### Highlights:

- Asthma is the most common childhood chronic illness in the United States and asthma-related morbidity has been identified as one of the major factors associated with childhood disability.
- Children with asthma are found to be utilizing healthcare services (Primary care and ED visits) at higher rates compared to adults with asthma.
- There is growing evidence supporting the value of community health workers (CHWs) in reducing health care costs, however, incorporating CHWs into the formal healthcare system for asthma management and treatment requires sustainable funding mechanisms, such as federal and state funded programs (Medicaid and CHIP) as well as private health insurance.

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Nemours Children’s Health System launched an asthma intervention program titled “Optimizing Health Outcomes for Children with Asthma in Delaware” on July 1, 2012 with funding from the Centers for Medicare & Medicaid Innovation (CMMI). The three overall goals of the program were to increase the quality of care for Delaware children with asthma, improve outcomes of care for this population, and reduce the cost of asthma care over time. One focus of the intervention was on children served by the Nemours Children’s Health System in general, and three Nemours duPont Pediatrics practices and the Emergency Department (ED) specifically. An additional focus was on children enrolled in Medicaid. The design of the intervention was guided by a socio-ecological model and aimed to integrate medical care with community-based, population health services. It included a range of practice-oriented improvements, such as the enhancement of family-centered medical homes, the deployment of a Community Health Worker (CHW) workforce, the development of a primary care “integrator” model surrounding the targeted primary care sites, optimizing the use of information technology and electronic communications, and strategies for sustaining the overall intervention. Children with poorly managed asthma were assigned to a Nemours Asthma Registry. The primary focus of the intervention was on the development and implementation of this registry to identify, track and provide enhanced services for these particularly high-risk asthma cases.

Community health workers (CHWs) are front-line public health workers who are generally considered trusted members of the community, or have a particularly strong understanding of the community. A range of literature has explored the benefits of employing CHWs in large scale community health initiatives, particularly asthma management. A review of literature on CHW-based asthma management efforts (for example, Friedman et al., 2006) shows that these interventions are almost always geared towards low income communities and employ a variety of lay or health workers with different levels of training to act as intervention agents. Practice enhancement in primary care settings, particularly in pediatrics, is designed to provide a "medical home" model of care by fostering partnerships among patients, physicians and available community resources. The goal of this approach is to provide coordinated care to patients by improving awareness of and access to available community resources, while also increasing patients’ understanding of the healthcare delivery system. CHWs are ideally suited to fulfill this function and act as a connection between clinicians and patients.

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Methodology:

Health services utilization data was analyzed for children, ages 2 through 18, covered by Medicaid and receiving care within the Nemours Children’s Health System between 2010 and 2014. Client data provided by Nemours were aggregated into three exclusive groups: (1) children on the CMMI asthma registry; (2) children not on the registry, but who had received at least one asthma diagnosis; (3) children who were Nemours clients, but had not received an asthma diagnosis. Statistical difference tests were performed on the different groups, but no statistical significance was found.

The CMMI project focused its efforts, according to need, on the below zip code areas. The zip codes represent the communities immediately surrounding each of the three targeted Nemours practices where the intervention took place.

- Aggregate zip codes 19801 and 19802; compared to the rest of New Castle County
- Aggregate zip codes 19901 and 19904; compared to the rest of Kent County
- Aggregate zip codes 19956 and 19973; compared to the rest of Sussex County

Summary of Empirical Findings

Demographic Description

The majority of clients with severe asthma in the Nemours system are male. Most are children five years or older, and most are Black or African American and non-Hispanic. When examining the demographic breakdown by focus areas, the age distribution is relatively consistent; however, the proportion of males and Black or African Americans varies more by region. The Kent County focus and non-focus areas have a larger proportion of males; the New Castle County areas have a high proportion of Black/African Americans; the Sussex County areas are the only areas with a countable Hispanic population. While not all clients participated in Medicaid (as indicated by the existence of a medical claim for the year) in all years of the study period, the demographic profile remains constant.

Healthcare Utilization

The analysis of the utilization for children with asthma focused on claims for services provided in the ED and inpatient hospitalizations, as these where the services most likely to be impacted by the intervention.

Figure 1 compares the mean number of claims for asthma-related ED visits and inpatient hospitalizations between the baseline period (2010-2012) and the intervention period (2013-2014) for children on the registry.

