

# Environmental Public Health Tracking Network

## ASTHO Peer-to-Peer Fellowship Final Report

Delaware

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Submitted by

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## I. Introduction

The Division of Public Health (DPH) is the lead public health agency within the Delaware Department of Health and Social Services (DHSS). Its vision is healthy people in healthy communities supported by a mission to protect and promote the health of all people in Delaware. The Delaware Department of Natural Resources and Environmental Control (DNREC) is the state's environmental protection agency. Its mission is to be a leader in restoring, maintaining, and enhancing the quality of Delaware's air, land, and water. Its vision is to work cooperatively with all Delawareans for a healthy, sustainable environment. The Environmental Tracking Network (EPHTN) provides an opportunity for the two agencies that have historically worked together to partner again through an integrated data sharing platform that provides key environmental and health data for community action.

## II. Background

In June 2016, DPH submitted an application to DNREC for funding to implement an adaptation recommendation in the Climate Framework for Delaware (Executive Order 41 by Governor Jack Markell); specifically, to evaluate the feasibility of and implement an environmental public health tracking network in Delaware. DPH was awarded funding to lead the project with Dr. Tabatha Offutt-Powell, state epidemiologist and chief of the Epidemiology, Health Data, and Informatics Section of DPH, as the project's principal investigator. In September 2016, Delaware submitted an application to participate in the Association of State and Territorial Health Officials' (ASTHO) 2016 Environmental Public Health Tracking, Peer-to-Peer Fellowship Program. Although initial funding for the tracking network was provided by DNREC, the additional guidance and expertise of the Centers for Disease Control and Prevention (CDC), ASTHO, and a state tracking network mentor would ensure that DPH's approach and activities continued to be grounded in best practices and with a support network of experts. Additionally, DPH wanted to ensure that the project funded through DNREC resulted in a viable sustainable platform for data transmission and sharing with CDC's EPHTN. Participation in the fellowship program would leverage CDC's technical and data standards throughout the duration of the project. DPH intended the tracking network to serve as an interactive data sharing platform for the public and our community partners. In the past, funding to develop such a portal was non-existent; therefore, this is the first time, with the funding from DNREC, that DPH has been able to make some progress in this area.

## III. Pilot project

Delaware's application for the peer-to-peer fellowship program outlined its pilot project scope. Specifically, Delaware focused its pilot project on two specific areas of environmental health, asthma hospitalizations and air quality.

### ***Asthma and air quality***

A report released in 2016 by DPH describes the burden of asthma using a number of key datasets.<sup>1</sup>

- The prevalence of asthma in Delaware is 10.6%; higher than national average of 7.4%.
- The prevalence of asthma is higher in Wilmington than in suburban New Castle County, Kent, or Sussex counties.
- The highest number of days in which the air quality index was measured as unhealthy for sensitive groups of people was highest in New Castle County.

- Carbon monoxide concentrations measures as the second highest one-hour and eight-hour averages in each at the Wilmington monitoring site from 1993 to 2015.
- The number of asthma hospitalizations and deaths is disproportionately higher in the black population as compared to whites.
- The total cost of asthma in Delaware is estimated at \$200 million.

These data and statistics provide a summary of the some of the key areas related to asthma and air quality. The last asthma report was published in 2005; therefore, it was important for this pilot project to address these two key areas by providing more timely information to key stakeholders to inform community, environmental, and public health prevention and response efforts. The focus for Delaware's fellowship project was two-fold: (1) to make asthma and air quality available; and (2) to build a strong foundation and platform for the development of the tracking network web portal by applying CDC technical and data standards. Strategies and related activities to develop the DEPTHN are outlined and described below. In summary, these activities include:

1. Engage and nurture partnerships between DPH and DNREC to ensure continued collaborations and open information sharing about the DEPTHN. This includes creation of a Technical Advisory Group and Governance Committee.
2. Initiate informatics infrastructure planning to evaluate existing Delaware data portals, review CDC technical and data documents for the tracking network, and make recommendations for developing Delaware's EPHTN.
3. Initiate development and implementation of the tracking network platform with focus on asthma and air quality indicator datasets.

The majority of the 11 nationally consistent data and measures (NCDMs) identified by the CDC are managed in Delaware by their own single centralized office, most operating under a single state agency. For the fellowship proposal, DPH focused on air quality measures given the opportunity to collaborate with DNREC and the continued support from the Director of DNREC's Division of Air Quality.

The primary outcome of the fellowship project was a comprehensive implementation plan (IT documents, MOUs, datasets identified and analyses conducted) for Delaware's EPHTN with specific emphasis on asthma and air quality data as its first set of measures included in the tracking network, which is described as Year 1 of the DNREC proposal. Year 2 had two primary outcomes that expanded upon Year 1 of the project (the fellowship year) and either (1) uses funds to purchase software (if necessary) or (2) uses funds to pay for a vendor to install open source software. In brief, at the end of the fellowship (i.e., Year 1 of DNREC's funding), DPH expects that it will have all of the IT documentation submitted and approved, software identified, and data prepared for submission to CDC and for inclusion in the data portal.

#### **IV. Peer site visit – Kentucky**

In June 2017, a virtual site visit was held between DPH (Dr. Tabatha Offutt-Powell) and Kentucky Department of Health's tracking network program staff. The following team members from the Kentucky Department of Health, Division of Public Health Protection and Safety participated in the site visit: Colleen Kaelin, MSPH, RS (Epidemiologist II); Janie Cambron (Epidemiologist III); and Ben Scott (Epidemiologist I). The following areas were addressed and discussed in great detail during the virtual site visit:

- An overview of Delaware's tracking network project and goals including staffing plan, data priorities, and resources from the national tracking program.

- Building partnership by identifying key partners and stakeholders.
  - Obtaining buy-in and the role of the Technical Advisory Group (TAG).
  - Contracting and negotiating with the data custodians.
  - Securing data sharing agreements.
  - Challenges and solutions: lessons learned.
- Tracking network technology including the decision process for information technology (IT) aspects of the portal.
  - Kentucky's EPHTN design and applications
  - Challenges and solutions: lessons learned.
- Demonstration of Kentucky's EPTHN web portal including an overview of key features, latest enhancements, mapping applications at varying geographic levels, and secure portals.
- Making data useful and the importance of having high quality data; addressing gaps in data; avoiding duplication of records; indicators, metadata; end users.
  - Visualizing data discussing the benefits, advantages, and limitations.
  - Data re-release and confidentiality measures.

The discussion and sharing of information and resources between Kentucky and Delaware was beneficial for Delaware. Some of the information shared confirmed for the Delaware team that their approach was appropriate and would benefit the end-users of the portal. As a result of the site visit, an exchange of information occurred between the two teams that included the following documents: data sharing agreement examples, memorandums of understanding with stakeholders and data stewards, staffing and evaluation plans, and other resources regarding sub-county data workshop and communication materials (e.g., social media resources).

## **V. Pilot project outcomes and accomplishments**

The pilot project activities focused on establishing a strong foundation for the development and creation of Delaware's EPHTN. The following outcomes encapsulate the primary components of Delaware's EPHTN and pilot project that will be used to create and build a strong infrastructure for the tracking network.

