20.8 |
| 20,000 to <35,000 | 134,208 (18%) | 24,906 (19%) | 18.6 |
| 35,000 to <50,000 | 190,481 (25%) | 32,369 (24%) | 17.0 |
| 50,000 to <75,000 | 223,522 (30%) | 37,559 (28%) | 16.8 |
| ≥75,000 | 178,497 (24%) | 32,133 (24%) | 18.0 |

1. **Comparing results of state-specific asthma incidence cases with original incidence rate**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Asthma incident cases | AC | % of all asthma cases |
|  | Total | 794,934 | 141,931 | 17.9 |
| By living location (% of Total) | Rural | 148,470 (19%) | 14,466 (10%) | 9.7 |
| Urban cluster | 75,453 (9%) | 9,844 (7%) | 13.0 |
| Urbanized area | 571,011 (72%) | 117,621 (83%) | 20.6 |
| By median household income (% of Total) | <20,000 | 28,207 (4%) | 5,892 (4%) | 20.9 |
| 20,000 to <35,000 | 137,765 (17%) | 25,794 (18%) | 18.7 |
| 35,000 to <50,000 | 200,367 (25%) | 34,549 (24%) | 17.2 |
| 50,000 to <75,000 | 236,827 (30%) | 40,540 (29%) | 17.1 |
| ≥75,000 | 191,621 (24%) | 35,128 (25%) | 18.3 |

1. **Comparing results of state-specific asthma incidence rate with original incidence rate**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | State cases | Origin cases | Diff | % Diff |
| Total | 754,893 | 794,934 | -40,041 | -5.0% |
| Rural | 142,559 | 148,470 | -5,911 | -4.0% |
| Urban cluster | 71,249 | 75,453 | -4,204 | -5.6% |
| Urbanized area | 541,085 | 571,011 | -29,926 | -5.2% |
| <20,000 | 28,039 | 28,207 | -168 | -0.6% |
| 20,000 to <35,000 | 134,208 | 137,765 | -3,558 | -2.6% |
| 35,000 to <50,000 | 190,481 | 200,367 | -9,885 | -4.9% |
| 50,000 to <75,000 | 223,522 | 236,827 | -13,305 | -5.6% |
| ≥75,000 | 178,497 | 191,621 | -13,123 | -6.8% |

1. **Comparing results of state-specific attributable cases and fraction with original incidence rate**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | State AC | Origin AC | Diff | % Diff | State AF | Origin AF | Diff | % Diff |
| Total | 132,829 | 141,931 | -9,103 | -6.4% | 17.6% | 17.9% | -0.3% | -1.4% |
| Rural | 13,951 | 14,466 | -514 | -3.6% | 9.8% | 9.7% | 0.0% | 0.4% |
| Urban cluster | 9,296 | 9,844 | -549 | -5.6% | 13.0% | 13.0% | 0.0% | 0.0% |
| Urbanized area | 109,581 | 117,621 | -8,040 | -6.8% | 20.3% | 20.6% | -0.3% | -1.7% |
| <20,000 | 5,834 | 5,892 | -58 | -1.0% | 20.8% | 20.9% | -0.1% | -0.4% |
| 20,000 to <35,000 | 24,906 | 25,794 | -889 | -3.4% | 18.6% | 18.7% | -0.2% | -0.9% |
| 35,000 to <50,000 | 32,369 | 34,549 | -2,180 | -6.3% | 17.0% | 17.2% | -0.2% | -1.4% |
| 50,000 to <75,000 | 37,559 | 40,540 | -2,981 | -7.4% | 16.8% | 17.1% | -0.3% | -1.8% |
| ≥75,000 | 32,133 | 35,128 | -2,994 | -8.5% | 18.0% | 18.3% | -0.3% | -1.8% |

1. **Air pollution concentration by state**
2. **Air pollution concentration by strata**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Mean | Min | Median | Max |
| Total |  |  |  |  |  |
| By living location | Rural |  |  |  |  |
| Urban cluster |  |  |  |  |
| Urbanized area |  |  |  |  |
| By median household income | <20,000 |  |  |  |  |
| 20,000 to <35,000 |  |  |  |  |
| 35,000 to <50,000 |  |  |  |  |
| 50,000 to <75,000 |  |  |  |  |
| ≥75,000 |  |  |  |  |

1. **Childhood asthma survey summary count**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **2006** | **2007** | **2008** | **2009** | **2010** | **Mean** |
| Children sample |  |  |  |  |  |  |
| Ever asthma |  |  |  |  |  |  |
| Incident case |  |  |  |  |  |  |
| At-risk |  |  |  |  |  |  |
| IR per 1,000 |  |  |  |  |  |  |
| PRV per 100 |  |  |  |  |  |  |

1. **Childhood asthma survey summary weighted**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **2006** | **2007** | **2008** | **2009** | **2010** | **Mean** |
| Weighted sample | 50,674,742 | 43,661,381 | 53,327,550 | 47,747,373 | 39,975,264 | 47,077,262 |
| Ever asthma | 6,493,224 | 5,763,409 | 7,218,400 | 6,279,938 | 5,158,455 | 6,182,685 |
| Incident case | 404,276 | 312,917 | 385,818 | 297,546 | 319,743 | 344,060 |
| At-risk | 30,825,589 | 36,050,557 | 26,491,259 | 25,942,087 | 22,900,850 | 28,442,068 |
| IR per 1,000 | 13.1 | 8.7 | 14.6 | 11.5 | 14.0 | 12.1 |
| PRV per 100 | 12.8 | 13.2 | 13.5 | 13.2 | 12.9 | 13.1 |