Table 1. Mean number of asthma-related claims for ED and inpatient utilization; baseline and intervention period, according to the number of CHW visits

<table>
<thead>
<tr>
<th>Type of Claim</th>
<th>Mean Number of Claims</th>
<th>Baseline</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Health Worker Visits = 0</td>
<td>ED</td>
<td>0.10</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>Inpatient</td>
<td>0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>Community Health Worker Visits = 1-3</td>
<td>ED</td>
<td>0.11</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>Inpatient</td>
<td>0.12</td>
<td>0.08</td>
</tr>
<tr>
<td>Community Health Worker Visits = 4 or more</td>
<td>ED</td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Inpatient</td>
<td>0.21</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Source: Center for Community Research & Service, University of Delaware, 2015. Compiled with data provided by the Delaware Division of Medicaid & Medical Assistance through a partnership with the University’s Colleges of Health Sciences and Arts & Sciences
Table 2 shows the mean number of claims for the selected services among registry clients according to geographic area. Specific geographic areas show little change between the baseline and intervention time period.

Table 3 provides information on the mean percent of community health worker (CHW) visits for children on the registry according to geographic area. As seen in this table, more than three quarters of the children on the asthma registry living in Kent and New Castle Counties received four or more visits during the intervention period, regardless of whether or not they lived in the focus area zip codes. In contrast, among registry clients in Sussex County, the majority had fewer than four visits.

Analysis of Utilization among Registry Clients and Comparison Groups

Registry clients are, by definition, sicker children than the comparison groups shown below. All three groups saw an overall decrease in number of claims per child in the 2010-2014 time period. Emergency claims were somewhat stable.

Table 4. Mean number of claims across comparison groups, 2010-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Registry</th>
<th>Other Clients with Asthma</th>
<th>Other Clients - No Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>22.9</td>
<td>11.5</td>
<td>8.3</td>
</tr>
<tr>
<td>2011</td>
<td>21.4</td>
<td>10.6</td>
<td>7.6</td>
</tr>
<tr>
<td>2012</td>
<td>20.4</td>
<td>9.1</td>
<td>6.6</td>
</tr>
<tr>
<td>2013</td>
<td>18.6</td>
<td>9.1</td>
<td>6.5</td>
</tr>
<tr>
<td>2014</td>
<td>18.4</td>
<td>9.0</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Source: Center for Community Research & Service, University of Delaware, 2015. Compiled with data provided by the Delaware Division of Medicaid & Medical Assistance through a partnership with the University’s Colleges of Health Sciences and Arts & Sciences
Conclusion:

This analysis was limited in scope by practical resource constraints (e.g. money and time), and revealed many additional questions that could be explored in more detail in future studies. For instance, it would be valuable to examine utilization patterns over a longer period of time. Future analysis may focus on assessing the total length of the intervention by including 2015 Medicaid claims data. The data analyzed, however, offers a useful starting point and framework for future studies.

As Nemours providers are keenly aware, asthma is the most common cause of chronic illness in children and has a profound effect on their quality of life. The health impacts, combined with the economic impacts associated with treating childhood asthma, call for continued efforts to identify and implement effective strategies to improve quality of care, reduce costs, and ultimately improve outcomes for low income children and their families.

Finally, although we were not able to compare asthma-related utilization across all three groups, we were able to make comparisons between children on the asthma registry and other children in Nemours with less severe asthma (i.e. those with an asthma diagnosis but not on the registry). The mean billed amount for asthma-related ED claims appears to jump in 2013 for both groups. The mean billed amount gives a measure of consumption but is not actual cost. However, it falls again in 2014 for children on the registry, while it continues to increase for children with less severe asthma. These trends are also illustrated in Figure 2 below.

**Figure 2. Mean billed amount for asthma-related ED claims for registry clients and non-registry clients with an asthma diagnosis, 2010-2014, adjusted to 2014 dollars**

Figure 3 shows an increase in the mean billed amount across time periods for non-registry clients, and a corresponding decrease in the mean billed amount across time periods for registry clients. We cautiously interpret these trends as an indication that the intervention may be having a positive impact that could become more apparent over time and with additional analyses.

**Figure 3. Mean billed amount for asthma-related ED claims for registry clients and non-registry clients with an asthma diagnosis, baseline compared with the intervention period**

The project described was made possible by Grant Number 1C1CMS331017 from the Department of Health and Human Services, Centers for Medicare & Medicaid Services. The contents of this report are solely the responsibility of the authors and do not necessarily represent the official views of the U.S. Department of Health and Human Services or any of its agencies.

Source: Center for Community Research & Service, University of Delaware, 2015. Compiled with data provided by the Delaware Division of Medicaid & Medical Assistance through a partnership with the University’s Colleges of Health Sciences and Arts & Sciences.