### **Outcome 1: Strong partnerships**

Delaware recognizes the importance of establishing, maintaining, and nurturing partnerships with our sister agencies. Without strong collaborations, this project will not continue to be successful; therefore, we briefly describe our partnerships that will make this a successful program. In the past, DPH and DNREC have worked together on a number of collaborative projects where the care of the public health and the quality of the environment intersect, such as pesticides, air and water quality, hazardous waste site evaluation and human exposures, drinking water protection, toxics strategies, laboratory operations, and anti-terrorism response. These agencies are building on their past relationship and expanding their collaborative efforts. Health Systems Protection (HSP) is one of the Delaware Division of Public Health's sections. Offices within HSP that are relevant to this tracking program and speak to our competency in environment health are: Office of Environmental Health and Toxicology (human health risk assessment and chemical toxicology); Office of Drinking Water (drinking water contaminants); Office of Healthy Environments (radon and child blood lead programs); Office of Radiation Control (radiological exposures); and Office of Occupational Health (work-related exposures). These are all statewide programs.

### **Outcome 2: Development of a Governance Committee (GC)**

Delaware established a Governance Committee consisting of key stakeholders and data owners to implement and enforce data standards and identify data to be included in the tracking network broadly (to ensure expansion of the network) and related to asthma and air

quality (specific to the ASTHO fellowship project and DNREC funded proposal). The GC's inaugural meeting was held in April 2017. The GC will ensure that the data to support the defined outcomes that result from the planning activities are accessible and that data owners come to agreement on how to share and secure the data. The GC will be responsible for creating successful partnerships, crafting and signing Memoranda's of Understanding (MOU's), and ensuring that all work items are transparent to internal/external stakeholders and the community.

### **Outcome 3: Technical documents**

A contractor was hired in October 2016 to serve as a business analyst to review the technical requirements for the national and state tracking networks, provide the Delaware EPTHN team with recommendations for data acquisition and management of the nationally consistent data measures (NCDMs), review existing state network portals, and prepare the required IT documentation meeting state standards and requirements. After numerous meetings with staff from existing state tracking networks and our peer state, Kentucky, the IT documents including the project charter, business requirements document, and a request for proposals (RFP) were submitted and approved by Delaware's Department of Technology and Information. A large percentage of the data included in the National Environmental Public Health Tracking Network (EPHTN) that will be reported to CDC and provided on state networks are managed within DPH. Air quality data will be ascertained from DNREC through data use and sharing agreements. With support from public health leadership and section chiefs sharing of these data across programs will occur readily. We have a dedicated informatics team in DPH that is well established and currently supports grant and state-mandated surveillance systems and informatics projects.

### **Outcome 4: Data presentation**

An important outcome of the fellowship project was the compilation and presentation of both asthma and air quality data that meet the requirements of the National EPTHN's nationally consistent data measures. The following figures display time series trends and descriptive summary statistics for inpatient hospitalizations for asthma from DPH's Hospital Discharge dataset and ozone and fine particle (PM<sub>2.5</sub>) data available from DNREC's Air Monitoring program. Although not completed for this phase of Delaware's EPTHN project, future activities include presenting these data geospatially by state, county, and census-derived geographical aggregations with the additional ability to overlay environmental and health data simultaneously to provide opportunities to generate hypotheses regarding the impacts of environmental hazards on health risks and outcomes.

Delaware recognizes that the display of tracking data in the absence of context or statistical associations does not infer causality (e.g., environmental hazard X caused health outcome Y). However, tracking data can be used to describe trends and patterns and to determine whether further investigation is needed. Tracking may also assist with generating and/or screening hypotheses to elucidate reasons for correlations/statistical associations of environmental and health factors. As a result of these initial findings, analytic studies can be designed to more fully understand the causal relations between environmental exposures and health outcomes. As such, we present a series of graphs to begin the process of hypothesis generation.

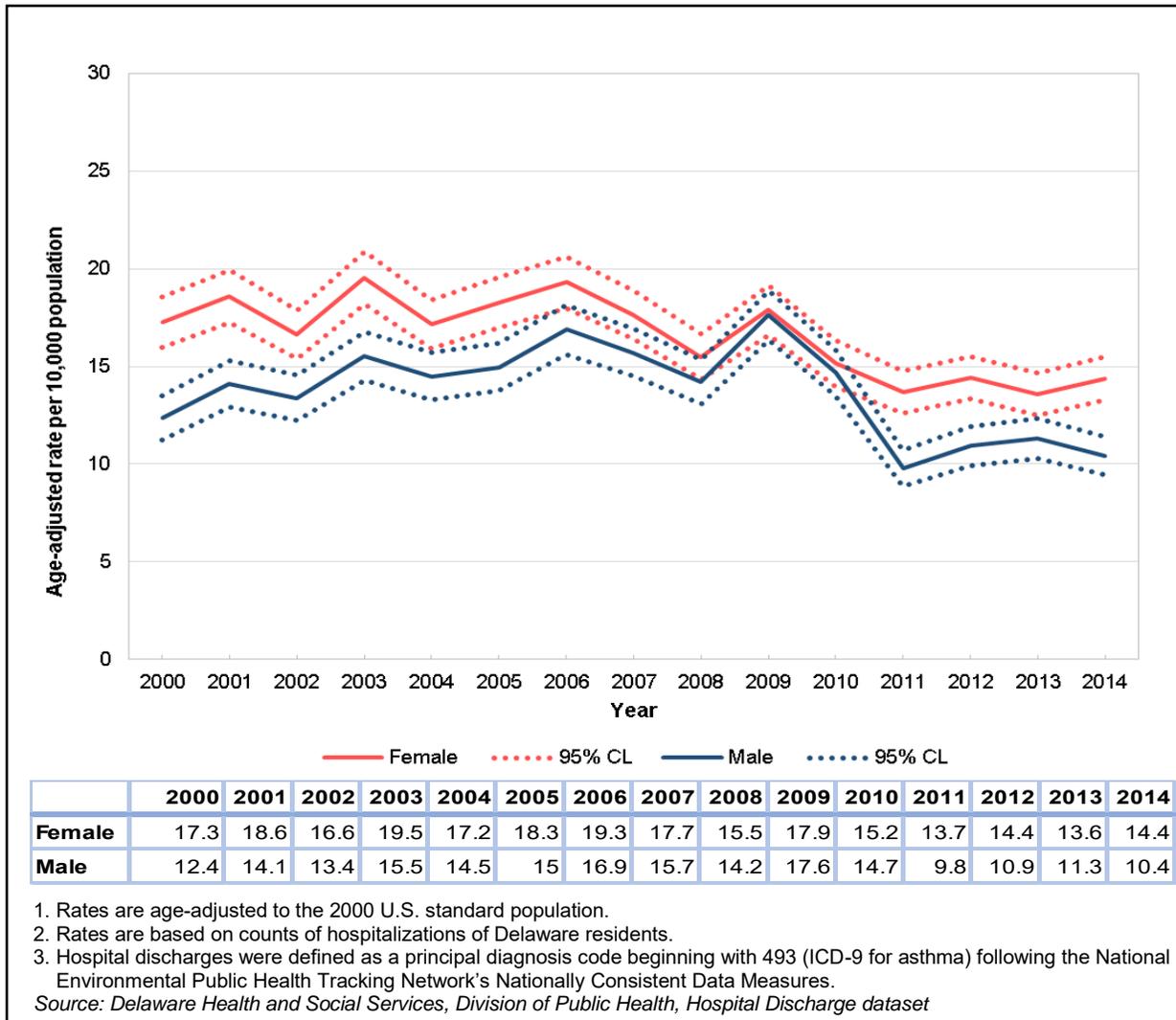
The first set of figures presents age-adjusted inpatient hospitalization rates of Delaware residents for asthma diagnoses stratified by sex and county. Inclusion of the 95% confidence limits (95% CL) in the graphs is important to convey the stability of the estimates to random variation. Age-adjustment to the U.S. standard population is necessary to ensure standardized comparisons between the state, Delaware counties, the U.S. estimates (if desired) given the differing age structures / compositions of the geographically defined populations. To ease