1. **Childhood asthma survey mean weighted summary by state**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **State** | **Sample** | **Ever asthma** | **Incident** | **At-risk** | **IR per 1000** | **PRV per 100** |
| Arizona | 6,631,643 | 866,487 | 42,622 | 2,802,422 | 15.2 | 13.1 |
| California | 36,944,762 | 4,513,981 | 156,599 | 16,850,453 | 9.3 | 12.2 |
| Connecticut | 3,216,911 | 515,372 | 32,939 | 2,734,478 | 12.0 | 16.0 |
| D.C. | 550,985 | 109,403 | 3,184 | 179,493 | 17.7 | 19.9 |
| Georgia | 12,211,232 | 1,847,944 | 94,786 | 10,458,074 | 9.1 | 15.1 |
| Illinois | 12,758,371 | 1,580,896 | 37,799 | 5,673,571 | 6.7 | 12.4 |
| Indiana | 7,837,910 | 1,006,366 | 105,219 | 6,936,762 | 15.2 | 12.8 |
| Iowa | 3,410,014 | 287,609 | 11,510 | 1,829,734 | 6.3 | 8.4 |
| Kansas | 3,428,398 | 396,147 | 27,509 | 3,059,760 | 9.0 | 11.6 |
| Louisiana | 2,178,496 | 282,443 | 5,379 | 931,966 | 5.8 | 13.0 |
| Maine | 825,221 | 109,120 | 6,662 | 722,763 | 9.2 | 13.2 |
| Maryland | 6,754,689 | 1,002,976 | 64,871 | 5,816,584 | 11.2 | 14.8 |
| Michigan | 11,990,510 | 1,625,547 | 126,102 | 10,491,065 | 12.0 | 13.6 |
| Mississippi | 3,630,503 | 515,551 | 18,264 | 1,300,917 | 14.0 | 14.2 |
| Missouri | 5,518,464 | 766,864 | 46,410 | 3,600,272 | 12.9 | 13.9 |
| Montana | 1,059,004 | 102,944 | 3,296 | 768,012 | 4.3 | 9.7 |
| Nebraska | 2,201,248 | 204,905 | 18,262 | 2,014,605 | 9.1 | 9.3 |
| New Hampshire | 886,427 | 107,549 | 9,423 | 788,302 | 12.0 | 12.1 |
| New Jersey | 8,196,056 | 1,168,380 | 51,472 | 5,274,310 | 9.8 | 14.3 |
| New Mexico | 1,497,760 | 179,121 | 8,857 | 1,327,496 | 6.7 | 12.0 |
| New York | 17,587,681 | 2,781,426 | 221,226 | 15,027,481 | 14.7 | 15.8 |
| Ohio | 8,133,870 | 997,198 | 71,568 | 4,755,245 | 15.1 | 12.3 |
| Oklahoma | 3,491,913 | 487,287 | 24,628 | 2,285,659 | 10.8 | 14.0 |
| Oregon | 2,525,767 | 281,481 | 8,328 | 752,768 | 11.1 | 11.1 |
| Pennsylvania | 13,667,687 | 1,905,109 | 62,292 | 4,733,925 | 13.2 | 13.9 |
| Rhode Island | 907,043 | 145,915 | 5,476 | 384,117 | 14.3 | 16.1 |
| Texas | 26,030,068 | 3,420,044 | 381,999 | 22,992,023 | 16.6 | 13.1 |
| Utah | 3,963,227 | 404,738 | 30,221 | 2,902,955 | 10.4 | 10.2 |
| Vermont | 646,239 | 89,457 | 6,498 | 563,280 | 11.5 | 13.8 |
| Washington | 3,063,863 | 330,138 | 18,647 | 2,752,373 | 6.8 | 10.8 |
| West Virginia | 1,877,224 | 238,133 | 3,847 | 325,031 | 11.8 | 12.7 |
| Wisconsin | 3,890,403 | 410,615 | 14,404 | 1,174,447 | 12.3 | 10.6 |

**Figures**

1. **“Never asthma”, “Newly diagnosed asthma case” and “At-risk population” from the Behavioral Risk Factor Surveillance System (BRFSS) and Asthma Call-back Survey (ACBS) data sets, 2006–2010.**

***Boxplots***

1. **NO2 concentration**
2. **NO2 concentration by living location**
3. **NO2 concentration by median income grp**
4. **NO2 concentration by living location stratified into median income grp**
5. **NO2 concentration by median income grp stratified into living location**
6. **NO2 concentration by state**
7. **NO2 concentration by state and living location**
8. **NO2 concentration by state and median income grp**
9. **Attributable Fraction (AF)**
10. **AFconcentration by living location**
11. **AFconcentration by median income grp**
12. **AFconcentration by living location stratified into median income grp**
13. **AFconcentration by median income grp stratified into living location**
14. **AF by state and living location**
15. **AF by state and median income grp**

***Scatter plots***

1. **Median income by NO2 concentration by living location (color)**
2. **Median income by AF by living location (color)**