comparisons between the state and county graphs, the y-axes were standardized within the same data series.

### Asthma

Figure 1 illustrates fluctuations in hospitalization rates for asthma among females and males living in Delaware between 2000 and 2014 with a marked decrease measured in 2011. Statewide age-adjusted hospitalization rates for asthma were highest among females compared to males. Trends between females and males were similar over the 15-year time period. In 2009 and 2010, the disparity between females and males decreased. In 2009, the rate among males increased to reflect a similar rate among females (male= 17.6 hospitalizations for asthma per 10,000 population; females= 17.9 hospitalizations for asthma per 10,000 population). Hospitalization rates decreased more dramatically following 2009 among males than females and seemed to plateau between 2011 and 2014. In 2014, females continued to have higher hospitalization rates for asthma diagnoses as compared to males (female= 14.4 hospitalizations per 10,000 population; male= 10.4 hospitalizations per 10,000 population).

**Figure 1. Age-adjusted<sup>1</sup> inpatient hospitalization rates<sup>2</sup> for asthma<sup>3</sup> by sex, Delaware, 2000-2014**



County-specific rates presented in figures 2 to 4 vary considerably across the three counties. The highest rates occurred in 2014 among Kent County and New Castle County females (Kent= 16.9, 95% CL: 14.2, 19.6 per 10,000 population; New Castle= 15.7, 95% CL: 14.2, 17.2 per 10,000 population). Stratification by county illustrates differences in hospitalization rates among females and males. For example, age-adjusted hospitalization rates for asthma were most often higher for females compared to males across the three counties.

**Figure 2. Age-adjusted<sup>1</sup> inpatient hospitalization rates<sup>2</sup> for asthma<sup>3</sup> by sex, Kent County, Delaware, 2000-2014**

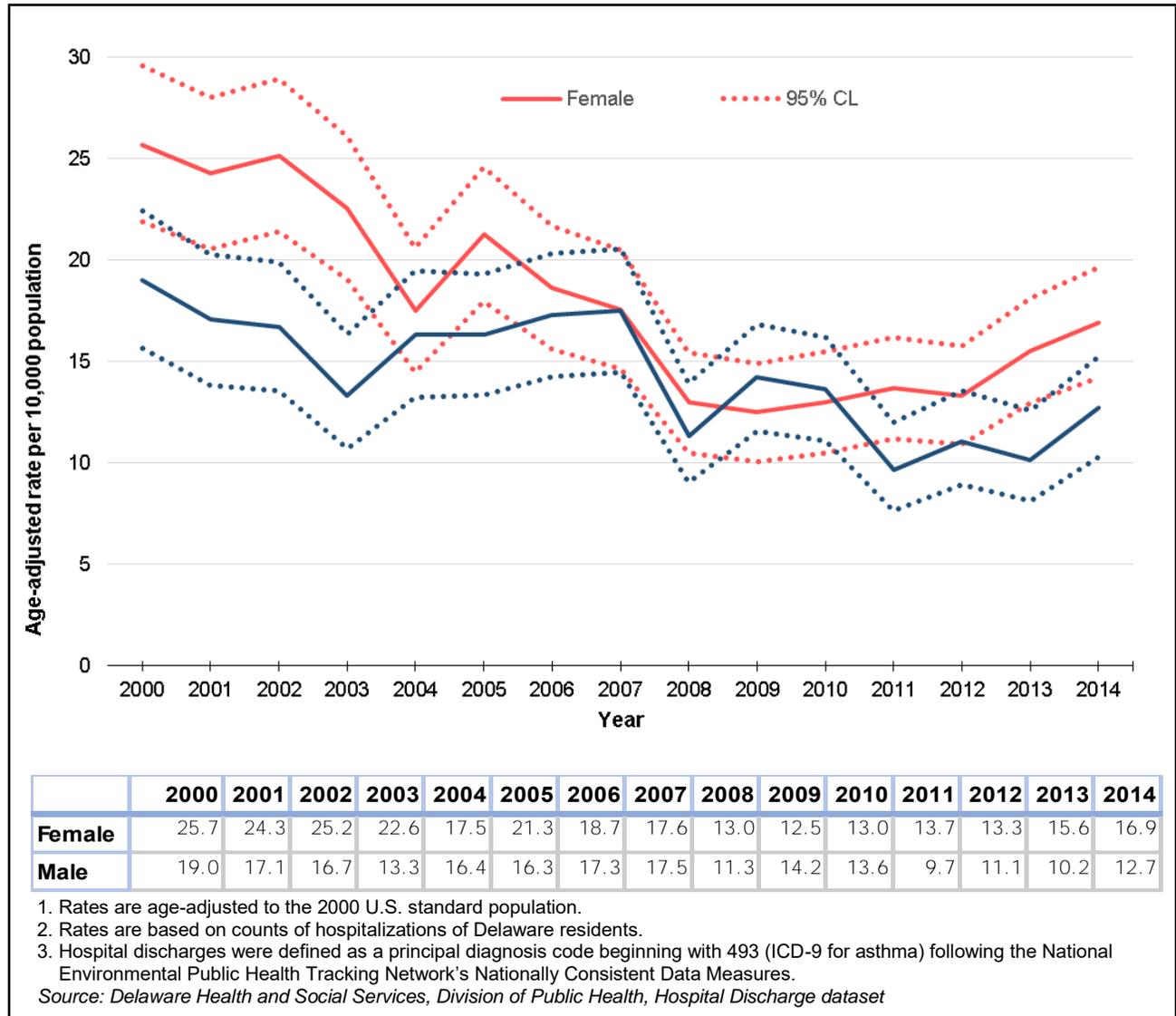


Figure 2 presents age-adjusted hospitalization rates for asthma among females and males living in Kent County. The highest hospitalization rates for asthma in 2000 occurred in Kent County with subsequent fluctuations and a downward trend over the past 15 years; however, a slight increase in hospitalization rates occurred among both females and males in Kent County beginning in 2013. Current hospitalizations rates for asthma reported in 2014 are highest in

Kent County among females (females= 16.9 hospitalizations per 10,000 population; males=12.7 hospitalizations per 10,000 population).

Figure 3 presents age-adjusted hospitalization rates for asthma among females and males living in New Castle County. Hospitalization rates among both males and females increased between 2000 and 2009 with a noticeable decrease beginning in 2010 through 2014. In 2009, hospitalization rates for asthma among men slightly exceeded rates among women.

**Figure 3. Age-adjusted<sup>1</sup> inpatient hospitalization rates<sup>2</sup> for asthma<sup>3</sup> by sex, New Castle County, Delaware, 2000-2014**



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Female</b>	15.4	18.0	16.0	20.1	17.9	18.6	21.4	19.8	18.3	22.3	17.8	15.2	17.0	14.2	15.7
<b>Male</b>	11.6	14.4	13.5	17.4	15.5	16.5	19.2	17.9	17.8	22.7	18.5	11.7	12.8	13.5	11.7

1. Rates are age-adjusted to the 2000 U.S. standard population.  
 2. Rates are based on counts of hospitalizations of Delaware residents.  
 3. Hospital discharges were defined as a principal diagnosis code beginning with 493 (ICD-9 for asthma) following the National Environmental Public Health Tracking Network's Nationally Consistent Data Measures.  
 Source: Delaware Health and Social Services, Division of Public Health, Hospital Discharge dataset

Overall, hospitalization rates were lowest across the state among females and males living in Sussex County (females= 9.2 per 10,000 population; males= 5.6 per 10,000 population), although there was more variability in the Sussex County rates compared to Kent and New Castle counties given the smaller number of hospital discharges. This is reflected in the wider confidence limits displayed on the graphs.

**Figure 4. Age-adjusted<sup>1</sup> inpatient hospitalization rates<sup>2</sup> for asthma<sup>3</sup> by sex, Sussex County, Delaware, 2000-2014**



1. Rates are age-adjusted to the 2000 U.S. standard population.  
 2. Rates are based on counts of hospitalizations of Delaware residents.  
 3. Hospital discharges were defined as a principal diagnosis code beginning with 493 (ICD-9 for asthma) following the National Environmental Public Health Tracking Network's Nationally Consistent Data Measures.  
 Source: Delaware Health and Social Services, Division of Public Health, Hospital Discharge dataset

Figure 5 illustrates the age-specific inpatient hospitalization rates per 10,000 population for asthma by 5-year age groups for the state for 2010-2014. Hospitalization rates for asthma diagnoses were highest among the very young, children under 10 years of age. Rates were disproportionately higher among males than females in children under 15 years of age; however, rates among females surpassed those of males in children older than 14 years of age and among adult populations. Rates were lowest among males in the 20 to 39 year age group.

**Figure 5. Inpatient hospitalization rates<sup>2</sup> for asthma<sup>3</sup> by age group, Delaware, 2010-2014**

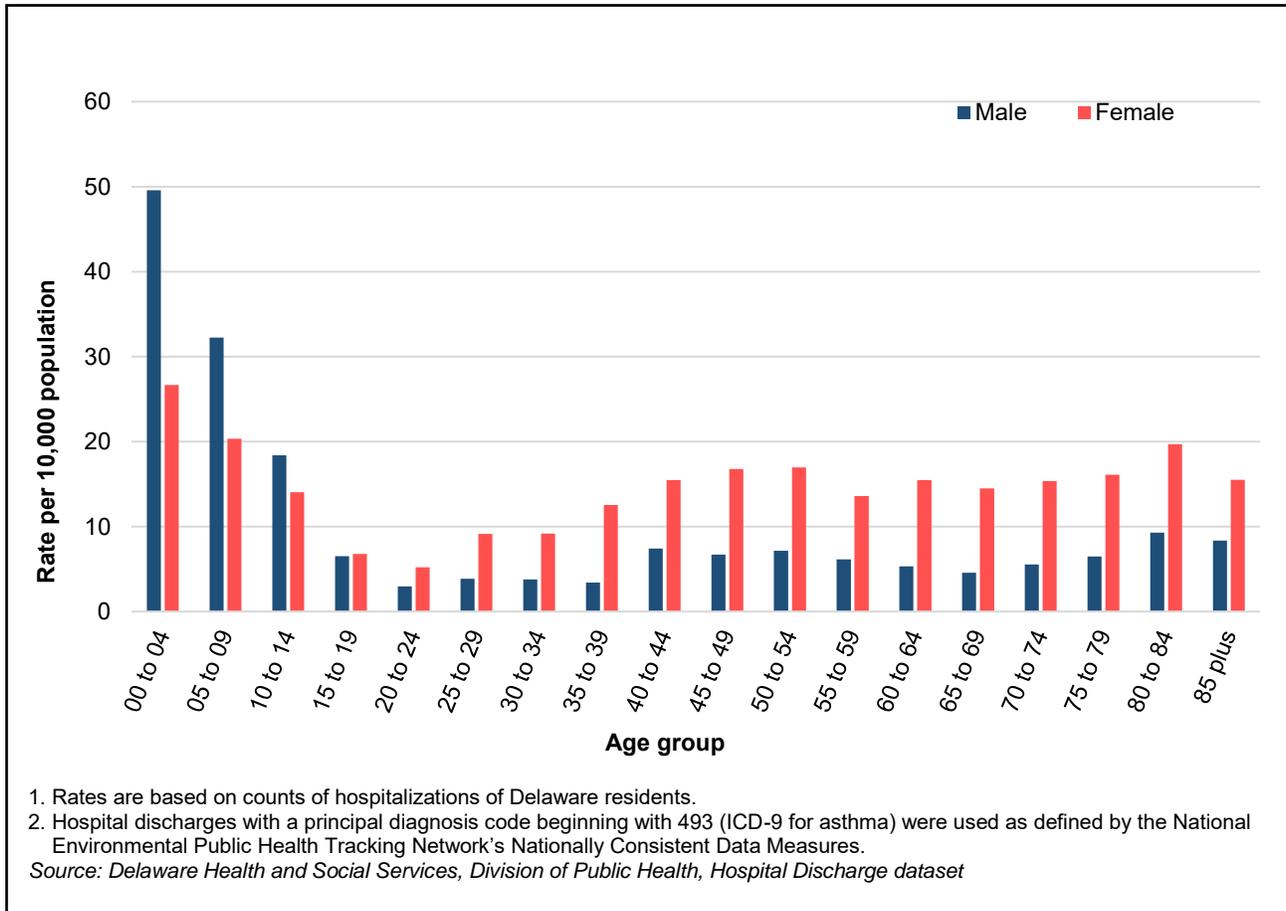


Figure 6 illustrates the age-specific inpatient hospitalization rates per 10,000 population for asthma by 5-year age groups among Kent County residents for 2010-2014. Trends for hospitalization rates by age group for residents of Kent County are relatively similar to those exhibited by the state. Minor variances occur among females in the 45 to 54 year old age groups. Hospitalization rates for asthma among females are higher than the state in these age groups. Additionally, hospitalization rates among males in the 80 to 84 year old age group is slightly higher than females in Kent County and similar to the rate among females across the state.

**Figure 6. Inpatient hospitalization rates<sup>2</sup> for asthma<sup>3</sup> by age group, Kent County, Delaware, 2010-2014**

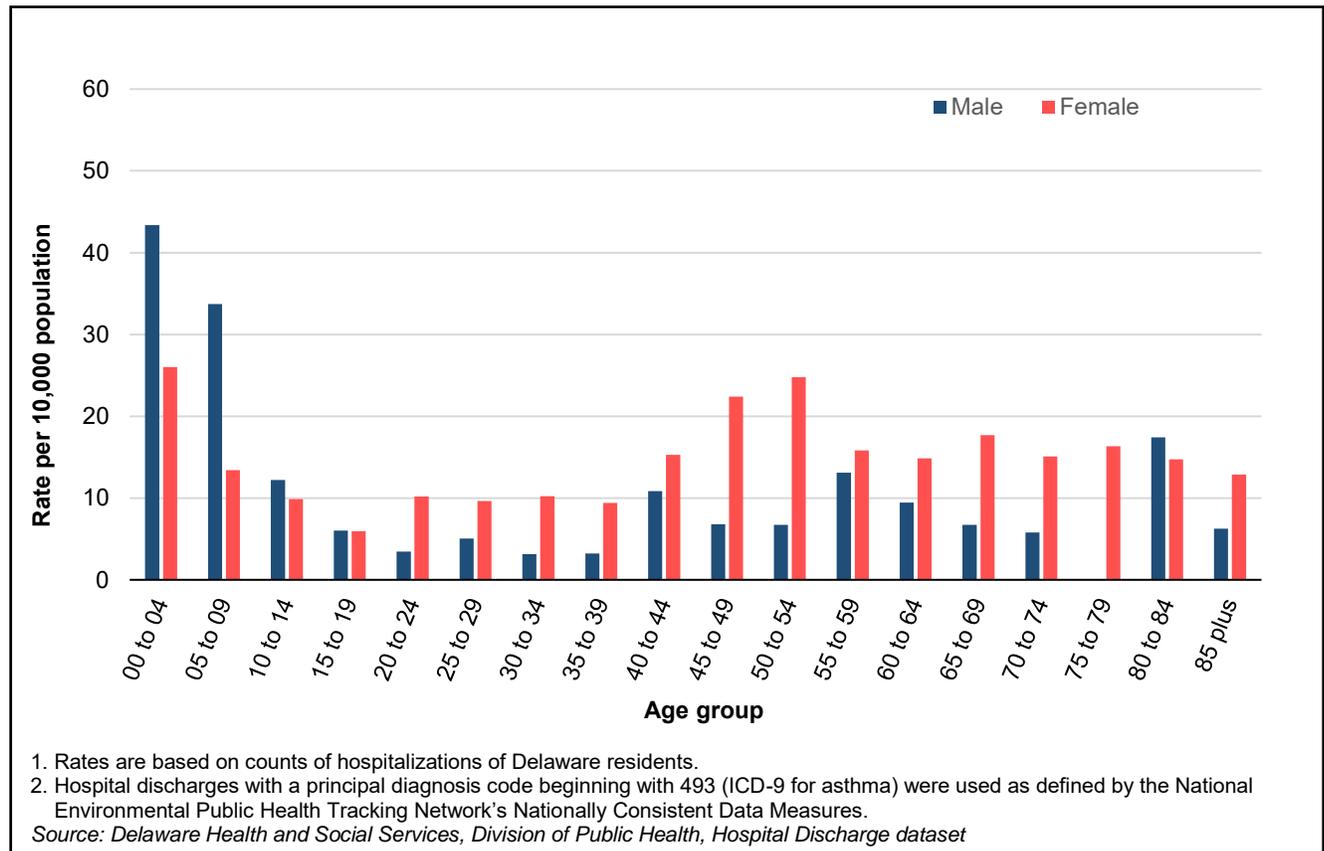


Figure 7 illustrates inpatient hospitalization rates per 10,000 population for asthma by 5-year age groups among New Castle County residents for 2010-2014. Hospitalization rates for asthma among New Castle County males and females follow a similar trend as the state rates with slightly higher hospitalization rates for asthma in nearly all age groups. Most notable is the highest reported hospitalization rates across the state occurred among males younger than 5 years of age living in New Castle County (Age 0-5 years= 62.3 hospitalizations for asthma per 10,000 population). Similar to state and county trends, hospitalization for asthma diagnoses disproportionately affected the young and the old.

**Figure 7. Inpatient hospitalization rates<sup>2</sup> for asthma<sup>3</sup> by age group, New Castle County, Delaware, 2010-2014**

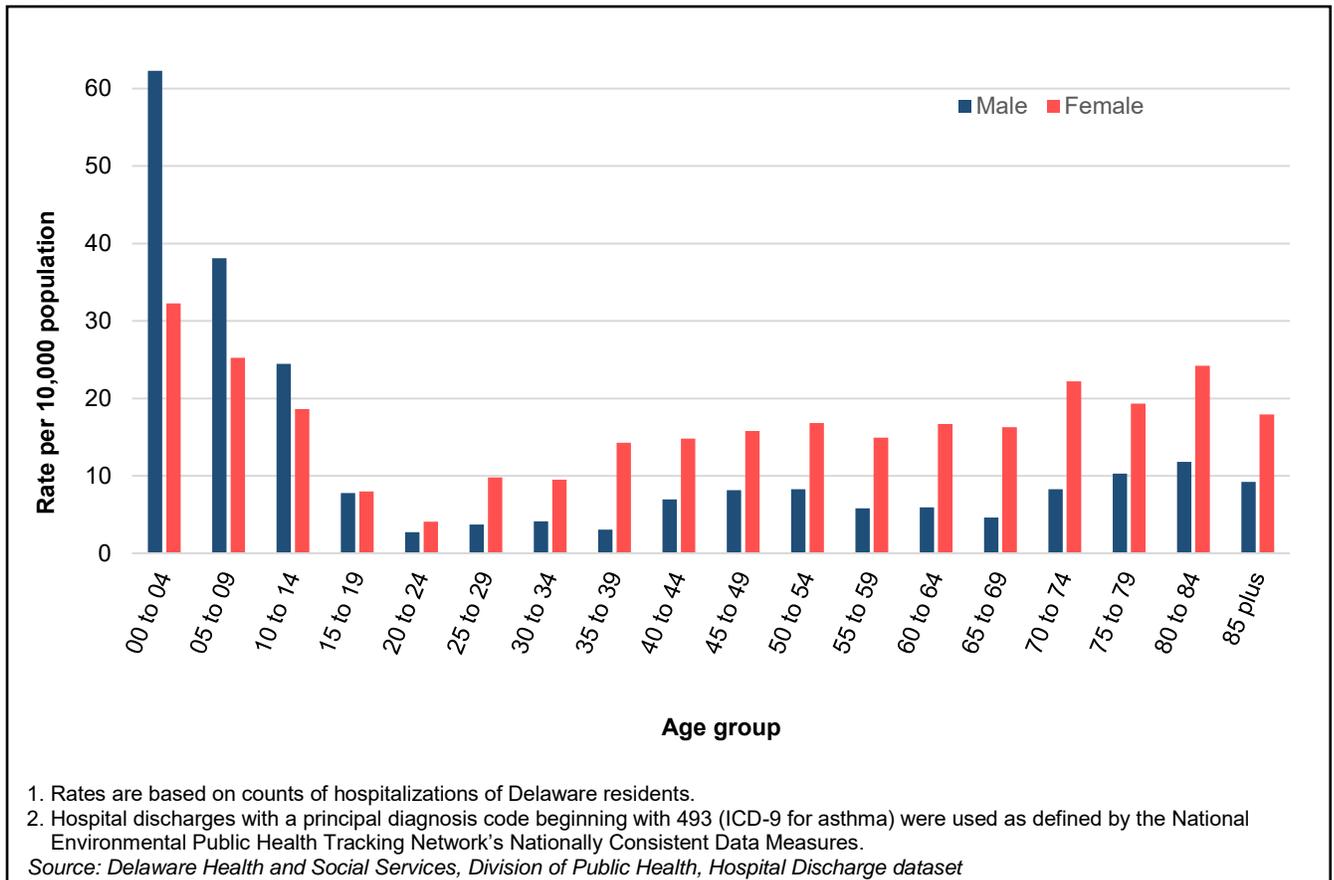
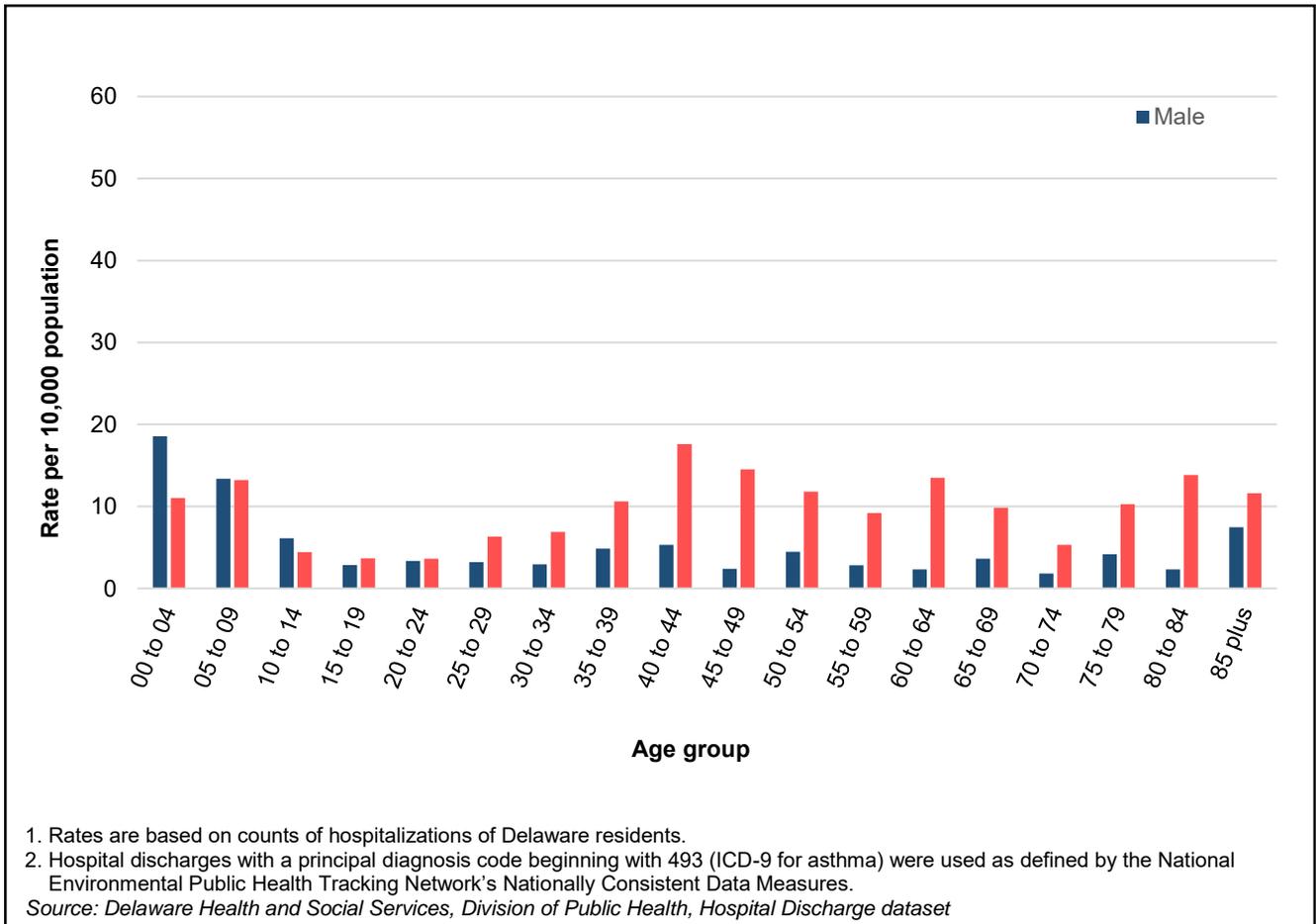


Figure 8 illustrates age-specific hospitalization rates for asthma among residents of Sussex County from 2010-2014. Sussex County hospitalization rates differ from those of Kent and New Castle among the youngest age groups. This could result from the fact that Sussex County has a generally older population distribution than Kent and New Castle counties. Highest hospitalization rates occurred in male children less than 5 years of age and females between the ages of 40 and 44 years (males aged 0-5 years= 18.6 hospitalizations per 10,000; females aged 40-44 years= 17.6 hospitalizations per 10,000 population).

**Figure 8. Inpatient hospitalization rates<sup>2</sup> for asthma<sup>3</sup> by age group, Sussex County, Delaware, 2010-2014**

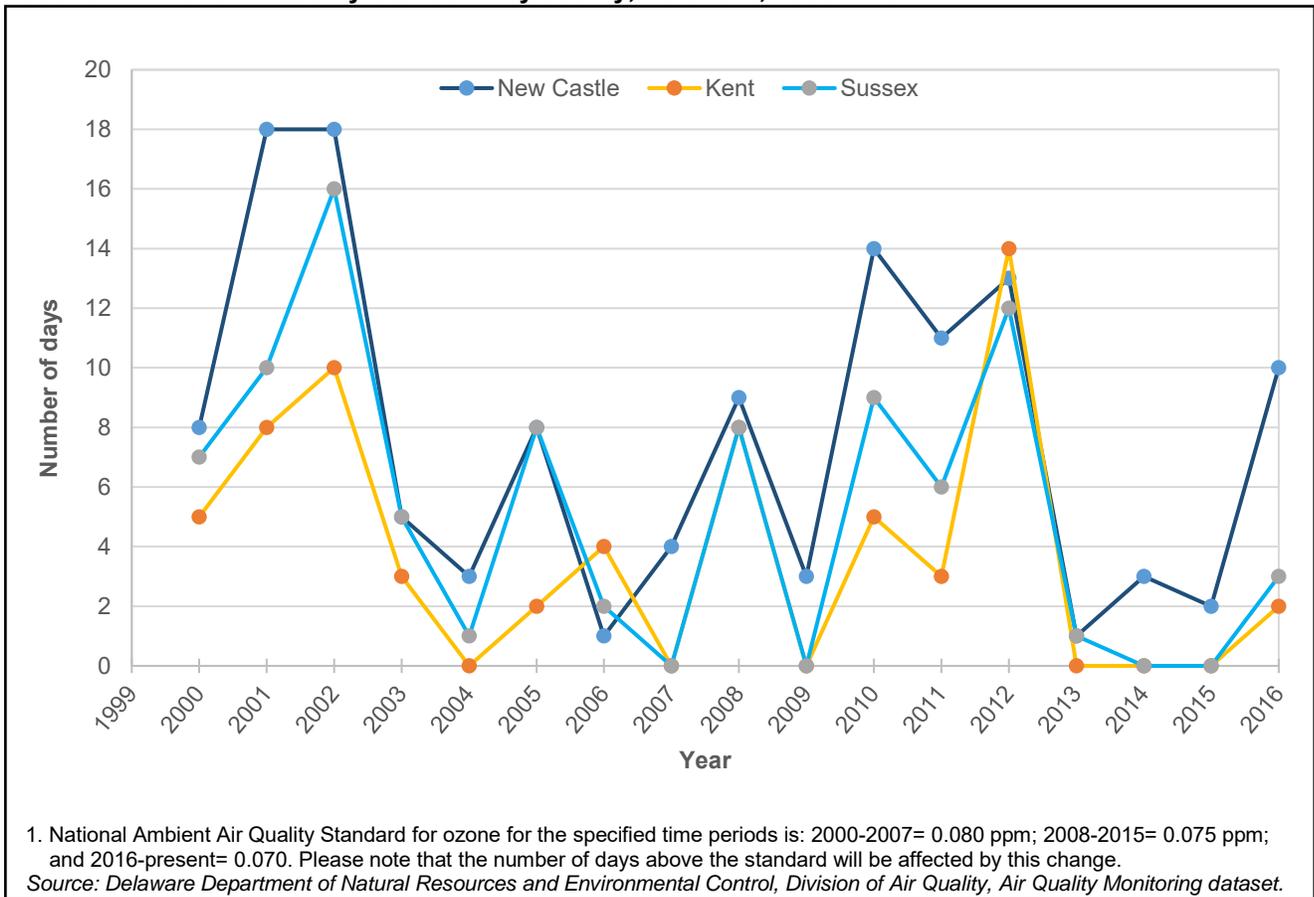


### Air Quality

National standards for air quality are used to establish acceptable levels of ozone concentration and particulate matter and identify geographic areas that exceed standard levels. Figure 9 presents air quality data available from monitoring stations across the state that measure 8-hour average ozone concentrations that exceed the National Ambient Air Quality Standard (NAAQS) stratified by county.

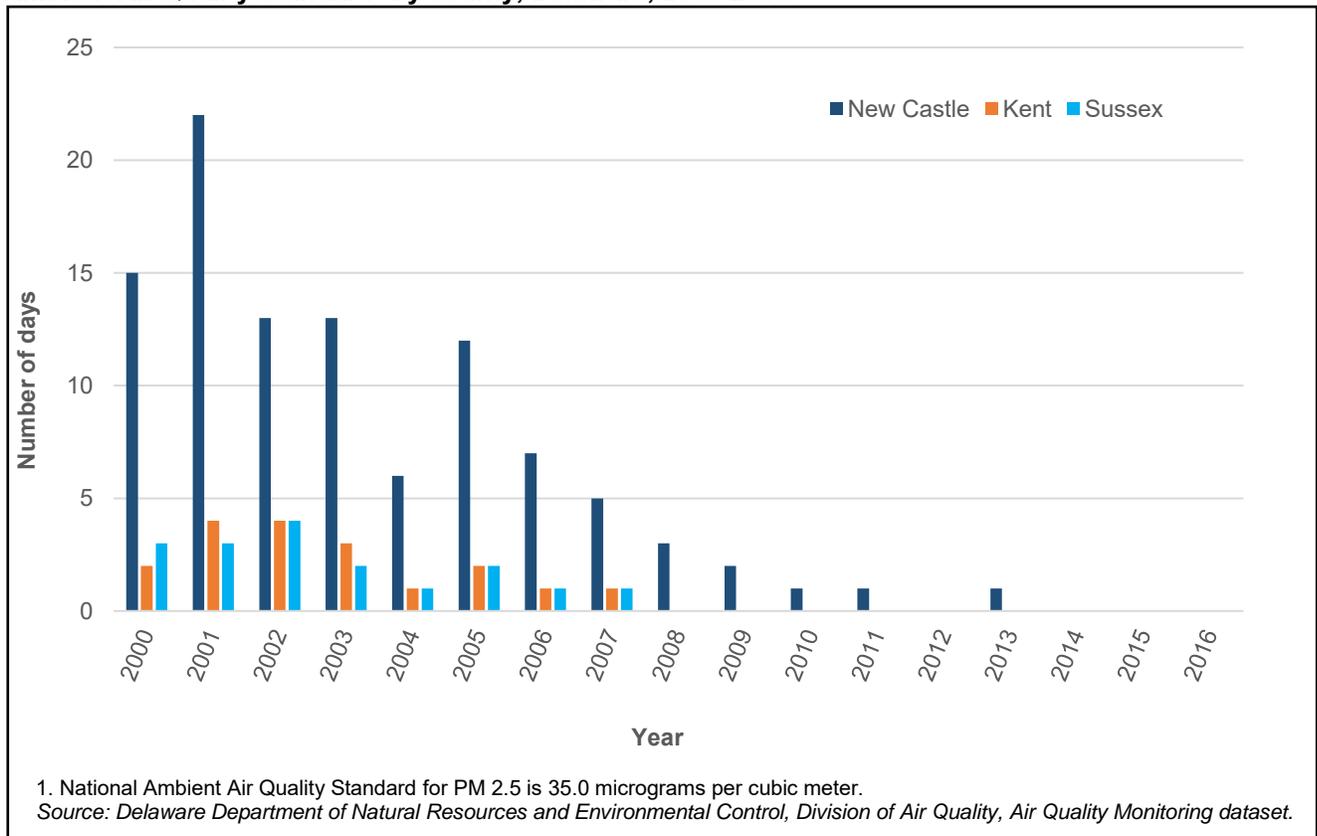
Fluctuations in the number of days that exceed the standard vary considerably from year to year and were relatively similar across the three counties with the highest numbers of days reported in New Castle and Sussex counties. The most current data available for 2016 reflected an increase in the number of days in exceedance of the standard in all three counties. New Castle County air monitors recorded the highest number of days exceeding the NAAGS measured in 2016 at 10 days compared to Sussex County (3 days) and Kent County (2 days).

**Figure 9. Number of days with maximum 8-hour average ozone concentration in exceedance of the National Ambient Air Quality Standard<sup>1</sup> by county, Delaware, 2000-2016**



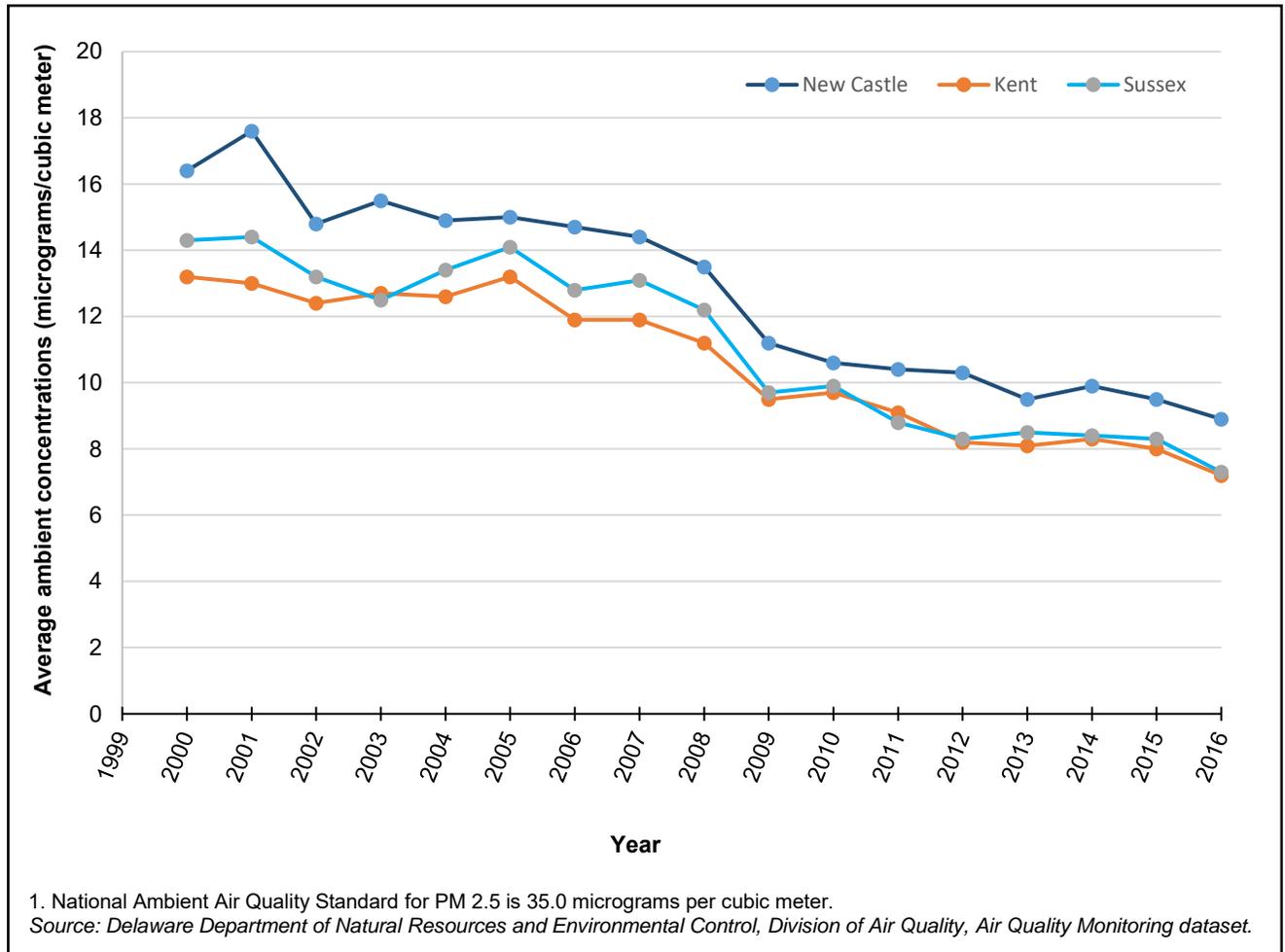
The number of days with Particulate Matter (PM 2.5) levels that exceeded the NAAQS level of 35.0 micrograms per cubic meter in Delaware is reported for the past 17-year period (2000-2016) in Figure 10. For the past three years, no counties in Delaware recorded days in which the 8-hour average ozone concentration exceeded the national standard. New Castle County air monitors recorded one day each in 2010, 2011, and 2013 that measured PM 2.5 above the national standard level. The highest number of days in exceedance of the national standard were reported in New Castle County in 2001 with the number of days gradually decreasing over the past 10 years across all three counties.

**Figure 10. Number of days with Particulate Matter (PM) 2.5 levels in exceedance of the of the National Ambient Air Quality Standard<sup>1</sup> by county, Delaware, 2000-2016**



Although Delaware recently recorded relatively few days, if none, in exceedance of the national standard of 35.0 micrograms per cubic meter, it is meaningful to quantify the annual average concentrations of PM 2.5 with an understanding that there are likely variations in these levels that result from a number of different environmental factors. Figure 11 presents the annual average concentration of PM 2.5 by county from 2000 to 2016. Annual average concentrations in all three counties remained below the NAAQS over the 17-year period. Highest concentrations were reported in 2000 or 2001 (New Castle= 17.6 mg/m<sup>3</sup>; Sussex= 14.4 mg/m<sup>3</sup>; Kent= 13.2 mg/m<sup>3</sup>).

**Figure 11. Annual average concentration of Particulate Matter (PM) 2.5 by county, Delaware, 2000-2016**



The data and statistics presented in the prior graphs and tables provide users of this report with an opportunity to start asking questions and generating hypotheses. As previously mentioned, there are limitations to presenting data at a county level; however, there are also limitations and challenges with presenting data at smaller geographically-defined levels that are meaningful to the community and can be used to inform community action. Although this report does not present data using maps, DPH intends to provide, when possible, data at more granular geographic levels using mapping and other visual display tools.

**VI. Sustainability beyond project period and fellowship**

The ASTHO fellowship project occurred during Year 1 of a two-year funded project from DNREC to develop an EPHTN in Delaware. The first phase focused on the evaluation of resources and compilation of required technical documentation for the development of the tracking network, which was completed in year 1. The second phase of the project will focus on the creation and implementation of the tracking network platform, which will require the entirety of year 2.

Because this project builds upon the vision of the Division of Public Health of healthy people in healthy communities and the mission of the Epidemiology, Health Data, & Informatics Section, which states:

*Optimizing the use of science, practice, and technology, the Epidemiology, Health Data, and Informatics Section will serve as the coordinating unit within the Division of Public Health to lead, support, and facilitate the compilation and analysis of public health data for the generation of epidemiologic evidence and translation of findings into practical and actionable information for internal and external partners.<sup>2</sup>*

Successful completion of this project is a priority. To ensure sustainability of the project, DPH will submit an application to participate in the CDC EPTN during the next funding cycle in which funding is available. Additionally, sources of funding for maintenance of the data portal are currently being explored. Dedicated staff in the Epidemiology, Health Data, & Informatics Section will ensure that existing data on the portal are updated according to a predefined schedule. Furthermore, the state of Delaware has recently engaged in an open data initiative, which may support automated updates of the data in the portal.

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